SSC Report

Research Libraries as Data Hubs

Considerations and recommendations by the Swiss Science Council SSC
Expert reports by Prof. Dr. J. Philipp Trein and Dr. Ana Petrus on behalf of the SSC

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The Swiss Science Council SSC is the advisory body to the Federal Council for issues related to science, higher education, research and innovation policy. The goal of the SSC, in conformity with its role as an independent consultative body, is to promote the framework for the successful development of the Swiss higher education, research and innovation system. As an independent advisory body to the Federal Council, the SSC pursues the Swiss higher education, research and innovation landscape from a long-term perspective.

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9 Expert reports

Multilevel Governance and the Digital Transformation of Research Libraries: An Analytical Framework, by. J.P. Trein

Research Libraries as Data Hubs - Good Practices from Abroad, by A. Petrus

Executive summary

Reliable knowledge is an essential public good for science and the future prosperity of our society. For centuries, research libraries have been responsible for safeguarding this knowledge and making it accessible. Accordingly, RLs are an integral component of the research infrastructure landscape, playing a pivotal role in knowledge production and contributing to the competitiveness of higher education institutions within Switzerland.

The present study on "Research Libraries as Data Hubs" explores ways to strengthen RLs in the face of accelerated digital change, automation, big data and artificial intelligence.

As data hubs, research libraries store and share data from various sources and in multiple forms (analogue, digital), according to the FAIR principles. In recent years, the FAIR principles have become the widely accepted standard for enhancing the findability, accessibility, interoperability and reusability of digital assets. All the major stakeholders in Swiss science and science policy have adopted them as their common basis. The latest technological developments, new publication business models and increasing geopolitical complexity are challenging these principles. Research libraries and their expansion into data hubs are particularly affected by this. As custodians of reliable knowledge as a public good, their primary responsibility is to collect, preserve, provide and publish scientific information and data. This is especially pertinent given the rapid development of non-library information systems such as Google Scholar and generative AI tools.

Against this backdrop, the report identifies the specific challenges that research libraries face as their remit expands. These include developing and implementing new library-relevant technologies and services to ensure continuous access to reliable information. As data hubs RLs must not only provide adequate training for researchers, students and other user groups, but also continuously upskill library staff and advance the curricula of their professional education and degree programmes in a timely manner. Furthermore, a long-term preservation strategy for digital and digitised content is needed to provide future science with longitudinal data and historical depth. National cooperation must be intensified and governance improved within the context of multi-level governance. In a rapidly evolving scientific landscape, communication and integration into central structures are essential, as RL services often remain invisible. Finally, Swiss RLs currently face impending funding cuts and a systemic lack of strategic leadership at the national level.

This report is based on expert interviews, a stakeholder workshop and two external mandates focusing on multi-level governance and international best practice. The first part of the report (chapters 2 and 3) analyses the landscape of RLs in Switzerland, including important stakeholders, organisational features, resources and tasks. It provides an overview of successful examples of national collaboration, while also addressing aspects of funding and multi-level governance within the Swiss RL landscape. The second part (chapters 4 and 5) identifies the main challenges RLs are facing in the ongoing digital transformation and presents the following scenarios: status quo with minimal change, partial transformation and advanced transformation.

Against the backdrop of these considerations, the SSC formulates the following guiding principles and recommendations

Guiding Principles

Preserving the right to information as a public good

Research libraries play a crucial role in providing reliable information and preserving knowledge as a public good. Issues of data sovereignty and cyber security are becoming increasingly urgent. Preserving digital memory is a cultural responsibility, not just a technical challenge. Decisions made today will determine whether future generations can access the intellectual, scientific and cultural record of our time. It is thus essential to the integrity of research and the public good that born-digital and digitised content remains usable and trustworthy.

Further developing the Swiss information space

The enormous wealth of knowledge available in Swiss research libraries must be made fully accessible for scientific purposes across the entire research landscape. To this end, the Swiss information space must be expanded sustainably. To ensure information quality, data security and data sovereignty, research libraries promote bibliodiversity in digital and analogue forms. They enrich data spaces by adding the historical depth of their collections. They enhance the interoperability of their diverse collections in rapidly changing digital environments.

Reframing the future role of research libraries

As strategic partners at the heart of research infrastructures and academic innovation, RLs will continue to play an indispensable role throughout the entire research cycle, including the dissemination of reliable scientific results. In the age of digitalisation and artificial intelligence, innovation is essential for institutions whose core task is to store, manage and process information as efficiently as possible. To fulfil their role in the Swiss information space and beyond, RLs must redefine their strategic role as data hubs to help shaping a trustworthy, sustainable and open future for research.

Addressing technological complexity

Our society and economy are on the eve of a new general-purpose technology, which can be defined as the conjunction of pervasive digitisation, automation, big data and artificial intelligence. This cluster of new technologies creates huge opportunities and potential benefits but bears also great risks. As the general-purpose technology brings a wide range of innovations and regulatory challenges to research libraries, their future role will largely depend on their capacity to enhance the positive effects and mitigate the negative ones.

Recommendations

I. Empowerment through a national strategy

The Swiss Science Council SSC recommends that swiss-universities provide the Swiss Library Network for Education and Research SLiNER with the mandate to develop a national strategy for further digital transformation in research libraries.

This strategy should address the following challenges identified in this report:

- Dealing with the potential and risks of artificial intelligence

- Preserving the right of access to reliable information

- Ensuring historical depth in future research

- Enhancing collaboration and governance

- Increasing visibility and communication

- Updating training and professional developement

II. Dedicated funding

Funding is essential to strengthen strategic collaboration and ensure the sustainable development of research libraries amid accelerated digital transformation. However, library resources are largely tied up in the operational activities of individual institutions. Based on findings regarding multi-level governance, additional funding is required for cross-cutting strategic tasks related to cooperation of RLs at the national level.

The Swiss Science Council SSC therefore recommends dedicated funding for research libraries to be included in the next ERI Dispatch 2029–2032, e.g., through an innovation fund, a PgB programme on research libraries, or funding under art. 15 of the Federal Act on the Promotion of Research and Innovation RIPA.

III. Strengthen strategic governance and national collaboration

To expand their role in the digital age, research libraries must become strategic partners at management level within their home institutions as well as within the relevant national bodies. Only then will they be able to cooperate strategically at local, national and international levels.

The Swiss Science Council SSC therefore recommends that the Swiss higher education institutions involve their libraries more closely in strategic processes and integrate them into the relevant committees.

The Swiss Science Council SSC also recommends the greater involvement of Swiss research libraries in national strategic bodies. This is the only way to ensure that the perspective of research libraries is adequately considered in research and infrastructure policy.

Résumé

Des connaissances fiables constituent un bien public indispensable à la science et à la prospérité future de notre société. Depuis des siècles, les bibliothèques de recherche ont pour mission de préserver ces connaissances et de les rendre accessibles. Elles font ainsi partie intégrante des infrastructures de recherche, jouent un rôle central dans la production de savoir et contribuent à la compétitivité des hautes écoles suisses.

La présente étude sur le thème *Research Libraries as Data Hubs* examine comment les bibliothèques de recherche peuvent être renforcées face à l'accélération de la transformation numérique, à l'automatisation, au big data et à l'intelligence artificielle.

En tant que *data hubs,* les bibliothèques de recherche stockent et partagent des informations provenant de différentes sources et sous différentes formes (analogiques, numériques) conformément aux principes FAIR. Au cours de ces dernières années, les principes FAIR sont devenus la norme généralement reconnue pour améliorer la facilité de recherche (*findability*), l'accessibilité (*accessibility*), l'interopérabilité (*interoperability*) et la réutilisabilité (*reusability*) des ressources numériques. Tous les acteurs importants de la science et de la politique scientifique suisses les ont adoptés comme base commune. Cependant, les évolutions technologiques actuelles, les nouveaux modèles économiques dans le domaine de l'édition et la complexité géopolitique croissante remettent ces principes en question. Les bibliothèques de recherche et leur développement en tant que *data hubs* sont particulièrement touchés. En qualité de gardiennes d'un savoir fiable comme bien public, la tâche principale des bibliothèques de recherche consiste à collecter, conserver, fournir et publier des informations et des données scientifiques. Cela est particulièrement important compte tenu du développement rapide des systèmes d'information non bibliothécaires tels que Google Scholar et les outils d'IA générative.

Dans ce contexte, le présent rapport identifie les défis spécifiques auxquels sont confrontées les bibliothèques de recherche, au fur et à mesure que leur mission s'élargit. Il s'agit notamment de développer et de mettre en œuvre de nouvelles technologies et de nouveaux services de bibliothèques afin de garantir la continuité de l'accès à des informations fiables. En tant que *data hubs*, les bibliothèques de recherche doivent non seulement former de manière adéquate les chercheurs, les étudiants et d'autres groupes d'utilisateurs, mais aussi former en continu le personnel des bibliothèques et faire évoluer rapidement les plans d'études de leurs programmes de formation professionnelle initiale et continue. En outre, une stratégie à long terme pour la conservation des contenus numériques est nécessaire afin de fournir à la science de demain des données longitudinales et une profondeur historique. La coopération nationale doit être intensifiée et la gouvernance améliorée dans le contexte de la «gouvernance multiniveaux». Dans un paysage scientifique en rapide évolution, la communication et l'intégration au sein de structures centrales sont indispensables pour les bibliothèques de recherche, car leurs services restent souvent invisibles. Enfin, les bibliothèques de recherche suisses sont actuellement confrontées à des menaces de coupes budgétaires et à un manque systémique de leadership stratégique au niveau national.

Ce rapport s'appuie sur des entretiens avec des expertes et experts, un atelier avec les parties prenantes ainsi que deux mandats externes axés sur la «gouvernance multiniveaux» et les bonnes pratiques sur le plan international. La première partie du rapport (chapitres 2 et 3) analyse le paysage des bibliothèques de recherche en Suisse. Elle examine les principales parties prenantes, les caractéristiques organisationnelles, les ressources et les domaines de responsabilité. Elle discute également des exemples réussis de coopération nationale entre les bibliothèques de recherche. Enfin, elle aborde les aspects du financement et de la «gouvernance multiniveaux». La deuxième partie (chapitres 4 et 5) identifie les principaux défis auxquels sont confrontées les bibliothèques de recherche dans le cadre de la transformation numérique en cours et présente les scénarios suivants: un statu quo avec des changements mineurs, une transformation partielle et une transformation profonde.

Sur la base de ces réflexions, le CSS formule les principes directeurs et recommandations suivants

Principes directeurs

Préserver le droit à l'information en tant que bien public

Les bibliothèques de recherche jouent un rôle crucial dans la mise à disposition d'informations fiables et la préservation du savoir en tant que bien public. Les questions de souveraineté des données et de cybersécurité deviennent de plus en plus urgentes. La préservation de la mémoire numérique est une responsabilité culturelle, et non seulement un défi technique. Les décisions prises aujourd'hui détermineront si les générations futures auront accès aux archives intellectuelles, scientifiques et culturelles de notre époque. Pour l'intégrité de la recherche et le bien commun, il est donc essentiel que les contenus numérisés restent utilisables et fiables.

Développement de l'espace d'information suisse

L'immense richesse de connaissances disponible dans les bibliothèques de recherche suisses doit être rendue entièrement accessible à des fins scientifiques dans l'ensemble du domaine de la recherche. À cette fin, l'espace d'information suisse doit être élargi de manière durable. Afin de garantir la qualité de l'information, la sécurité des données et leur souveraineté, les bibliothèques de recherche encouragent la bibliodiversité sous forme numérique et analogique. Elles enrichissent les espaces de données en y ajoutant la profondeur historique de leurs collections et améliorent l'interopérabilité de leurs collections diversifiées dans des environnements numériques en rapide évolution.

Redéfinir le rôle futur des bibliothèques de recherche

En qualité de partenaires stratégiques des infrastructures de recherche et de l'innovation académique, les bibliothèques de recherche continueront à jouer un rôle indispensable dans l'ensemble du cycle de la recherche, y compris dans la diffusion de résultats scientifiques fiables. À l'ère de la numérisation et de l'intelligence artificielle, l'innovation est cruciale pour les institutions dont la mission principale est de stocker, gérer et traiter les informations de la manière la plus efficace possible. Afin de remplir leur rôle dans l'espace informationnel suisse et au-delà, les bibliothèques de recherche doivent redéfinir leur rôle stratégique comme «centres de données» afin de contribuer à façonner un avenir fiable, durable et ouvert pour la recherche.

Gérer la complexité technologique

Notre société et notre économie se situent à l'aube d'une nouvelle technologie à usage général (*general-purpose technology*), qui peut être définie comme l'interaction entre la numérisation omniprésente, l'automatisation, le big data et l'intelligence artificielle. Cet ensemble de nouvelles technologies offre d'énormes opportunités et d'avantages potentiels, mais comporte également des risques importants. Les technologies à usage général entraîneront une multitude d'innovations et de défis réglementaires pour les bibliothèques de recherche. Le rôle futur de ces dernières dépendra donc en grande partie de leur capacité à renforcer ses effets positifs et à en atténuer ses effets négatifs.

Recommandations

I. Renforcement grâce à une stratégie nationale

Le Conseil suisse de la science CSS recommande à swissuniversities de charger le Swiss Library Network for Education and Research (SLiNER) d'élaborer une stratégie nationale pour la poursuite de la transformation numérique dans les bibliothèques de recherche.

Cette stratégie devrait aborder les défis identifiés dans le présent rapport, à savoir:

- gérer le potentiel et les risques de l'intelligence artificielle;

- préserver le droit d'accès à l'information fiable;

- garantir la profondeur historique dans la recherche future;

- améliorer la coopération et la gouvernance;

- accroître la visibilité et la communication;

- actualiser en permanence la formation et les compétences professionnelles.

II. Financement ciblé

Les ressources financières sont indispensables pour renforcer la coopération stratégique et assurer le développement durable des bibliothèques de recherche dans un contexte de transformation numérique accélérée. Cependant, les ressources des bibliothèques sont étroitement liées aux activités opérationnelles des différentes institutions. Sur la base des conclusions relatives à la «gouvernance multiniveaux», des moyens supplémentaires sont nécessaires pour les tâches stratégiques transversales et la coopération correspondante entre bibliothèques de recherche au niveau national.

Le Conseil suisse de la science CSS recommande donc de prévoir des financements dédiés aux bibliothèques de recherche dans le prochain message FRI 2029–2032, par exemple sous la forme d'un fonds d'innovation, d'un programme PgB pour les bibliothèques de recherche ou d'un financement conformément à l'art. 15 de la loi fédérale sur l'encouragement de la recherche et de l'innovation (LERI).

III. Amélioration de la gouvernance stratégique et de la coopération nationale

Afin de renforcer leur rôle à l'ère numérique, les bibliothèques de recherche doivent devenir des partenaires stratégiques au niveau de la direction au sein des institutions auxquelles elles sont rattachées et des instances nationales compétentes. Ce n'est qu'ainsi que les bibliothèques de recherche seront en mesure de coopérer stratégiquement aux niveaux local, national et international.

Le Conseil suisse de la science CSS recommande donc aux hautes écoles suisses d'impliquer plus étroitement leurs bibliothèques dans les processus stratégiques et de les intégrer dans les instances correspondantes.

Le Conseil suisse de la science CSS recommande en outre une implication plus forte des bibliothèques de recherche suisses au sein des organes stratégiques nationaux. C'est la seule façon de garantir que le point de vue des bibliothèques de recherche soit pris en compte de manière appropriée dans les politiques de la recherche et des infrastructures de recherche.

Riassunto

Conoscenze affidabili sono un bene pubblico essenziale per la scienza e per il futuro benessere della nostra società. Da secoli, le biblioteche di ricerca hanno il compito di salvaguardare e rendere accessibili queste conoscenze. Esse sono quindi parte integrante delle infrastrutture di ricerca e svolgono un ruolo fondamentale nella produzione di sapere, contribuendo così alla competitività delle scuole universitarie svizzere. Il presente studio sul tema «Research Libraries as Data Hubs» esplora come le biblioteche di ricerca possano essere rafforzate di fronte all'accelerata trasformazione digitale, all'automazione, ai big data e all'intelligenza artificiale.

In qualità di «hub di dati», le biblioteche di ricerca archiviano e condividono dati provenienti da varie fonti e in diverse forme (analogiche e digitali) secondo i principi FAIR. Negli ultimi anni, questi principi sono diventati uno standard ampiamente riconosciuto per migliorare la reperibilità («findability»), l'accessibilità («accessibility»), l'interoperabilità («interoperability») e la riutilizzabilità («reusability») delle risorse digitali. Tutti i principali attori della scienza e della politica scientifica svizzera li hanno adottati come base comune. Tuttavia, l'evoluzione tecnologica, i nuovi modelli economici nell'editoria commerciale e la crescente complessità del panorama geopolitico mettono in discussione questi principi. Le biblioteche di ricerca e la loro espansione in «hub di dati» sono particolarmente soggette a questi sviluppi. In qualità di custodi di conoscenze affidabili considerate come un bene pubblico, le biblioteche sono responsabili della collezione, conservazione, valorizzazione e pubblicazione di informazioni e dati scientifici. Ciò è particolarmente rilevante, considerando il rapido sviluppo di piattaforme non bibliotecarie come Google Scholar e degli strumenti di intelligenza artificiale generativa.

In questo contesto, il presente rapporto idividua le sfide specifiche che le biblioteche di ricerca devono affrontare alla luce dell'ampliamento del loro ambito di competenza. In particolare, queste sfide includono lo sviluppo e l'implementazione di nuove tecnologie e servizi bibliotecari per garantire l'accesso continuo a informazioni affidabili. In qualità di «hub di dati», le biblioteche di ricerca devono non solo fornire una formazione adeguata a ricercatori, studenti e altri gruppi di utenti, ma anche aggiornare costantemente le competenze del personale bibliotecario e sviluppare tempestivamente corsi di formazione professionale e programmi di studio. A ciò si aggiunge la necessità di adottare una strategia di conservazione a lungo termine dei contenuti digitali e digitalizzati, al fine di garantire alla scienza del futuro dati longitudinali e profondità storica. È inoltre fondamentale intensificare la cooperazione nazionale e migliorare la governanza nel contesto della «governance multilivello». In un panorama scientifico in rapida evoluzione, la comunicazione e l'integrazione in strutture centrali sono indispensabili per le biblioteche di ricerca, i cui servizi rimangono spesso invisibili. Infine, le biblioteche di ricerca svizzere devono attualmente affrontare imminenti tagli ai finanziamenti e una carenza sistemica di leadership strategica a livello nazionale.

Il presente rapporto si basa su interviste con esperte ed esperti, un workshop con gli attori interessati e due mandati esterni incentrati sulla governance multilivello e sulle più valide pratiche a livello internazionale. La prima parte del rapporto (capitoli 2 e 3) analizza il panorama delle biblioteche di ricerca in Svizzera, concentrandosi sui principali gruppi di interesse, sulle caratteristiche organizzative, sulle risorse e sui compiti. In questa parte vengono presentati esempi di collaborazione nazionale di successo e si affrontano anche gli aspetti relativi al finanziamento e alla governance multilivello nel panorama delle biblioteche di ricerca svizzere. La seconda parte (capitoli 4 e 5) individua le principali sfide che le biblioteche di ricerca devono affrontare nel contesto dell'attuale trasformazione digitale e presenta tre scenari: uno status quo con cambiamenti minimi, una trasformazione parziale e una trasformazione avanzata.

Alla luce di queste considerazioni, il CSS formula i seguenti principi guida e le seguenti raccomandazioni

Principi guida

Preservare il diritto all'informazione come bene pubblico

Le biblioteche di ricerca svolgono un ruolo cruciale nel promuovere l'accesso a informazioni affidabili e nel preservare la conoscenza come bene pubblico. Le questioni relative alla sovranità dei dati e alla sicurezza informatica stanno diventando sempre più urgenti. Preservare la memoria digitale è una responsabilità culturale, non solo una sfida tecnica. Le decisioni prese oggi determinano se le generazioni future avranno accesso al patrimonio intellettuale, scientifico e culturale del nostro tempo. È quindi essenziale per l'integrità della ricerca e per il bene pubblico, che i contenuti nati in formato digitale e quelli digitalizzati rimangano utilizzabili e affidabili.

Ulteriore sviluppo dello spazio svizzero dell'informazione

L'enorme patrimonio di conoscenze custodito nelle biblioteche di ricerca svizzere deve essere reso pienamente accessibile a fini scientifici per l'intero settore della ricerca. A tale scopo, lo spazio svizzero dell'informazione deve essere ampliato in modo sostenibile. Per garantire la qualità, la sicurezza e la sovranità dei dati, le biblioteche di ricerca promuovono la bibliodiversità in forma sia digitale che analogica. Esse arricchiscono gli spazi di dati aggiungendovi la profondità storica delle loro collezioni e migliorando l'interoperabilità delle loro diverse risorse in un ambiente digitale in continua evoluzione.

Ridefinire il ruolo futuro delle biblioteche di ricerca

In qualità di partner strategici per le infrastrutture di ricerca e per l'innovazione accademica, le biblioteche di ricerca continueranno a svolgere un ruolo indispensabile in ogni fase del processo di ricerca, compresa la disseminazione di risultati scientifici affidabili. In un'era caratterizzata dalla digitalizzazione e dall'intelligenza artificiale, l'innovazione è essenziale per queste istituzioni, il cui compito principale è archiviare, gestire e elaborare le informazioni in modo efficiente. Per poter svolgere il loro ruolo nell'ambito dello spazio svizzero dell'informazione e oltre, le biblioteche di ricerca devono ridefinire il loro ruolo strategico come «hub di dati» per contribuire a creare un futuro affidabile, sostenibile e aperto per la ricerca.

Affrontare la complessità tecnologica

La nostra società e la nostra economia si trovano alle soglie di una nuova tecnologia a uso generale («general purpose technology»), definibile come la combinazione di digitalizzazione pervasiva, automazione, big data e intelligenza artificiale. Questo insieme di nuove tecnologie crea grandi opportunità e vantaggi potenziali, ma comporta anche rischi notevoli. Poiché questa tecnologia comporta una vasta gamma di innovazioni e sfide normative per le biblioteche di ricerca, il loro ruolo futuro dipenderà in larga misura dalla loro capacità di potenziarne gli effetti positivi e di mitigarne quelli negativi.

Raccomandazioni

I. Empowerment attraverso una strategia nazionale

Il Consiglio svizzero della scienza CSS raccomanda a swissuniversities di affidare alla Swiss Library Network for Education and Research SLiNER (Rete delle biblioteche svizzere di educazione e ricerca) il mandato di sviluppare una strategia nazionale per l'ulteriore trasformazione digitale nelle biblioteche di ricerca.

Tale strategia dovrebbe affrontare le seguenti sfide individuate nel presente rapporto:

- Gestire il potenziale e i rischi dell'intelligenza artificiale

- Tutelare il diritto di accesso a informazioni affidabili

- Garantire la profondità storica nella ricerca futura

- Migliorare la cooperazione e la governance

- Aumentare la visibilità e la comunicazione

- Aggiornare continuamente la formazione e le competenze professionali

II. Risorse a destinazione vincolata

Le risorse finanziarie sono indispensabili per consolidare la collaborazione strategica e garantire lo sviluppo sostenibile delle biblioteche di ricerca in un contesto di trasformazione digitale accelerata. Tuttavia, le risorse delle biblioteche sono in gran parte vincolate alle attività operative delle singole istituzioni. Alla luce delle considerazioni relative alla «governance multilivello», è necessario prevedere ulteriori finanziamenti per i compiti strategici trasversali e per la relativa cooperazione delle biblioteche di ricerca a livello nazionale.

Il Consiglio svizzero della scienza CSS raccomanda pertanto di includere nel prossimo messaggio ERI 2029–2032 contributi a destinazione vincolata a favore delle biblioteche di ricerca, ad esempio sotto forma di un fondo per l'innovazione, di un programma PgB per le biblioteche di ricerca o di sussidi ai sensi dell'articolo 15 della Legge federale sulla promozione della ricerca e dell'innovazione (LPRI).

III. Consolidare la governance strategica e la collaborazione nazionale

Per poter svolgere appieno il loro ruolo nell'era digitale, le biblioteche di ricerca devono diventare partner strategici a livello dirigenziale all'interno delle istituzioni a cui sono affiliate e degli organismi nazionali di riferimento. Solo in questo modo le biblioteche di ricerca potranno cooperare strategicamente a livello locale, nazionale e internazionale.

Il Consiglio svizzero della scienza CSS raccomanda pertanto alle scuole universitarie svizzere di coinvolgere maggiormente le proprie biblioteche nei processi strategici e di integrarle nei comitati corrispondenti.

Il Consiglio svizzero della scienza CSS raccomanda inoltre un maggiore coinvolgimento delle biblioteche di ricerca svizzere negli organismi strategici nazionali. Solo in questo modo sarà possibile garantire che la prospettiva delle biblioteche di ricerca sia adeguatamente considerata nella politica della ricerca e delle infrastrutture.

Zusammenfassung

Verlässliches Wissen als öffentliches Gut ist unverzichtbar für die Wissenschaft und den künftigen Wohlstand unserer Gesellschaft. Forschungsbibliotheken sind seit Jahrhunderten dafür verantwortlich, dieses Wissen zu sammeln und zugänglich zu machen. Sie sind daher ein integraler Bestandteil der gesamten Forschungsinfrastruktur, spielen eine zentrale Rolle für die Wissensproduktion und tragen wesentlich zur Wettbewerbsfähigkeit der Hochschulen in der Schweiz bei.

Die vorliegende Studie zum Thema «Research Libraries as Data Hubs» untersucht, wie Forschungsbibliotheken in Zeiten des beschleunigten digitalen Wandels und in Anbetracht gegenwärtiger Entwicklungen im Bereich Automatisierung, Big Data und Künstlicher Intelligenz gestärkt werden können.

Als «Data Hubs» speichern und vermitteln Forschungsbibliotheken Daten aus verschiedenen Quellen und in verschiedenen Formaten (analog, digital). Hierfür folgen sie den FAIR-Prinzipien, die sich in den letzten Jahren zum allgemein anerkannten Standard für die Verbesserung der Auffindbarkeit («findability»), Zugänglichkeit («accessibility»), Interoperabilität («interoperability») und Wiederverwendbarkeit («reusability») digitaler Ressourcen entwickelt haben. Die FAIR-Prinzipien werden von allen wichtigen Akteuren der Schweizer Wissenschaft und Wissenschaftspolitik als gemeinsame Grundlage anerkannt. Die neuesten technologischen Entwicklungen, neue Geschäftsmodelle im Verlagswesen und die zunehmende geopolitische Komplexität stellen diese Grundsätze vor neue Herausforderungen. Dies betrifft Forschungsbibliotheken und ihre Entwicklung zu «Data Hubs» in besonderer Weise. Als Hüterinnen von verlässlichem Wissen als öffentlichem Gut besteht die Hauptaufgabe von Forschungsbibliotheken darin, wissenschaftliche Informationen und Daten zu sammeln, zu bewahren, bereitzustellen und öffentlich zugänglich zu machen. Dies ist besonders wichtig angesichts der rasanten Entwicklung von nicht-bibliothekarischen Informationssystemen wie Google Scholar und generativen KI-Tools.

Der vorliegende Bericht identifiziert entsprechend spezifische Herausforderungen, denen Forschungsbibliotheken angesichts ihrer wachsenden Aufgabenstellungen gegenüberstehen. Dazu gehören die Entwicklung und Implementierung neuer bibliotheksrelevanter Technologien und Dienste, um einen kontinuierlichen Zugang zu verlässlichen Informationen zu gewährleisten. Zu «Data Hubs» weiterentwickelte Forschungsbibliotheken müssen Forschende, Studierende und andere Nutzer- und Nutzerinnengruppen angemessen schulen, das Bibliothekspersonal kontinuierlich weiterbilden und die Lehrpläne ihrer beruflichen Aus- und Weiterbildungsprogramme den neuen Anforderungen gemäss zeitnah weiterentwickeln. Um für die Wissenschaft der Zukunft Längsschnittdaten und eine historische Tiefendimension sicherstellen zu können, ist eine langfristige Strategie zum Erhalt digitaler und digitalisierter Inhalte erforderlich. Im Kontext der «Multi-level Governance» müssen die nationale Zusammenarbeit intensiviert und die Governance gestärkt werden. In einer sich rasch entwickelnden Wissenschaftslandschaft sind Kommunikation und Integration in zentrale (Leitungs-)Strukturen für Forschungsbibliotheken unerlässlich, zumal ihre Dienstleistungen allzu oft unsichtbar bleiben. Nicht zuletzt sehen sich die Schweizer Forschungsbibliotheken derzeit mit drohenden Mittelkürzungen und einem systemischen Mangel an strategischer Führung auf nationaler Ebene konfrontiert.

Der vorliegende Bericht basiert auf Interviews mit Expertinnen und Experten, einem Stakeholder-Workshop und zwei externen Mandaten, die sich auf die «Multi-level Governance» und «best practices» im Ausland konzentrieren. Der erste Teil des Berichts (Kapitel 2 und 3) analysiert die Landschaft der Forschungsbibliotheken in der Schweiz. Er thematisiert die wichtigsten Interessengruppen, organisatorische Merkmale, Ressourcen und Aufgabenbereiche und diskutiert erfolgreiche Beispiele in der nationalen Zusammenarbeit von Forschungsbibliotheken. Weiter wird auf Fragen der Finanzierung und der «Multi-level Governance» eingegangen. Der zweite Teil (Kapitel 4 und 5) identifiziert die wichtigsten Herausforderungen, denen Forschungsbibliotheken im Zuge der anhaltenden digitalen Transformation gegenüberstehen, und stellt drei mögliche Szenarien vor: Status quo mit minimalen Veränderungen, partielle Transformation und fortgeschrittene Transformation.

Ausgehend von diesen Überlegungen formuliert der SWR die folgenden Grundsätze und Empfehlungen

Grundsätze

Wahrung des Rechts auf Information als öffentliches Gut

Forschungsbibliotheken spielen eine entscheidende Rolle bei der Bereitstellung verlässlicher Informationen und der Sicherung von Wissen als öffentlichem Gut. Fragen der Datenhoheit und Cybersicherheit werden immer dringlicher. Die Pflege und Bewahrung des digitalen Gedächtnisses sind nicht nur eine technische Herausforderung, sie müssen auch als kulturelle Verantwortung begriffen werden. Die heute getroffenen Massnahmen entscheiden darüber, ob künftige Generationen Zugang zu den intellektuellen, wissenschaftlichen und kulturellen Leistungen unserer Zeit haben werden. Für die Integrität der Forschung und das öffentliche Wohl ist es daher unerlässlich, dass digital erstellte und digitalisierte Inhalte nutzbar und vertrauenswürdig bleiben.

Weiterentwicklung des Informationsraums Schweiz

Der enorme Wissensschatz, der in Schweizer Forschungsbibliotheken verfügbar ist, muss für wissenschaftliche Zwecke der gesamten Forschungslandschaft vollständig zugänglich gemacht werden. Zu diesem Zweck muss der Informationsraum Schweiz nachhaltig erweitert werden. Zur Gewährleistung von Informationsqualität, Datensicherheit und Datenhoheit fördern Forschungsbibliotheken die Bibliodiversität in digitaler und analoger Form. Sie erweitern Datenräume um die historische Tiefe ihrer Sammlungen und verbessern die Interoperabilität ihrer vielfältigen Sammlungen in sich schnell verändernden digitalen Umgebungen.

Neupositionierung der Forschungsbibliotheken

Die Forschungsbibliotheken werden als strategische Partner für Forschungsinfrastrukturen und akademische Innovation weiterhin eine unverzichtbare Rolle im gesamten Forschungszyklus einschliesslich der Verbreitung verlässlicher wissenschaftlicher Ergebnisse spielen. In Zeiten beschleunigter Digitalisierung und Künstlicher Intelligenz ist Innovation für Institutionen, deren Kernaufgabe darin besteht, Informationen so effizient wie möglich zu speichern, zu verwalten und zu verarbeiten, von entscheidender Bedeutung. Um ihre Rolle im Schweizer Informationsraum und darüber hinaus zu erfüllen, müssen Forschungsbibliotheken daher ihre strategische Rolle als «Data Hubs» neu definieren, um eine vertrauenswürdige, nachhaltige und offene Zukunft für die Forschung mitzugestalten.

Bewältigung technologischer Komplexität

Unsere Gesellschaft und Wirtschaft stehen an der Schwelle zu einer neuen «General-purpose Technology» (Querschnittstechnologie), die als Zusammenspiel von umfassender Digitalisierung, Automatisierung, Big Data und Künstlicher Intelligenz definiert werden kann. Dieser Cluster neuer Technologien schafft enorme Chancen und potenzielle Vorteile, birgt aber auch grosse Risiken. Da diese Technologie mit universellem Einsatzbereich eine Vielzahl von Innovationen und regulatorischen Herausforderungen mit sich bringt, wird die zukünftige Rolle von Forschungsbibliotheken massgeblich von ihrer Fähigkeit abhängen, positive Auswirkungen in ihrem Aufgabenbereich zu verstärken und negative abzuschwächen.

Empfehlungen

I. Stärkung durch eine nationale Strategie

Der Schweizerische Wissenschaftsrat SWR empfiehlt, dass swissuniversities das Swiss Library Network for Education and Research (SLiNER) mit der Entwicklung einer nationalen Strategie für die weitere digitale Transformation der Forschungsbibliotheken beauftragt.

Diese Strategie sollte sich mit den folgenden in diesem Bericht identifizierten Herausforderungen befassen:

- Umgang mit dem Potenzial und den Risiken der Künstlichen Intelligenz

- Wahrung des Rechts auf Zugang zu verlässlichen Informationen

- Sicherstellung der historischen Tiefe für die zukünftige Forschung

- Verbesserung der Zusammenarbeit und Governance

- Erhöhung der Sichtbarkeit und Intensivierung der Kommunikation

- Aktualisierung von Weiterbildung («Upskilling») und Schulung

II. Bereitstellung zweckgebundener Mittel

Finanzmittel sind unerlässlich, um die strategische Zusammenarbeit zu stärken und die nachhaltige Entwicklung von Forschungsbibliotheken in der beschleunigten digitalen Transformation sicherzustellen. Die Ressourcen der Bibliotheken sind jedoch weitgehend in den operativen Tätigkeiten der einzelnen Institutionen gebunden. Basierend auf den Erkenntnissen zur «Multi-level Governance» sind zusätzliche Mittel für übergreifende strategische Aufgaben und die entsprechende Zusammenarbeit von Forschungsbibliotheken auf nationaler Ebene erforderlich.

Der Schweizerische Wissenschaftsrat SWR empfiehlt daher, zweckgebundene Mittel für Forschungsbibliotheken in die nächste BFI-Botschaft 2029–2032 aufzunehmen, beispielsweise durch einen Innovationsfonds, ein PgB-Programm für Forschungsbibliotheken oder über eine Finanzierung gemäss Art. 15 des Bundesgesetzes über die Förderung der Forschung und der Innovation FIFG.

III. Stärkung der strategischen Governance und der nationalen Zusammenarbeit

Um ihre Rolle im digitalen Zeitalter angemessen wahrnehmen zu können, müssen Forschungsbibliotheken zu strategischen Partnern innerhalb der Leitungsgremien ihrer Institutionen sowie der relevanten nationalen Gremien werden. Nur dann werden sie in der Lage sein, auf lokaler, nationaler und internationaler Ebene strategisch zusammenzuarbeiten.

Der Schweizerische Wissenschaftsrat SWR empfiehlt daher den Schweizer Hochschulen, ihre Bibliotheken stärker in strategische Prozesse einzubeziehen und sie in die entsprechenden Gremien zu integrieren.

Der Schweizerische Wissenschaftsrat SWR empfiehlt zudem eine stärkere Einbindung der Schweizer Forschungsbibliotheken in nationale strategische Gremien. Nur so kann sichergestellt werden, dass die Perspektive der Forschungsbibliotheken in der Forschungs- und Infrastrukturpolitik angemessen berücksichtigt wird.

1 Introduction

Reliable knowledge and its preservation are public goods. This is vital for science and the future prosperity of society.[1] For centuries, research libraries (RL) have been responsible for safeguarding this knowledge and ensuring its continuous scientific usability. Libraries are therefore essential for science, they play a crucial role in knowledge production, and they contribute to the competitiveness of their universities. The purpose of RLs is to guarantee key services to their researchers, including access to scientific knowledge, Research Data Management and Open Science services, as well as the collection, maintenance and curation of scientific collections.

In this report, the term "research library" (RL) refers mainly to academic libraries at higher education institutions, including the ETH domain, cantonal universities, Universities of Applied Sciences, as well as Universities of Teacher Education.[2] The report emphasises the libraries' function for research, while other important (social) roles of academic libraries as learning centres or patrimonial libraries are not addressed.

Over the last thirty years, RLs have had to cope with demanding challenges in the context of digital transformation. Two major disruptive developments have occurred: the shift from analogue to digital holdings and the adoption of Open Science and FAIR principles as the new standard for publicly funded research.[3] In this context business models of scientific publications changed, moving the focus from "reading" to "publishing".[4] To meet these challenges, RLs have successfully established new forms of collaboration at the national level.

Society and the economy are currently experiencing the dawn of a new general-purpose technology[5] – which can be captured as the conjunction of pervasive digitisation, automation, big data and artificial intelligence. This cluster of new technologies creates huge opportunities and potential benefits but also great risks in all sectors of activities, not least for knowledge production. Under these conditions, innovation is imperative for institutions which are primarily concerned with storing, managing and processing information. In times of exceptionally rapid technological change, which has enormous potential implications for productivity, the costs of non-innovation will be very high for sectors lagging behind. Accordingly, the new challenge for RLs is to identify "innovational complementarities" between the new technologies and library-specific processes to transform and improve the services they offer.[6]

Against this backdrop, the report focuses on the following questions:

- What are the effects of the digital transformation on the services of Swiss research libraries (collection, access, preservation, publication, training) and their framework conditions (governance, legal issues, funding, technologies)?

- What are good practices from abroad to address these effects?

- What measures can be taken to secure and improve the services of Swiss research libraries and their framework conditions against the backdrop of the digital transformation?

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1 In 2023, the Council of Europe emphasised the overall importance of libraries for a «democratic, cohesive, inclusive and equitable society», which contribute to the «achievement of the Sustainable Development Goals» (Council of Europe 2023: 1).

2 See also the LIBER definition of RLs and the set of values that LIBER has defined in this context (LIBER 2017a; LIBER 2017b). It should be emphasised that there are other libraries in Switzerland with a strong research focus, as for example the Library of the Social Archive (Zurich), as well as libraries of museums or public authorities. Cf. Heller 2022: 13.

3 For analogue holdings, the FAIR approach applies to their metadata and digital surrogates.

4 «Reading» refers to access to subscription-based articles, while «publishing» means the possibility of authors to publish their articles open access.

5 General-purpose technologies are characterised by their «transformative nature, including a wide range of applications, and their economic impact on an aggregate scale» (Calvino et al. 2025: 11).

6 For theoretical considerations on innovation in libraries and a dedicated framework cf. Desmarchelier et al. 2025. On contemporary trends and technologies in Research Libraries cf. Lata & Owen 2022. On the situation in Switzerland: Mumenthaler et al. 2016; Keller 2018a.

For this study, the SSC conducted around 20 expert interviews with representatives from libraries, service providers and institutions in the fields of education, research and innovation.[7] The interviews were semi-structured and based on the above-mentioned key questions. They provided insights into past, current and future challenges facing the Swiss library landscape. Thereby, it became evident that many important steps were already taken in the past and that Swiss RLs have accumulated an impressive level of expertise in change management.

In addition to the interviews, the SSC issued two external mandates: Philipp Trein, assistant professor of Public Administration and Policy at the University of Lausanne, has written a report on the issue of multi-level governance in the context of research libraries, addressing specifically the question of national collaboration, which is discussed in chapter 3 of this report.

Ana Petrus, a former professor of Data Management at the Fachhochschule Graubünden and Managing Director and Senior Consultant at scivia LLC, has focused on "good practices" of leading institutions from abroad which are of relevance to Swiss RLs. Her report is based on interviews with representatives of international library networks and organisations, national networks and innovation incubators, as well as individual research libraries. The results of this report contribute largely to show up the challenges research libraries have been confronted with for years due to the still ongoing and accelerating digital transformation and are of particular interest with regard to various scenarios for the future.

The interview outcomes as well as the (preliminary) results of the external mandates were discussed at a stakeholder event, which took place at the University of Bern on 4 April 2025. More than 40 representatives from libraries, research repositories, service providers, policy bodies and funding institutions took part in the information event of the morning session. The discussion was deepened in a workshop in the afternoon, which focused on artificial intelligence, training, data spaces with historical depth and strategic collaboration.

The report is structured as follows: Chapter 2 maps the existing landscape of Swiss RLs, including available resources, organisational structures and key stakeholders. The main functions of HEI libraries—such as knowledge access, research support, training and preservation—are then examined in detail. In chapter 3, questions of national cooperation are discussed and existing initiatives presented. Chapter 4 focuses on challenges for RLs in the context of digital transformation, including the role of artificial intelligence, the right of information, long-term preservation, collaboration and governance, visibility as well as training.

On this basis, chapter 5 discusses scenarios of RLs as well as funding opportunities. Chapter 6 summarises the results of the analysis with guiding principles and presents the corresponding recommendations by the SSC.

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7   For the list of interviews see the annex to this report.

2 Landscape description

2.1 Stakeholders

The landscape of Swiss RLs is characterised by great diversity. This is due to the federally organised Swiss system with a multi-level governance structure. The different language regions of Switzerland add to the complexity.[8]

RLs are affiliated to different types of higher education institutions including:

- Cantonal universities

- Universities of Applied Sciences

- Universities of Teacher Education

- the ETH domain (ETH Zurich, EPFL and the four research institutes).[9]

These affiliations may entail different legal statuses: from autonomous entities to subject of cantonal or federal legislation. The research literature has highlighted the different conditions between libraries at cantonal universities and the ETH domain on the one hand, and libraries at Universities of Applied Sciences and Universities of Teacher Education on the other.[10] Thus, research libraries operate within different structural frameworks and institutional environments.

A specificity of the Swiss system is the role of the Swiss National Library (SNL). As a memory institution under the authority of the Federal Office of Culture, its main mission is to collect, preserve and make accessible the documentary heritage of Switzerland and to promote the development of national and international librarianship.[11] While considered as a scientific library with aspects of a RL by the Federal Office of Culture, the SNL does not play an important strategic role for the Swiss RLs. In this respect, the function of the SNL differs from the role of foreign national libraries in countries such as the Netherlands and the United Kingdom.

The following table provides an overview of the main stakeholders in the Swiss RL system, including governance bodies, service providers, users and funders.

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8   Dora 2012; Trein 2025; Heller 2022: 11; Keller 2018b: 59–60.

9   The ETH research institutes include the Swiss Federal Laboratories for Materials Science and Technology (EMPA), the Swiss Federal Institute of Aquatic Science and Technology (EAWAG), the Paul Scherrer Institute (PSI), and the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL). Lib4RI, a research library in the strict sense of the term, is assigned to these four research institutes.

10   Heller 2022: 12; Heinemann et al. 2023: 97.

11   Federal Office of Culture 2023: 3. Under the modernised Swiss National Library Act, approved by the Swiss Parliament in June 2025, this will include the duty to collect, index, and preserve information related to Switzerland that is available electronically (sda 2025). See also Holländer 2019: 54–56.

Governance and advisory bodies	Service providers	Users	Funders
• Universities / cantons	• Consortium of Swiss Academic Libraries	• Researchers	• Swiss Confederation
• ETHs / Swiss Confederation	• Swiss Library Service Platform SLSP	• Research managers	• Cantons
• swissuniversities	• Switch	• Teachers	• Universities
• SLiNER	• Data Science Support Centers	• Students	• SNSF
• Delegation Open Science	• Companies	• General public	• swissuniversities
• SERI		• Companies	• Swiss Academies
• Swiss Research Data Support Network (SRDSN)			• Horizon Europe
• Bibliosuisse			• Foundations

Figure 1: Overview of important stakeholders in the Swiss research library landscape.

In 2019, swissuniversities established the Swiss Library Network for Education and Research (SLiNER) as successor institution of the former Conference of Swiss University Libraries (KUB), the Library expert group of the Chamber of Universities of Applied Sciences and the Libraries working group of the Chamber of Universities of Teacher Education. SLiNER represents all academic and scientific libraries at Swiss higher education institutions. Within SLiNER exist two thematic working groups to support SLiNER on the topics of Open Access (AKOA) and Open Research Data (AKORD). They are open to all SLiNER members and contribute to their specific topics on a national level.

Global			
OCLC	IFLA	IARLA	ICOLC

Europe		
LIBER	CENL	GASCO

Swiss Confederation				
swissuniversities	Consortium of Swiss Academic Libraries	SLiNER	Swiss National Library	ETH-Domain

Cantons		
Cantonal Universities	Universities of Applied Sciences	Universities of Teacher Education

Figure 2: Cantonal, Swiss, European and global libraries and their organisations.

On an international level, the Association of European Research Libraries LIBER is of particular relevance.[12] Representing over 400 RLs in Europe, it provides regular input on policy development and strategic issues. To date, 21 libraries in Switzerland are part of LIBER, including the ETH domain, cantonal universities and Universities of Applied Sciences. So far, no University of Teacher Education participates in this organisation. The annual LIBER conference 2025 took place in Lausanne, the city in which LIBER was founded in 1971.[13]

Given the complexity of the system, it is not surprising that despite various efforts in the past, no national library strategy addresses the challenges of digital transformation in the long-term perspective to date.[14]

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12 LIBER has its own journal and organises an annual conference to discuss topical issues for RLs. In 2017 LIBER addressed the transformations in the academic landscape by discussing the definition of research (LIBER 2017a) and introducing a shared set of values that members have to agree on to be accepted as a research library. For the list of values: LIBER 2017b.

13 In 1971 the Director of the Bibliothèque Cantonale et Universitaire de Lausanne (BCUL), Jean-Pierre Clavel, was one of the driving forces and founding figures of LIBER (LIBER n.d.).

14 As of 2008, the Commission of the Swiss National Library initiated a process towards a «nationally coordinated library policy». This process failed, however, and the Commission was dissolved in 2020. Swiss National Library 2020; interview with Damian Elsig / Matthias Nepfer 2024.

2.2 Organisational structure and resources

Today's landscape of Higher Education Libraries is strongly influenced by the reorganisation of the Swiss Higher Education ecosystem in 2015 via the Federal Act on the Funding and Coordination of the Swiss Higher Education Sector (HEdA).[15] Thereby, the academic library system of Switzerland became even more varied in terms of their representative bodies, jurisdiction and integration in higher education policies. While some of the RLs have an exclusive focus on their universities, others fulfil further functions for their cantons or cities.[16] As such, they serve a broader group of users and fulfil functions of patrimonial and public libraries.

Examples of research libraries with cantonal tasks are the university libraries of Basel and Bern on the one side, and the BCU Lausanne and the ZHB Lucerne on the other side. In Basel and Bern, the cantons have delegated library supervision and control to their universities, making the libraries an integrated part of the institutions. Their affiliation with the universities likely fosters a closer connection than if they were managed by the cantonal administration. In both cases, library directors are appointed by the university, ensuring a direct line to university management.[17]

The BCU Lausanne and the ZHB Lucerne negotiate their services directly with the cantons, which act as the library's governing bodies.[18] The BCU Lausanne and the ZHB Lucerne are part of the cantonal administration and, although not legally independent, they operate autonomously within the framework of decentralised administrative units.[19]

Governance structures are heterogeneous as well. Some of the cantonal university libraries are affiliated with the Vice President for Education (Basel University Library[20]) or the Vice President Faculty Affairs and Scientific Information (Zurich University Library),[21] while others are located within the Direction and central domain, as is the case for Neuchâtel University Library, which is part of the Scientific information and library services unit,[22] or directly affiliated with the Administrative Director's Office (Bern University Library).[23]

The libraries of the ETH domain are subject to federal law and comprise the two Federal Institutes of Technology ETH Zurich and EPFL, the four research institutes PSI, WSL, EMPA and EAWAG, as well as the ETH Board. In addition to the two libraries of EPFL (affiliated within the Vice presidency for academic affairs, Unit for scientific information and libraries) and ETH-Zürich (subordinate to the Vice president for infrastructure and sustainability), the research institutes EAWAG, EMPA, PSI and WSL have a specialised research library, Lib4RI, which provides services to all affiliates of the four institutes.[24]

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15 With the Higher Education Act (HedA), which was coming into force in 2015, the Higher Education Institutes were divided into three different types: Universities (including cantonal Universities and the Federal Institutes of Technology), Universities of Applied Sciences, and Universities of Teacher Education. See also Heller 2022: 11–18.

16 University Libraries with extended functions are: UB Basel, UB Bern, BCU Fribourg, Bibliothèque de l'Université de Genève and Bibliothèque de Genève, BCU Lausanne, Biblioteca universitaria di Lugano, ZHB Luzern, Bibliothèque publique et universitaire de Neuchâtel, Bibliothek der Universität St. Gallen (HSG), Universitätsbibliothek Zürich (UB) und Zentralbibliothek (ZB) Zürich. Cf. Heller 2022: 12; Oesterheld 2018: 30–31.

17 The University of Basel has, since 2007, been governed by both the cantons of Basel-Stadt and Basel-Landschaft together. The cantonal mandate of the University Library of Basel, specifically the task of patrimonial library for the Canton of Basel-Stadt, the collection of Basiliensia, is part of a separate agreement between the University and the Canton of Basel-Stadt: «Against this background, a detailed calculation of the costs of the cantonal mandate, including apportionments, was carried out in order to exempt the canton of Basel-Landschaft, which has its own cantonal library, from financing the University Library of Basel». Chappuis 2009: 43.

18 Heinemann et al. 2023: 97.

19 Chappuis 2009: 42. In the case of the BCU Lausanne, the library's mission is enshrined in the «Loi sur le patrimoine mobilier et immatériel» (LPMI, Art. 32).

20 Universität Basel 2025.

21 Universität Zürich 2025.

22 Université de Neuchâtel 2023.

23 Universität Bern n.d.

24 Lib4RI 2025.

The differences mentioned are also reflected in the resources available to each RL. An overview of basic data for the Swiss library landscape used to be provided by the Swiss library statistics survey, which, until 2024, was conducted on a yearly basis by the Federal Statistical Office.[25]

The tables below highlight the different resources in Full-time Equivalents (FTEs) and expenditures of Swiss RLs at cantonal universities and the Federal Institutes of Technology ETH Zurich and EPF Lausanne.[26] While the numbers provide an overall impression of the library landscape in Switzerland, it has to be taken into account that different libraries have different functions. As for the EPFL library, for instance, there has been a strong focus on electronic and digital literature from an early stage on and the library does not fulfil the function of a patrimonial library. Moreover, at the EPFL, the Unit for Scientific Information and Libraries and the Open Science Unit have a strong ongoing collaboration but are separate entities from a financial point of view.[27] This is not the case for other libraries, where the expenditures also include the Open Science unit and related functions.

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25 As part of austerity measures, the Federal Council decided in June 2025 that the National Library Statistics would no longer be conducted by the Federal Statistical Office. This role has been taken over by Bibliosuisse, the association of Swiss libraries. Bibliosuisse and the ZHAW will compile the 2025 statistics (based on 2024 data) on an interim basis, using the same variables (Bibliosuisse 2025).

26 Federal Statistical Office FSO 2023. Note that FTEs and expenditures of Universities of Applied Sciences are generally significantly lower than those of cantonal universities and the ETH domain. Universities of Teacher Education have the least funding of all research libraries.

27 Interview with Isabelle Eula and Pascale Bouton 2024.

Institution	2020		2021		2022		2023	
	Work-force in FTEs	Expen-diture in million CHF	Work-force in FTEs	Expen-diture in million CHF	Work-force in FTEs	Expen-diture in million CHF	Work-force in FTEs	Expen-diture in million CHF
ETH Zurich Library[28]	223	49.3	206	50	196	49.8	189	50
University Library Bern	202	35.9	198	36.2	195	37.3	194	36.9
Central Library Zurich[29]	189	44.3	172	43.1	183	43.2	184	45.7
University Library Basel	148	27.4	172	30.8	168	32.4	170	31
University Library Lausanne	138	23.8	146	25.7	142	25.3	145	26
University Library Geneva	131	22.8	126	23	120	23	125	23.5
University Library Lucerne	75	13.8	76	14.2	74	14.5	95	17.1
University Library Zurich[30]	47	13.1	46	12.8	123	23.5	126	24.8
EPF Lausanne Library[31]	39	10.1	38	10.5	36	10.3	39	11.3
University Library St. Gallen	31	7.7	31	7.8	31	8.2	31	8.4
University Library Neuchâtel	24	3.9	25	6.9	25	6.6	23	4.5
University Library Università della Svizzera italiana	19	3.3	18	3.7	18	3.4	20	3.7

Table 1: FTEs and expenditure of cantonal university, ETH Zurich and EPFL libraries 2020–2023. Federal Statistical Office FSO, 2020–2023.

28   Federal Statistical Office FSO 2021–2023. The figures for 2020 were provided by ETH Library.
29   Regarding the data for Zurich, it is important to consider the rather complex library landscape of Switzerland's largest university location. Until 2022, the University of Zurich included diverse small and medium-sized faculty and institute libraries, which operated independently. Furthermore, as of 1980, there existed a «Main Library of the University of Zürich» for the faculties of the natural sciences and medicine. Since January 2022, the University Library of Zurich (UB Zurich) comprises all the libraries of the University of Zurich under one organisational umbrella: in a project lasting several years, the previously largely independent libraries were merged and all their resources (staff, finances, spaces) transferred. The Central Library of Zürich (founded as «Kantons-, Stadt- und Universitätsbibliothek» in 1910), remains another important stakeholder. Details for the situation before 2022 can be found in Oesterheld 2018: 32ff. The reorganisation and transformation to the present University Library as well as the drivers and challenges of the reorganisation are discussed by Mumenthaler & Tschander 2024.
30   See footnote 29.
31   Both, the Open Science Unit and the Scientific Information and Libraries Unit are affiliated to the Vice President of Academic Affairs, as shown in the Organizational Chart (EPFL 2025).
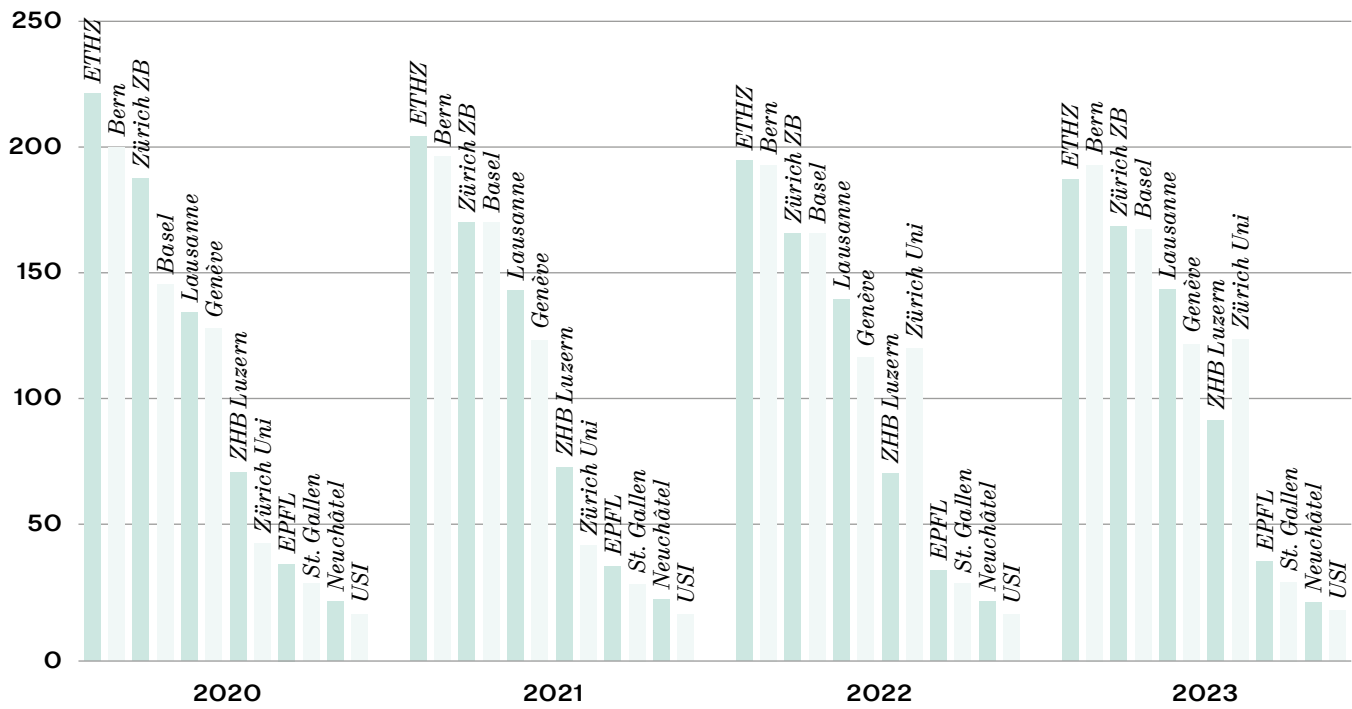
FTEs in University Libraires

Figure 3: FTEs of cantonal university, ETH Zurich and EPFL libraries. Federal Statistical Office FSO, 2020–2023.

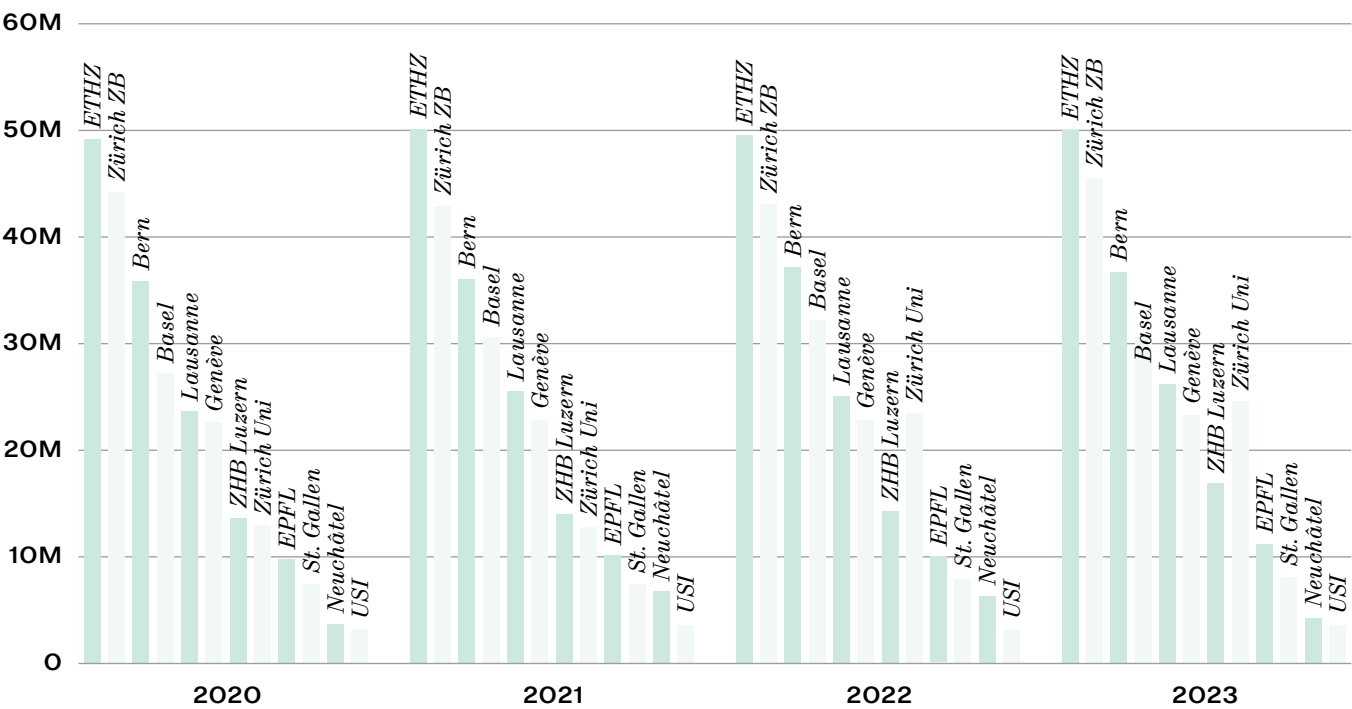## Total Expenditures of University Libraries

Figure 4: Expenditures of cantonal university, ETH Zurich and EPFL libraries. Federal Statistical Office FSO, 2020–2023.

2.3 Main tasks

Over the last thirty years, Swiss RLs have successfully confronted major disruptive developments like the transition from analogue to digital holdings and the (fast) growing possibilities to exchange research data more quickly and collaboratively. Thus, digital transformation has expanded the service portfolio of RLs considerably.[32]

The central function of libraries is to select, collect, organise, preserve and provide access to data, information and knowledge, and to mediate their utilisation.[33] As a "third place", libraries also serve as "community education providers, and digital literacy suppliers".[34]

In the interviews and workshop with stakeholders, the following tasks of RLs were discussed in particular.

Enabling access to and preservation of knowledge

RLs curate and manage extensive collections of physical and digital resources, ensuring that researchers and students can access the information, data(bases) and materials they need in different forms and formats. This includes negotiating licences for electronic content, facilitating interlibrary loans[35], and participating in consortia to maximise value and coverage. RLs provide discovery systems that allow users to find information quickly, reliably and effectively. The most important tasks of research libraries are collecting, maintaining and curating scientific knowledge and guaranteeing long-term access to both, born-digital and analogue content through appropriate preservation strategies.

Research support and training

Experts at RLs support the research process, from literature searching and reference management to publishing, especially in view of Open Access (OA) publishing.[36] In parallel, they offer teaching on information and digital literacy, equipping their patrons with the critical skills required to navigate, evaluate and ethically use information in an increasingly complex digital environment.[37] RLs are training PhDs in the context of research data management (RDM), Open Access publishing or research impact. The training of staff on digital skills remains a key challenge because of the ongoing technological and legal changes and the strong competition for IT expertise, especially highlighted during the workshop.[38]

Publishing

RLs are important players in shaping the future of scholarly communication. They manage institutional repositories, support OA publishing, and promote the visibility and impact of academic outputs. They also advise on copyright, publishing rights and compliance with funder mandates, helping institutions and researchers meet their legal and ethical obligations.[39]

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32   van der Graaf et al. 2025.
33   Lor 2019: 119.
34   Vietiell 2025: 422.
35   Several interviews confirmed that interlibrary loan of electronic books poses a problem, due to copyright issues.
36   Hacker 2023.
37   Drössler et al. 2025.
38   Sesartic Petrus & Töwe 2019.
39   berinfor 2018: 1; van der Graaf et al. 2025.

3 Collaboration and governance

3.1 National collaboration and funding

Since the beginning of the 21ˢᵗ century, RLs have successfully established new forms of national collaboration to address challenges of the digital transformation. The 1980s and 1990s were characterised by a "fragmentation" and "drifting apart" of university libraries. Against this background, the implementation of "Projektgebundene Beiträge" (PgBs) as federal project contributions in the year 2000 can be seen as a turning point.[40] They enabled the initiation of collaborative RL initiatives such as the Consortium of Swiss Academic Libraries and the Swiss Library Service Platform (SLSP). PgBs are based on a seed financing approach, and funded entities must cover at least 50% of the project costs. Some stakeholders emphasised that this approach has its limitations, for instance when it comes to foster disruptive innovation.[41]

In the first two periods of the federal programmes (2000–2007 and 2008–2012), funding stemmed from the Swiss University Conference (SUK) as well as the ETH Board and Universities of Applied Sciences. This changed with the foundation of swissuniversities as an umbrella organisation for all university types in 2015. Until 2012, there were specific thematic sub-programmes for libraries. Since 2013, those sub-programmes have covered cross-cutting issues such as "scientific information" and "Open Science". Consequently, RLs are no longer the sole beneficiaries but rather share funding with other institutions, such as IT providers and universities.[42]

The table below provides an overview of federal project contributions (PgBs) for RLs in the period 2000–2024. Note that the table does not include self-contributions of RLs and their home institutions and that the amount indicated as "Projects with participation of RL" may include funding of other partner institutions, such as universities or service providers.

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40 Keller 2018b: 59–60.

41 Oesterheld 2018: 35; Heller 2022: 25–26; Neubauer 2018; Dora 2012: 81; Keller 2018b; Petrus 2025. See also Keller 2018a: 496: «Beachtet man die Auflage der Geldgeber, dass Eigenleistungen in der Höhe von mindestens 50 % erbracht werden müssen und es sich ausschliesslich um Anschubfinanzierungen handelt, so überrascht es nicht, dass die Bibliotheken Projekte wählen, die auf ihren Kernaufgaben aufbauen. Schliesslich ist allen klar, dass man nach Ablauf der Projektphase auf eigenen Beinen stehen muss. Dies dürfte einerseits die Nachhaltigkeit positiv beeinflussen, andererseits werden hierdurch Projektvorschläge für radikale Innovationen erschwert oder gar verhindert. Projekte bleiben typischerweise Zusatzdienste, oft sehr wichtige, manchmal auch nur 'Nice to have'-Angebote.»

42 Keller 2018b: 65. See table 2 and footnotes below for more information.

Year	Programme / Projects	CHF (million)	Funders
2000–2007	Programme: Consortial Projects Project: Consortium of Swiss Academic Libraries	13.4	SUK / ETH Board / Universities of Applied Sciences[43]
2008–2012	Programme: e-lib Projects (selection): swisbib, e-rara, e-codices	11.8	SUK / ETH Board / Universities of Applied Sciences[44]
2013–2016	Programme: P 2 – Scientific Information (I) Projects (selection): Speicherbibliothek, National licences; SLSP (conceptual phase)	Total budget: 36 Projects with participation of RL: 8.3	SUK (as of 2015: swissuniversities) / ETH Board / Universities of Applied Sciences[45]
2017–2020	Programme: P 5 – Scientific Information (II) Projects (selection): SLSP, geodata4edu.ch, NIE-INE	Total budget: 30 Projects with participation of RL: 10.1	swissuniversities (PgB)[46]
2021–2024	Programme: P 5 – Open Science (I) Projects (selection): GOAL; PLATO	Total budget: 45 Projects with participation of RL: 4.2	swissuniversities (PgB)[47]

Table 2: Selection of national RL projects funded by national bodies.

In what follows, the Consortium of Swiss Academic Libraries and SLSP – two outstanding examples of national collaborations – will be discussed in more detail. The Consortium provides services regarding consortial licence agreements and "Big Deals" with publishers. The Swiss Library Service Platform SLSP with the national platform swisscovery compiles scientific information from around 500 libraries in Switzerland.

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43   Ball & Boutsiouci 2018: 151.
44   Keller 2018b: 63.
45   swissuniversities 2019; swissuniversities 2020; Keller 2018b: 64–65.
46   swissuniversities 2019; swissuniversities 2020; Schneider 2018.
47   swissuniversities 2021a; swissuniversities 2021b; swissuniversities 2022a; swissuniversities 2022b; swissuniversities 2023.

3.2 The Consortium of Swiss Academic Libraries

The Consortium of Swiss Academic Libraries was founded in the year 2000 by the Conference of Swiss University Libraries (KUB). Its task is to purchase electronic resources for the libraries of Swiss higher education institutions (the Universities of Teacher Education were initially not included). During its first five years, the Consortium received CHF 13.4 million in funding from the Swiss University Conference (SUK). Since 2006, the Consortium has been financed entirely by its members – namely the libraries of the Swiss HEI, the ETH domain as well as the Swiss National Library – and its clients. Today, the members of the Consortium include the libraries from cantonal universities, the ETH Domain, UAS, UTE as well as the Swiss National Library. The legal form of the Consortium is a "simple partnership" ("Einfache Gesellschaft"), which is supervised by the general assembly of SLiNER. The Office of the Consortium has a staff of 7 FTEs and an annual budget of around CHF 1 million. In 2020, it was transferred from the ETH Library to SLSP AG. The team is located within the offices of and administratively managed by SLSP and benefits from this vicinity, both in terms of competences, infrastructures and administrative efficiency.[48]

The main responsibility of the Consortium is to negotiate and license electronic resources (including e-journals, e-books and databases) for its member institutions. On behalf of swissuniversities, the Consortium negotiates with the three major publishers Elsevier, Springer Nature and Wiley. The corresponding mandate is previously defined by the Delegation Open Science (DelOS) and approved by the members of swissuniversities. According to swissuniversities, these "Big Deals negotiations" "account for around three quarters of licence expenditure in Switzerland. The contracts concluded with them also serve as precedents for negotiations with medium-sized publishers."[49] Apart from the Big Deals, the Consortium conducts negotiations with other publishers to conclude consortial licences with at least three participating institutions. The Consortium is committed to extending contracts to include Open Access publishing and thereby support and promote the Swiss National Open Access Strategy.[50]

Additionally, the Consortium offers a range of services connected to the licensed products including training, and a helpdesk for resolving access problems. It is also represented in several international organisations, such as GASCO and ICOLC.[51] Most of the interview partners emphasised the added value that the Consortium provides to Swiss RLs. The Consortium not only benefits big RLs, but also smaller ones, namely libraries in Universities of Teacher Education and Universities of Applied Sciences, and smaller cantonal university libraries, such as the USI Libraries.[52]

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48   Ball & Boutsiouci 2018: 150–151; Consortium of Swiss Academic Libraries 2025; Friedlin 2020; Interview with Wilfried Lochbühler and Susanne Aerni 2025.

49   swissuniversities 2025a.

50   Interview with Wilfried Lochbühler and Susanne Aerni 2024.

51   Ball & Boutsiouci 2018: 151–152.

52   Interviews with August Scherer-Hug 2024 and Silvio Bindella 2024. Friedlin (2020: 7) states that the Consortium «creates added value by negotiating favourable contract terms and conditions and reducing administrative costs through centralised communication, negotiation, quotation preparation and documentation at the respective institutions. Thanks to the combined market power, the institutions benefit from larger discounts and can make optimal use of their budgets for e-resources.»

3.3 The Swiss Library Service Platform (SLSP)

In 2017 the Swiss Library Service Platform was founded by 15 higher education institutions and libraries "with the mission of consolidating the data sets of the six existing library consortia in Switzerland into a national platform, operating a centrally managed library system and offering centrally managed services for libraries."[53] The company Ex Libris has been awarded the contract to provide future library system solutions for SLSP. The development and implementation of the project was funded by swissuniversities under the "P-5" programme with CHF 5 million between 2018 and 2021.[54] At the end of 2020, SLSP launched "swisscovery" as the central platform for scientific libraries in Switzerland.[55] As of 2025, swisscovery brings together information from more than 500 libraries.

The SLSP project has been called a "uniquely ambitious undertaking for Switzerland, amounting to a veritable national change process."[56] A 2023 study by representatives of SLSP staff assessed "the implementation of a common library management system and the establishment of a national network for most of the libraries' business processes" as successful. It found "that the regular operations are running without major interruptions."[57] However, due "to the complexity of the Swiss library landscape, there is disagreement about the level of standardisation of services (e.g., fulfilment services) and about the respective responsibilities of the libraries and SLSP (e.g., resource management)."[58]

Among the unresolved challenges of swisscovery are the interlibrary loans of digital resources and the systematic listing of Open Access monographs. Swisscovery and non-library systems, such as Google Scholar and generative AI tools, have raised expectations regarding unrestricted access to information in the Swiss information space. These expectations are increasingly being undermined by the growing trend of legal restrictions on interlibrary loans of digital media, including databases and e-books.

Some interview partners have noted that SLSP might be more costly than previous systems but provides nevertheless a sustainable solution for challenges in the digital transition. It was described as an important step towards a national Swiss library system, and confidence in SLSP has increased after a difficult start. However, its structure as a (non-profit) Public Limited Company ("Aktiengesellschaft") still seems to cause some concern, e.g., when it comes to the potential role of SLSP for a national governance of Swiss RLs. SLSP itself is aware of these concerns, and its director Andreas Kirstein has articulated a vision of gradually shaping the organisation's culture more in the spirit of a cooperative. The company has begun to take significant steps with this orientation and has strengthened the participatory element in its organisation by establishing a library council as anchored in its statutes in the beginning of 2023.[59]

Several interviewees mentioned the potential of SLSP as a driver of innovation within the Swiss RL system. This would require, however, corresponding funding streams – e.g., via contributions to research facilities of national importance according to art. 15 RIPA – that so far do not, or only partly, exist (cf. chapter 5.2).

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53 Heinemann et al. 2023: 96. Other countries have also national catalogues for their university libraries, i.e. the HUC (Library Hub Discover), Italy (Servizio Bibliotecario Nazionale SBN), and France (Système Universitaire de Documentation SUDOC).
54 Heller 2022: 61.
55 The Canton of Vaud, which includes the Cantonal and University Library (BCU) Lausanne, operates with an own library catalogue «Renouvaud», which is closely collaborating with swisscovery. Cf. Heller 2022: 31–32.
56 Heller 2022: 2.
57 Heinemann et al. 2023: 102.
58 Heinemann et al. 2023: 102.
59 Interview with Andreas Kirstein and Michèle Dünki 2024.

3.4 Some considerations on strategic leadership

Until the late 2010s, the ETH Library was an important driving force behind various RLs initiatives, including the Consortium and SLSP.[60] Today, the ETH Library continues to make important contributions, particularly in the fields of innovative solutions, national platforms and collaboration. In recent years, however, responsibilities for national tasks have become more broadly shared within the Swiss RL landscape – for example with the transfer of the Consortium's office from ETH Zurich to SLSP. The interviews underline that the important contributions made by the ETH Library in the past are recognised and valued by the RL stakeholders. At the same time, and in light of the far-reaching reorganisation of the ERI-system in 2015, the (informal) strategic leadership of one single institution is no longer seen as a sustainable model for the future by the Swiss RL community.[61]

As of 2019, the Swiss Library Network for Education and Research (SLiNER) represents all academic and scientific libraries at Swiss higher education institutions. However, the interviews made clear that SLiNER can only set strategic priorities to a limited extent.[62] This is due to its limited mandate, its militia organisation and the scarce resources available to its secretariat. In addition, SLiNER has only guest status in important stakeholder organisations such as the ORD Strategy Council and the Open Science Delegation (DelOS), both important actors in the areas of Open Science and Open Research Data.[63]

Finally, representatives from national repositories emphasised that lack of national strategic planning and dedicated funding is not a singular problem for RLs but an overall challenge for digital research infrastructures in Switzerland.[64]

3.5 Aspects of multi-level governance

The concept of multi-level governance has been developed in the context of the European Union's integration policy. It can be described as complex decision-making processes across interconnected actors within various jurisdictions. As such, the concept has also been applied to Switzerland, for instance regarding the exchange of health data between different cantons. The SSC has commissioned an external report to examine the perspective of multi-level governance on research libraries and to develop a dedicated framework.

The report emphasises that "one of the strongest aspects of multi-level governance is its capacity to generate [...] 'problem-solving legitimacy'." Behind this background, both the Consortium and SLSP can be described as successful examples of multi-level governance, as they provide "adjustable responses to problems that require shared solutions".[65] In the following, the analytical framework of the report is applied to the Consortium and SLSP cases.

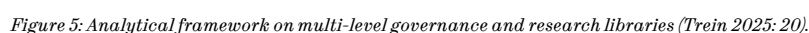60 Oesterheld 2018: 35; Heller 2022: 25–26; Neubauer 2018.
61 Of specific relevance for the role of the ETH Library were the interview with Ulrich Weidmann 2024 and the interview with Rafael Ball and Michael Gasser 2024. In some interviews cases of regional cooperation where mentioned, e.g., between cantonal universities in the German part of Switzerland. In the interview with the Harvard Library, the importance of coalitions of the willing was emphasised (interview with Franziska Frey and Ardys Kozbial 2025).
62 The Consortium's central task is to provide its members and secondary partners with licences to e-resources. See: Konsortium der Schweizer Hochschulbibliotheken (n.d.).
63 Heller 2022: 16 and swissuniversities 2025b.
64 Interviews with Georg Lutz 2025 and Beat Immenhauser 2024.
65 Trein 2025: 6.

Non-state actors
- International organisations
- Companies, foundations

↓

Coordination demands
- Framework creation / management
- Entire libraries
- Fields / Service-specific cooperation

Power resources
- Identities
- Power differences

↓ (E1, E2a, E2c)

Processes
- Bargaining / Opportunism
- Colaboration
  - Trust
  - Win-win

→ Links that are theorised
→ Links that are not theorised

Immediate result
- Learning / change
- Single-loop learning
- Double-loop learning

↓

(E1, E2b, E3c, E3)

Long-term result
- Durability of coordination
- Legal basis
- Financing

(E4b, E4c)

Feedback effects
- Centralisation (by stealth)
- Exit from collaboration
- User satisfaction

(E4a, E4c)

(E4a, E4b, E4c)

Figure 5: Analytical framework on multi-level governance and research libraries (Trein 2025: 20).

1. Coordination demands: The Consortium was formed in response to a need for coordinated negotiations between Swiss research libraries and publishers. SLSP aimed to offer library information on a single platform.

2. Coordination processes: Even though aspects of "bargaining" and "opportunism" may have played a role in the development of the Consortium and SLSP, the focus was on trusting collaboration with a win-win situation.

3. State and non-state actors / power resources: The dependence on non-state actors, namely private publishers, explains the collaboration of Swiss research libraries within the Consortium. In the case of SLSP, the company Ex Libris is an important non-state actor.

4. Immediate and long-term results: The Consortium and SLSP are both examples of a "double-loop learning" process, "based on changes in values, due to the need to adapt to digitalization".[66] The outcome of both institutions can be seen as durable, as they are operational for several years (the Consortium already for 25 years), and have a stable legal and regulatory framework.

5. Feedback effects: One consequence of a multi-level governance policy intervention can be a stronger centralisation. The Consortium and SLSP have indeed led to more centralised services (negotiations with publishers and access to information), which was also an important aim of these institutions. Negative consequences of this centralisation may include the reduction of "some offerings in favour of others, potentially disadvantaging smaller, less prominent disciplines relative to more dominant scientific approaches." [67] In the case of the Consortium, this danger seems to be particularly prevalent for the disciplines of the humanities. For SLSP, centralisation might have led at least in some cases to higher costs for participating entities.[68]

The report commissioned by the SSC emphasises the importance of a common financial and legal framework within a multi-level governance setting from a theoretical point of view.[69] The case studies of SLSP and the Consortium confirm this assumption on an empirical basis.

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66   Trein 2025: 23.
67   Trein 2025: 24.
68   Trein 2025: 16–17; interview with Jeannette Frey 2024.
69   Trein 2025: 18.

4 Challenges in times of accelerating digital transition

For centuries, academic libraries have been responsible for providing access to reliable knowledge and ensuring its long-term preservation. To preserve the knowledge generated over the centuries and continue to use it as the cultural foundation of the modern world, RLs must be expanded into modern data hubs. As data hubs libraries steward analogue and digital materials, with digital assets (whether born-digital or digital surrogates of analogue holdings) and metadata being managed according to FAIR standards: findable, accessible, interoperable and reusable.[70] This represents a logical progression of their past activities and an important response to the ongoing digitisation of information and knowledge production, the accompanying technology-driven organisational changes that accompany it, and the latest developments in AI technologies (including generative AI). By addressing these changes in their field, the Swiss RL system can contribute to Switzerland's outstanding position in the development of international science policy.[71]

In recent decades, many librarians and information scientists have addressed the numerous challenges facing RLs. The previous chapter has highlighted some successful collaboration in Switzerland. However, newest technological developments have further increased the dynamics of transformation. This does not only affect the responsible adaption of technologies itself but also the management of possible implications for legal, ethical and societal aspects. In her report Ana Petrus highlights the profound digital shift currently being experienced by RLs in order to provide better supporting for open science, data management and digital scholarship. She concludes that RLs should therefore be viewed "not merely as support units, but as strategic institutions at the heart of research infrastructure and academic innovation." [72]

"I'm serious when I say we're looking at the death of the public library as we know it. Digital has changed the dynamics because rights holders have decided that they will not rely on copyright law in the digital age. This has undermined libraries' position in law and their societal function. We're just asking for those positions to be reinstated by allowing libraries to purchase, lend and preserve digital content as they have done for millennia."[73]

Ben White, chair of LIBER's Copyright and Legal Matters Working Group

The subsequent section delineates some of the most significant challenges and opportunities the system of libraries is confronted with.[74]

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70 Ziegler 2019; Deinzer et al. 2025.

71 On the changing role of RLs cf. Revez 2018; Liber Strategy 2023–2027. On the implication of AI for academic libraries, cf. Cox & Tzok 2023; Deschenes & McMahon 2024; Gasparini 2022; Mumenthaler 2023; Prisching 2020. For the overall policy context see also the «Strategie Digitale Schweiz 2025» (Federal Chancellery 2024).

72 Petrus 2025: chapter 1.

73 Mackinlay 2021.

74 Due to the variety of library tasks and specific circumstances and given the clear focus of the interviews on digital infrastructure and data hubs, this list will necessarily be incomplete. It is intended to provide inspiration and cannot replace the strategic reviews and prioritisation processes carried out by individual research libraries and the national network.

4.1 Dealing with the role of artificial intelligence

While it is largely undisputed that (generative) AI will have a major impact on the activities and functions of research libraries, many questions regarding its specific impact remain unanswered. The expert interviews conducted for this report highlighted some of the related challenges, including handling masses of information, dealing with dynamic content as well as enabling content enrichment according to the FAIR principles.[75] While aspects of machine learning have already been implemented in library services (e.g., for cataloguing), the integration of generative AI is still in the beginning. Furthermore, legal issues are an important point of concern for the RL community in Switzerland. Even though multilingualism certainly poses particular challenges, some interviewees emphasised that, with regard to AI applications, it could also create special opportunities for a multilingual library system on a national level.

The research literature confirms the many unknowns regarding the role of AI for RLs. As for ChatGPT, Cox and Tzoc (2023) identified some action fields for academic libraries, including discovery and search, referencing and training. They conclude, however, that "it's hard to predict how AI tools will impact librarianship." A literature review on AI and research libraries of Gasparini et al. (2022) emphasises that the "librarian's role as a knowledge professional would remain, but the new technology would require a scaling up of professional competencies".[76] As a General-purpose Technology, AI influences virtually all services of RLs. This is also reflected in the subsequent discussion of the various challenges.

4.2 Preserving the right of access to information

Ensuring access to reliable information in both analogue and digital formats remains a key task for RLs, all the more so as access to knowledge is fundamental to science as a public and publicly funded resource. However, access cannot be considered separately from data sovereignty and cybersecurity, which are becoming increasingly challenging.

The shifts from physical to digital as well as from local to translocal and global have significantly altered the role of libraries in several respects. Among these, the transition from owner to intermediary is particularly important: changes in copyright and property rights, as well as increasingly restrictive licensing conditions, have had a substantial impact on libraries, causing them to rapidly transform from content owners to intermediaries operating in often restricted markets. This development challenges the libraries' fundamental function, namely ensuring access to knowledge for the scientific community.[77]

International research funding institutions have long been responding to these challenges and the associated inequalities in access to information by pursuing an Open Access (OA) strategy. In this context, the concept of "bibliodiversity" plays an important role. The new Swiss National Open Access Strategy published in 2024 explicitly recognises the need for diversity in publication models (diamond, gold, green and hybrid OA) and publication formats (e.g., articles, long-form publications, practice-based publications and publications in the arts) in the scientific publication landscape.[78] For the practical implementation of this strategy in Switzerland, RLs together with SLSP / swisscovery and the Consortium of Swiss Academic Libraries are indispensable for reducing inequalities between disciplines and promoting transparency and reproducibility for research.

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75   The ETH Library included aspects of AI in its strategy for the years 2025–2028, including Data and Process Readiness; AI Enhanced User Experience; and AI in Context.

76   Cox & Tzoc 2023; Gasparini 2022: 8. See also Deschenes & McMahon 2024; Mumenthaler 2023; Prisching 2020.

77   This manifested itself, among other things, in the parliamentary debate on the modernisation of the law on the Swiss National Library. Cf. SDA 2025.

78   swissuniversities et al. 2024.

Currently, research libraries are facing yet another, even more fundamental challenge: the rapidly growing role of generative AI in knowledge production. This affects libraries' ability to guarantee the quality, access and reliability of information. Firstly, technologically and organisationally advanced commercial providers that do not follow FAIR principle (e.g., Google and ChatGPT) offer seemingly easy access to scientific information, thereby exacerbating the 'shadow value' problem of RLs, which is discussed further below. Secondly, parts of today's publication system are prone to use AI technologies to optimise their revenue streams, whereby sometimes at the expense of quality assurance measures.[79] With established quality assurance measures under pressure, it becomes difficult to secure reliability and reproducibility of information. As mediators of this knowledge, libraries have to be involved in the development of measures to address these issues and related topics of scientific integrity. Thirdly, the aforementioned legal conditions hinder the possibilities for controlled scientific use of generative AI content, including by libraries.

4.3 Ensuring historical depth in future research

The making of digital collections was an important and relatively early step in the digitisation of libraries, transforming their role as guardians of knowledge by expanding their remit to include complex areas of technology management. Since the early 2000s, large-scale mass digitisation has established digital collections as a core aspect of the mission of research libraries. The momentum behind digitisation and digital collecting arose from concerns that we could be the first society to pass on very little of our wealth of information to future generations.[80] In this early phase, commercial firms started to digitise and sell licences for large amounts of historical material.[81] The introduction of Google Books in 2005 was a sea change and accelerated the non-commercial inhouse digitisation efforts of research libraries in Europe, and the aggregation of the related metadata in European platforms like Europeana.[82]

New possibilities offered by web-based digital access to cultural heritage and scientific resources have opened unprecedented opportunities for use and reuse. However, they have also introduced new vulnerabilities, particularly with regard to long-term preservation and the instability of digital media. "Bit rot", whereby digital information gradually deteriorates over time, jeopardises the longevity of digital collections. They can also be the target of cyber attacks.[83] Consequently, research libraries must urgently address the legal, technical, and strategic questions surrounding long-term preservation and reuse of information. They can thereby act as a "honest broker".[84]

> *"Eternity takes five years in the IT sector. For libraries, eternity means forever."* [85]

> *Jeannette Frey, Director of the Bibliothèque Cantonale et Universitaire Lausanne (BCUL)*

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79 Liverpool 2023.
80 Hedstrom 1997.
81 E.g. between 2004 and 2010 the German DFG invested more than €100 million to license completed digital collections with historical material (DFG: n.d.).
82 Jeanneney 2005.
83 British Library 2023.
84 Rosenthal et al. 2005; Eve 2024.
85 Interview with Jeannette Frey 2024.

The continuous processing of digital and analogue formats is essential for creating new research opportunities and perspectives. Today, the value of digital collections held by research libraries and memory institutions lies not only in their ability to preserve analogue materials, but also in their potential to generate new research. The recent SwissCollNet initiative on natural history collections,[86] discussions about the role of research libraries in collecting and archiving software code and data sets in the context of open science, and considerations regarding the documentation and curation of academic legacies (e.g., lab notebooks), all demonstrate a new awareness of the relevance of digital collections.

The evolution of digital collections remains a cornerstone of the research library's mission in the digital age. It requires a long-term strategic vision as well as investment in preservation skills, cross-sector and cross-institutional collaboration and ongoing financial engagement. Today's decisions will determine future generations' access to the intellectual and cultural record of our time. Preserving digital memory is therefore a cultural responsibility. At the same time, ensuring that born-digital and digitised content remains usable and trustworthy is essential to the integrity of research and the public good.[87]

4.4 Enhancing collaboration and governance

The rapidly evolving digital opportunities and challenges facing RL make cooperation imperative.[88] As outlined in chapter 3, Swiss RLs have built up a long and successful history of cooperation. They have developed and implemented various large-scale collaborative projects, including the Consortium, e-rara, e-manuscripta, Speicherbibliothek and, most recently, SLSP.[89] However, in the light of fast advancing AI technologies a new form of cooperation on a national level is urgently needed.[90]

The largely federal structure of Swiss higher education, coupled with the integration of library management into the management and administrative structures of individual institutions and cantons, hampers closer collaboration and more strategic planning at a national level. The Swiss Library Network for Education and Research SLiNER represents all academic and scientific libraries and provides important advice to swissuniversities. However, the governance model of SLiNER does not provide the Swiss library sector with sufficient strategic competence, nor the necessary resources and implementation capacity for innovation at a national scale.

As described above, the Swiss library landscape faces a systemic strategic gap. Therefore, library leaders should be better integrated and actively involved in institutional digital governance structures and national strategic bodies. Their participation ensures that library perspectives are embedded in broader policy and infrastructure decisions. Rather than being treated as peripheral support facilities, libraries should be empowered to demonstrate the library value to their key stakeholders and core users. Enhanced forms of collaboration should involve the university governance leadership, the administrative services and research support units. As the Trein report has shown, multi-level governance systems have specific difficulties in addressing overall strategic goals. Thus, more efficient cooperation depends on an innovative governance structure.

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86   Swiss Academy of Sciences. Swiss natural history collections network (SwissCollNet) (n.d.).

87   On the concept of digital public goods and its relevance for libraries cf. IFLA 2023 and Dora 2012: 83–84. For the discussion on how to govern the «commons» see Ostrom 2012. Thanos Giannakopoulos, Section Chief from the Dag Hammarskjöl Library of the United Nations, emphasised the importance of information integrity in the context of the Sustainable Development Goals (SDGs) during a presentation at the LIBER conference 2025.

88   There are, for instance, similar interests and potential synergies between libraries and service providers such as Switch, e.g., regarding digital sovereignty and digital commons. Interview with Tom Kleiber and Sebastian Sigloch 2024.

89   Cf. Trein 2025: 14–18.

90   On the issue of «strategic library collaboration» see also the OCLC report by Bryant et al. 2023.

4.5 Increasing visibility and communication

The fact that libraries have seamlessly integrated some of their core service into the digital space, has decreased the visibility of those services. It is typical for infrastructures that they often only become visible on instances of breakdowns.[91] Furthermore, as digitisation and generative AI develop, commercial firms are offering additional services to search and process scientific information on the web. Removed from a direct and physical experience with RLs, researchers underestimate their significance as they are less visible in daily research experiences and tasks.[92]

However, RLs remain central in maintaining the whole infrastructure for standardising, documenting and curating informational outputs to enable effective and reliable operations of all digitised and internet-based processes of search and access. In this context, one can speak of a "shadow value" of research libraries. This poses a significant risk of under-valuation of RLs, with detrimental consequences for resource allocation. Considerable efforts must be made by RLs to estimate and communicate their social productivity and their true social value — the capitalised value of the services they provide to the research community, and to society more broadly.

4.6 Upskilling and training

The interviews and the workshop have indicated that the ongoing digital transformation requires continuous training for staff, researchers and users. In recent years, the tasks and functions of RLs have increased significantly and have become considerably more complex. This trend is set to intensify with the shift towards RLs being integrated throughout the whole research process. There is an urgent need for interdisciplinary profiles that combine IT, librarian and subject-specific expertise as well as soft skills in project management and communication. As such profiles are not easy to find, urgent action is needed in Switzerland to improve library staff training. This can be achieved by reorganising, reforming and further developing existing training programmes at BA / MA and CAS levels. It is also crucial to consistently provide relevant continuing professional development (CPD) opportunities. While initial steps have already been taken, these must be continuously reinforced and built upon.

In recent years, libraries have become increasingly important in providing training to students and researchers in information retrieval and data management. However, the specific requirements of this training vary significantly depending on the discipline and research area. Against this backdrop, the newly introduced Data Stewardship programme and the role of data management plans (DMPs) in achieving standardisation and interoperability are welcomed.[93] As libraries become more integral to the research process, both in terms of data management and as partners in research projects, effective communication with researchers and the development of relevant skills among library staff are paramount.

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91 Šimukovič (2023: 281) refers to the «invisible qualities of an infrastructure».
92 RLs are themselves active in making the scientific output for their researcher more visible. An example is an event by the ETH library in August 2025 on «Increasing the findability of Swiss research» (ETH Zurich 2025).
93 On the Concept of Deta Stewardship cf. Seidlmayer et al. 2023.

5 Scenarios and funding

The current pace of the digital revolution, primarily driven by AI technologies in the field of knowledge production, presents RLs with a fundamental challenge of reinventing themselves constantly in a state of continuous change, while continuing to ensure long-term access to reliable information as a public good. This involves diverse challenges such as the dynamisation of static content, further datafication of holdings and meta-data, fundamental changes to workflows and business models, threats to data sovereignty, upskilling and training for staff and users, the growing burden of long-term archiving of rapidly expanding digital holdings as well as changing user behaviour and research practices, all within given legal and financial framework conditions.

In her report Ana Petrus has presented three possible development scenarios for further development and subjected them to a SWOT analysis.[94]

5.1 Scenarios

Scenario 1: Status quo with minimal change

"In this baseline trajectory, Swiss research libraries maintain their current course, responding reactively to change while avoiding major structural shifts. Operations continue within existing institutional and financial frameworks, with no comprehensive national strategy for digital transformation of libraries. Innovation is incremental, unevenly distributed, and largely driven by temporary projects rather than long-term planning.

[The strength of this scenario] lies in its low additional financial load and organisational risk. It preserves familiar workflows and institutional autonomy and may be an appealing pathway in times of economic uncertainty or institutional conservatism. However, the strategic risks are considerable. Libraries under this model risk marginalisation within the research ecosystem, particularly in relation to digital scholarship and Open Science. The inability to attract and retain skilled professionals, coupled with limited policy influence, may lead to long-term erosion of relevance."[95]

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94   Petrus 2025: 74–75.
95   Petrus 2025: 71; 75.

Scenario 2: Partial transformation

This scenario "envisions Swiss research libraries adopting selected best practices from international models, blending innovation with institutional stability. Rather than pursuing full structural reform, libraries strategically implement improvements in digital service delivery, research engagement, and infrastructure collaboration. This approach emphasises feasible, high-impact changes that align with ongoing initiatives such as the Swiss Open Research Data strategy." This scenario "requires moderate investment, particularly in terms of platform upgrades, staff development, and collaborative governance. [...] The principal risk lies in uneven adoption and implementation. Without stronger coordination mechanisms, disparities may persist between institutions and disciplines, reinforcing existing inequalities and limiting the overall impact of reform. Nevertheless, Scenario 2 offers a realistic and forward-looking approach, aligning well with existing efforts under the Swiss Open Research Data strategy. It provides a scalable foundation for further development and institutional alignment without demanding immediate systemic transformation".[96]

Scenario 3: Advanced transformation

"In this transformative scenario, Swiss research libraries fully reposition themselves as critical actors in the national and international research infrastructure landscape. [...] They adopt a coordinated, integrated approach that redefines their role from service providers to strategic partners and innovation incubators in Open Science, data policy, and digital innovation in general. They serve as fully operational data hubs, in close partnership with research funders, IT services, and disciplinary communities."[97]

"This scenario demands significant investment in infrastructure, staffing, and governance reform. It also requires strong political will and sustained institutional leadership. While the financial and strategic risks are high, particularly in a decentralised system, the long-term benefits are substantial. Libraries become critical infrastructure providers and policy influencers. They are well-positioned to attract funding, foster innovation, and shape future frameworks for digital scholarship and Open Science."[98]

The three scenarios outline a wide range of possible measures. They differ in terms of their goals, ambitions and the organisational changes, coordination and financing they require. All of them depend heavily on the structural, legal and financial framework conditions. Different institutions are likely to find different scenarios attractive. "Ultimately the future relevance and impact of Swiss research libraries will depend on their willingness to invest, collaborate, and lead. These scenarios offer not prescriptive pathways, but a strategic framework to guide decision-making in an increasingly complex and digital-driven research environment."[99]

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96   Petrus 2025: 72; 75.
97   Petrus 2025: 73.
98   Petrus 2025: 75–76.
99   Petrus 2025: 76.

The SSC is convinced that the future national strategy for RLs should develop a roadmap that is suitable for different types and sizes of institutions without losing sight of a common Swiss information landscape. The Petrus report contains a whole range of relevant suggestions and best practice experiences, from collaborative governance to innovation incubator, which could be operated jointly at national level (even including international cooperation). To tackle the necessary permanent change, the SSC prefers scenarios 2 and 3. Both scenarios require an appropriate structural and financial framework.

5.2 Funding

Several European countries and the EU introduced large-scale, dedicated funding programmes for libraries as part of their digital transformation strategies.[100] In Switzerland, national projects for RLs have been funded via the federal project contributions (PgB) of swissuniversities and its predecessor organisation, the Swiss University Conference.[101] In the context of federal cost-cutting measures, the abolition of the PgBs is currently under discussion. This would have a significant impact on national cooperation and research projects of RLs.[102]

Against this backdrop, various options for financing national projects are conceivable for the future. These include a thematic PgB for RLs, in case this instrument is continued. Alternative funding could stem from a dedicated innovation fund for RLs[103], or from contributions to research facilities of national importance (art. 15 RIPA)[104]. This report cannot go into details about these options. However, it is undisputed that federal and cantonal funding for joint projects by RLs will continue to be essential in the future. The SSC therefore recommends including funding for RLs in the upcoming ERI dispatch 2029–2032.

An additional measure to strengthen the role of libraries as innovators is to promote funding via the Swiss National Science Foundation SNSF and the Innovation Agency Innosuisse. In principle, RL staff is already eligible for dedicated funding instruments, if they meet certain requirements. However, to actually exploit these opportunities, appropriate incentives are needed from both the funding agencies and the home institutions of RLs.

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100 The funding body «Research England» finances five National Research Libraries «that make a significant and essential contribution to the national research base.» UKRI 2024. Furthermore, the UK considers the development of a «National Data Library» «as a data institution that enables safe access to data and provides robust foundations for modern AI driven public services» (Meroño-Peñuela et al. 2025). On the library funding in Nordic countries and the EU cf. Vitiello 2025: 435–436. The German Research Foundation DFG fosters «bridge projects», «which involve not only extensive research work but are also dedicated to the development and provision of scientific information and / or information infrastructures» (DFG 2023). Cf. also Stäcker 2025.

101 For an assessment of the strengths and weaknesses of this instrument, see Chapter 3.

102 In its position statement within the consultation process on the Federal Act on the 2027 Relief Package, the SSC has emphasised the importance of the PgBs as an instrument that enables «the federal government and the cantons to advance strategic and socio-politically relevant projects and respond to new concerns raised by the population and parliament.» SSC 2025: 4.

103 An innovation fund for RLs in Switzerland would need a dedicated legal basis, e.g., in the Federal Act on Funding and Coordination of the Swiss Higher Education Sector (HEdA) or the Federal Act on the Promotion of Research and Innovation (RIPA). Innovation funds for libraries have already been implemented abroad, e.g., in the UK. Cf. UK Innovation Fund of the M25 Consortium of Academic Libraries 2025; UK Libraries: Opportunities for Everyone Innovation Fund 2025; Bristol Libraries Innovation Fund 2025.

104 Article 15 of the RIPA supports various national infrastructures, research institutes and technology competence centres. It is conceivable that a specific institution for research libraries could be established. Art. 15 RIPA also requires cantonal funding.

6 Guiding principles and recommendations

6.1 Guiding principles

Preserving the right to information as public good

Research libraries play a crucial role in providing reliable information and preserving knowledge as a public good. Issues of data sovereignty and cyber security are becoming increasingly urgent. Preserving digital memory is a cultural responsibility, not just a technical challenge. Decisions made today will determine whether future generations can access the intellectual, scientific and cultural record of our time. It is thus essential to the integrity of research and the public good that born-digital and digitised content remains usable and trustworthy.

Further developing the Swiss information space

The enormous wealth of knowledge available in Swiss research libraries must be made fully accessible for scientific purposes across the entire research landscape. To this end, the Swiss information space must be expanded sustainably. To ensure information quality, data security and data sovereignty, research libraries promote bibliodiversity in digital and analogue forms. They enrich data spaces by adding the historical depth of their collections. They enhance the interoperability of their diverse collections in rapidly changing digital environments.

Reframing the future role of research libraries

As strategic partners at the heart of research infrastructures and academic innovation, RLs will continue to play an indispensable role throughout the entire research cycle, including the dissemination of reliable scientific results. In the age of digitalisation and artificial intelligence, innovation is essential for institutions whose core task is to store, manage and process information as efficiently as possible. To fulfil their role in the Swiss information space and beyond, RLs must redefine their strategic role as data hubs to help shaping a trustworthy, sustainable and open future for research.

Addressing technological complexity

Our society and economy are on the eve of a new general-purpose technology, which can be defined as the conjunction of pervasive digitisation, automation, big data and artificial intelligence. This cluster of new technologies creates huge opportunities and potential benefits but bears also great risks. As the general-purpose technology brings a wide range of innovations and regulatory challenges to research libraries, their future role will largely depend on their capacity to enhance the positive effects and mitigate the negative ones.

6.2 SSC recommendations

I. Empowerment through a national strategy

The Swiss Science Council SSC recommends that swiss-universities provide the Swiss Library Network for Education and Research SLiNER with the mandate to develop a national strategy for further digital transformation in research libraries.

This strategy should address the following challenges identified in this report:

- Dealing with the potential and risks of artificial intelligence

- Preserving the right of access to reliable information

- Ensuring historical depth in future research

- Enhancing collaboration and governance

- Increasing visibility and communication

- Updating training and professional development

II. Dedicated funding

Funding is essential to strengthen strategic collaboration and ensure the sustainable development of research libraries amid accelerated digital transformation. However, library resources are largely tied up in the operational activities of individual institutions. Based on findings regarding multi-level governance, additional funding is required for cross-cutting strategic tasks related to cooperation of RLs at the national level.

The Swiss Science Council SSC therefore recommends dedicated funding for research libraries to be included in the next ERI Dispatch 2029–2032, e.g., through an innovation fund, a PgB programme on research libraries, or funding under art. 15 of the Federal Act on the Promotion of Research and Innovation RIPA.

III. Strengthen strategic governance and national collaboration

To expand their role in the digital age, research libraries must become strategic partners at management level within their home institutions as well as within the relevant national bodies. Only then will they be able to cooperate strategically at local, national and international levels.

The Swiss Science Council SSC therefore recommends that the Swiss higher education institutions involve their libraries more closely in strategic processes and integrate them into the relevant committees.

The Swiss Science Council SSC also recommends the greater involvement of Swiss research libraries in national strategic bodies. This is the only way to ensure that the perspective of research libraries is adequately considered in research and infrastructure policy.[105]

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105 This applies, for example, to SLiNER's representation in the Open Science Delegation, where it currently only has guest status.

7 Bibliography

Ball, R., & Boutsiouci, P. (2018). Literaturversorgung, Collection Management und das Konsortium der Schweizer Hochschulbibliotheken. Keller, A., Uhl, S. (Eds.). Bibliotheken der Schweiz: Innovation durch Kooperation. Festschrift für Susanna Bliggenstorfer anlässlich ihres Rücktrittes als Direktorin der Zentralbibliothek Zürich, 145–159.

berinfor (2016). *Roundtable «Innovation in Bibliotheken».*

British Library (2023). *Cyber-attack Recovery Update.* https://www.bl.uk/about/cyber-attack

Bibliosuisse (2025). *Bibliotheksstatistik von Bibliosuisse.* https://www.bibliosuisse.ch/aktivitaten/bibliothek-sstatistik

Bryant, R., Lavoie, B., Rinehart, A. K. (2023). *Building Research Data Management Capacity: Case Studies in Strategic Library Collaboration.*

Büttner, S. (Ed.) (2019). *Die digitale Transformation in Institutionen des kulturellen Gedächtnisses. Antworten aus der Informationswissenschaft.*

Calvino, F., Haerle D., Liu S. (2025). Is generative AI a General Purpose Technology?: Implications for productivity and policy. *OECD Artificial Intelligence Papers, No. 40.* https://doi.org/10.1787/704e2d12-en

Consortium of Swiss Academic Libraries (2025). *About Us.* https://consortium.ch/ueber-uns/?lang=en

Council of Europe (2023). Recommendation CM/Rec (2023) 3 of the Committee of Ministers to Member States on Library Legislation and Policy in Europe (Adopted by the Committee of Ministers on 5 April 2023 at the 1462nd meeting of the Ministers' Deputies).

Cox, C. & Tzoc, E. (2023). ChatGPT. Implications for Academic Libraries. *College & Research Libraries News 84 (3),* 99.

Deinzer, G., Lehenmeier, C., Stolzenberger, S. (2025). «Und wie ist das Forschungsdatenmanagement an Ihrer Einrichtung organisiert?» Zur Gründung des UR Data Hubs an der Universität Regensburg. *Zeitschrift für Bibliothekswesen und Bibliographie ZfBB 71 (5-6),* 314–318.

Deschenes, A. & McMahon, M. (2024). A Survey on Student Use of Generative AI Chatbots for Academic Research. *EBLIP 19 (2),* 2–22. https://doi.org/10.18438/eblip30512

Desmarchelier, B., Djellal, F., Gallouj, F. (2025). Innovation in Libraries: A Service-oriented Perspective. *Research Policy 54 (1),* 1–13. https://doi.org/10.1016/j.respol.2024.105110

Deutsche Forschungsgemeinschaft DFG (2023). Projects at the Interface between Research and Scientific Information Infrastructure. https://www.dfg.de/en/research-funding/funding-opportunities/programmes/infrastructure/lis/funding-opportunities/bridge-projects

Deutsche Forschungsgesellschaft (n.d.). Nationallizenzen. https://www.nationallizenzen.de/ueber-nationallizenzen/nationallizenzen

Dora, C. (2012). Eine Bibliotheksstrategie für die Schweiz? *Bibliothek Forschung und Praxis 36 (1),* 78–86. https://doi.org/10.1515/bfp-2012-0009

Drößler, S., Flaig, S., Scherr, J. (2025). Technikfolgen-abschätzung als Perspektive zur Gestaltung der Open-Acess-Tranformation. Eine Untersuchung zur Rolle wissenschaftlicher Bibliotheken in der Deliberation des Publikationssystems. O-Bib. *Das Offene Bibliotheksjournal Herausgeber VDB, 12(1),* 1-17. https://doi.org/10.5282/o-bib/6118

Eglin-Chappuis, N. (2009). *Governance von Universitätsbibliotheken. Optimierungsmöglichkeiten aus institutioneller Sicht.*

EPFL (2025). *Governance.* https://www.epfl.ch/about/overview/governance/

ETH Library (2025). *ETH-Bibliothek: Strategie 2025–2028.* https://ethz.ch/content/dam/ethz/associates/ethlibrary-dam/documents/ETH-Bibliothek_Strategie_2025-2028_final.pdf

ETH Zurich (2025, August 14). *NAIF Information Event: Increasing the Findability of Swiss Research.* https://ethz.ch/staffnet/en/news-and-events/internal-news/archive/2025/08/naif-information-event-increasing-the-findability-of-swiss-research.html

Eve, M. P. (2024). Digital Scholarly Journals Are Poorly Preserved: A Study of 7 Million Articles. *Journal of Librarianship and Scholarly Communication 12 (1),* 1–23. https://doi.org/10.31274/jlsc.16288

Federal Chancellery (2024). *Strategie Digitale Schweiz 2025.*

Federal Office of Culture (2023). *Weisungen zur Benutzung der Schweizerischen Nationalbibliothek (NB).*

Friedlein, S. (2020). *Nachhaltigkeit von swissuniversities P-2/P-5 geförderten Projekten: Problematik und Lösungsansätze am Beispiel der Projekte des Konsortiums der Schweizer Hochschulbibliotheken* (CAS Arbeit).

Gasparini, A. (2022). Understanding Artificial Intelligence in Research Libraries. An Extensive Literature Review. *Liber Quarterly* 32, 1–36.

Gastl-Hartmann, A. (2022). Forschen für die Ewigkeit. *IW* 7 (1), 396–429. https://doi.org/10.18755/iw.2022.22

Hacker, A. (2023). Open Access in Switzerland: An Institutional Point of View. *CRLN 84 (6),* 212–216. https://doi.org/10.5860/crln.84.6.212

Hedstrom, M. (1997). Digital Preservation: A Time Bomb for Digital Libraries. *Computers and the Humanities 31(3),* 189–202.

Heinemann, C., Unterholzner, M., Marty, T. (2023). How to Support Diverse Libraries in a National Network?: Organisation of Customer Management at Swiss Library Service Platform (SLSP). *ABI Technik, 43 (2),* 96-102. https://doi.org/10.1515/abitech-2023-0017

Heller, L. (2022). *Zur Genese eines nationalen Bibliotheksprojekts: Swiss Library Service Platform (SLSP).*

Heyde, M. v. d. (2019). *Open Research Data: Landscape and Cost Analysis of Data Repositories Currently Used By the Swiss Research Community, and Requirements for the Future.*

Holländer, S. (2019). *Die Schweizer Bibliotheken und die digitale Transformation. Büttner, S. (Ed.). Die digitale Transformation in Institutionen des kulturellen Gedächtnisses. Antworten aus der Informationswissenschaft,* 41–65.

IFLA (2023). Digital Public Goods. A Briefing. https://www.ifla.org/news/new-briefing-on-digital-public-goods/

Jeanneney, J.-N. (2005, January 22). Quand Google défie l'Europe. *Le Monde.* https://www.lemonde.fr/archives/article/2005/01/22/quand-google-defie-l-europe-par-jean-noel-jeanneney_395266_1819218.html

Jennex, M. & Masenya, T. M. (Eds.) (2022). *Innovative Technologies for Enhancing Knowledge Access in Academic Libraries.*

Johannsen, J., Mittermaier, B., Schäffler, H., Söllner K. (Eds.) (2025). *Praxishandbuch Bibliotheksmanagement.* https://www.degruyterbrill.com/document/doi/10.1515/9783111046341/html.

Keller, A. (2018a). Ein Ausblick zu Nachhaltigkeit und Erneuerungspotenzial an Schweizer Bibliotheken. Keller, A., Uhl, S. (Eds.). *Bibliotheken der Schweiz: Innovation durch Kooperation. Festschrift für Susanna Bliggenstorfer anlässlich ihres Rücktrittes als Direktorin der Zentralbibliothek Zürich,* 493–501.

Keller, A. (2018b). Nationale Förderprogramme und -strukturen in der Schweiz. Keller, A., Uhl, S. (Eds.). *Bibliotheken der Schweiz: Innovation durch Kooperation. Festschrift für Susanna Bliggenstorfer anlässlich ihres Rücktrittes als Direktorin der Zentralbibliothek Zürich,* 57–77.

Keller, A. & Uhl, S. (Eds.) (2018c). *Bibliotheken der Schweiz: Innovation durch Kooperation. Festschrift für Susanna Bliggenstorfer anlässlich ihres Rücktrittes als Direktorin der Zentralbibliothek Zürich.*

Köstner-Pemsel, C., Stadler, E., Stumpf, M. (Eds.) (2020). *Künstliche Intelligenz in Bibliotheken.*

Konsortium der Schweizer Hochschulbibliotheken (n.d.). Über uns. https://consortium.ch/ueber-uns/

Lata, N. & Owan, V. J. (2022). Contemporary Trends and Technologies in Research Libraries: An Overview. Jennex, M. E., Masenya, T. M. (Eds.). *Innovative Technologies for Enhancing Knowledge Access in Academic Libraries,* 40–56.

Lib4RI (2025). Library Profile. https://www.lib4ri.ch/library-profile

LIBER (2017a). *LIBER Definition of Research Library. Background Paper.* https://libereurope.eu/wp-content/uploads/2020/12/Mar2017Mail_DefinitionofResearchLibrariesBackgroundPaper.pdf

LIBER (2017b). *Libraries Joining LIBER: Endorsement Proposal.* https://libereurope.eu/wp-content/uploads/2020/12/Mar2017Mail_EndorsementProposal.pdf

LIBER (2022). Strategy 2023–2027. https://libereurope.eu/strategy/

LIBER (n.d.). History. LIBER Europe. https://libereurope.eu/history-of-liber/

Liverpool, L. (2023). AI Intensifies Fight against 'Paper Mills' that Churn out Fake Research. Nature 618, 222–223. https://doi.org/10.1038/d41586-023-01780-w

Lor, P. J. (2019). *International and Comparative Librarianship.* https://doi.org/10.1515/9783110267990

Lutz, G. & Gautschy, R. (2025). *Discussion Paper: Towards a Sustainable Swiss Research Infrastructure Policy, Funding and Governance Framework.* DaSCH-FORS. https://doi.org/10.5281/zenodo.15388177

Mackinlay, R. (2021). Know your Rights: the Key to eBook Access. *CILIP: The Library and Information Association.* https://www.cilip.org.uk/news/571553/Know-your-rights-the-key-to-eBook-access.html

Meroño-Peñuela, A., Massey, J., Newman, A., Simperl, E. (2025). *How an AI-ready National Data Library Would Help UK Science.*

Mumenthaler, R. & Tschander L. (2024). Von der Reorganisation zur Transformation – ein Erfahrungsbericht aus der UB Zürich. 027.7, 11(2). https://doi.org/10.21428/1bfadeb6.32ed2215

Mumenthaler, R. (2023). Universitätsbibliotheken im Jahre 2040. *Bibliothek Forschung und Praxis 47* (1), 33–37. https://doi.org/10.1515/bfp-2022-0087

Mumenthaler, R., Vardanyan, E., Balocco, M. (2016). Wie funktioniert Innovation in Bibliotheken? Bericht über das Schweizer Forschungsprojekt Innovationsmonitor für Wissenschaftliche Bibliotheken. *b.i.t. online* 19, 1–6.

Neubauer, W. (2018). «Gemeinsam sind wir stärker»: Das Kooperationsprojekt Swiss Library Service Platform (SLSP). Keller, A., Uhl, S. (Eds.). *Bibliotheken der Schweiz: Innovation durch Kooperation. Festschrift für Susanna Bliggenstorfer anlässlich ihres Rücktrittes als Direktorin der Zentralbibliothek Zürich,* 124–144.

Oesterheld, C. (2018). Die Wissenschaftlichen Bibliotheken der Schweiz zwischen Literatur- und Informationsversorgung, Dienstleistungen für Studium, Forschung und Bildung und kulturellem Auftrag: eine Standortbestimmung 2018. Keller, A., Uhl, S. (Eds.). *Bibliotheken der Schweiz: Innovation durch Kooperation. Festschrift für Susanna Bliggenstorfer anlässlich ihres Rücktrittes als Direktorin der Zentralbibliothek Zürich,* 27–54.

Ostrom, E. (2012). Governing the Commons.

Petrus, A. (2025). *Research Libraries as Data Hubs. Good Practices from Abroad.*

Prisching, M. (2020). Die Bibliothek nach dem Ende der Bibliothek: Wissenswelten im Digitalismus. Köstner-Pemsel, C., Stadler, E. Stumpf, M. (Eds.). *Künstliche Intelligenz in Bibliotheken,* 41–56.

Revez, J. (2018). Opening the Heart of Science: A Review of the Changing Roles of Research Libraries. *Publications, 6(1),* 9. https://doi.org/10.3390/publications6010009

Rosenthal, D. I., Robertson, T. S., Lipkis, T., Reich, V., Morabito, S. (2005). Requirements for digital preservation systems. D-Lib Magazine, 11(11). https://doi.org/10.1045/november2005-rosenthal

sda (2025). *Nationalbibliothek erhält moderne Rechts-grundlage.* SDA-Meldung vom 03.06.2025. https://www.parlament.ch/de/services/news/Seiten/2025/20250603085144395194158159026_bsd027.aspx

Schneider, G. (2018). Das Programm P-5 «Wissenschaftliche Information: Zugang, Verarbeitung und Speicherung»: teilnehmeroffene Dienste der Hochschulen, für die Hochschulen. Keller, A., Uhl, S. (Eds.). *Bibliotheken der Schweiz: Innovation durch Kooperation. Festschrift für Susanna Bliggenstorfer anlässlich ihres Rücktrittes als Direktorin der Zentralbibliothek Zürich,* 78–96.

Sesartic Petrus, A. & Töwe, M. (2019). Forschungsdatenmanagement an der ETH Zürich: Ansätze und Wirkung. Bibliothek Forschung und Praxis, 43(1), 49-60. https://doi.org/10.1515/bfp-2019-2002

Seidlmayer, E., Hoffmann, F., Dierkes, J., Lindstädt, B.; Depping, R.; Förstner, K. U. (2023). *Empfehlungen für Data Stewardship an akademischen Forschungsinstitutionen.*

Šimukovič, E. (2023). *Of Hopes, Villains, and Trojan Horses: Open Access Academic Publishing and its Battlefields.* Doctoral Thesis.

SSC (2025). *Draft of the Federal Act on the 2027 Relief Package. SSC position statement within the consultation process* (German version).

Stäcker, T. (2025). Die forschungsnahe Bibliothek. Johannsen, J., Mittermaier, B., Schäffler, H., Söllner K. (Eds.). 1–8. *Praxishandbuch Bibliotheksmanagement.* https://doi.org/10.1515/9783111046341-001.

Swiatek Cassafieres, C. (2024). How Libraries Shape the Future of Research Infrastructure. Software Heritage. https://www.softwareheritage.org/2024/11/26/libraries-infrastructure-code/

Swiss Academy of Sciences. Swiss natural history collections network (SwissCollNet) (n.d.). https://swisscollnet.scnat.ch/en

Swiss Confederation (2011). *Federal Act of 30 September 2011 on Funding and Coordination of the Swiss Higher Education Sector (Higher Education Act, HEdA).*

Swiss National Library (2020). 107. Jahresbericht 2020. Kommission (1895−2020). https://www.nb.admin.ch/dam/snl/de/dokumente/kommission_nb/studien_und_berichte/kommission-geschichte.pdf.download.pdf/kommission-geschichte.pdf

swissuniversities (2019). *Liste abgeschlossener Projekte «Hauptstossrichtung Publikationen».* https://www.swissuniversities.ch/fileadmin/swissuniversities/Dokumente/Organisation/SUK-P/SUK_P-2/Liste_abgeschlossener_Projekte__DE_Publikationen.pdf

swissuniversities (2020). P-5: Scientific information (2017-2020). Projects. https://www.swissuniversities.ch/en/topics/digitalisation/p-5-scientific-information/projects

swissuniversities (2021a). *«Open Science Program». Results of the Projects Submitted by January 15, 2021.* https://www.swissuniversities.ch/fileadmin/swissuniversities/Dokumente/Hochschulpolitik/Open_Access/Results_of_call_for_proposals_211/211_Result_of_the_call_15.01.21.pdf

swissuniversities (2021b). *«Open Science Program». Project applications of the call for proposals (212) – Deadline 31.05.2021.* https://www.swissuniversities.ch/fileadmin/swissuniversities/Dokumente/Hochschulpolitik/Open_Access/Results_of_call_for_proposals_212/212_Result_of_the_call_deadline_31.05.21_final.pdf

swissuniversities (2022a). *«Open Science Program». Project applications of the call for proposals (221) – Deadline 31.05.2022.* https://www.swissuniversities.ch/fileadmin/swissuniversities/Dokumente/Hochschulpolitik/Open_Access/Results_of_call_for_proposals_221/221_Result_of_the_call_deadline_31.05.22.pdf

swissuniversities (2022b). *Projektantrag Projektgebundene Beiträge 2021-2024 nach HFKG.* https://www.swissuniversities.ch/fileadmin/swissuniversities/Dokumente/Hochschulpolitik/ORD/PgB_OpenScience-I_ORD-2224.pdf

swissuniversities (2023). *«Open Science Program». Call for Open Access Projects 2023: List of Approved Projects.* https://www.swissuniversities.ch/fileadmin/swissuniversities/Calls/Ausschreibungen/OA_Call_231_approved_projects.pdf

swissuniversities (2025a). *Publisher Negotiations.* https://www.swissuniversities.ch/en/topics/open-science/publisher-negotiations

swissuniversities (2025b): Swiss Library Network for Education and Research. Mission and tasks. https://www.swissuniversities.ch/en/organisation/bodies/networks-and-agencies/swiss-library-network-for-education-and-research

swissuniversities & Swiss National Science Foundation (2024). Swiss National Open Access Strategy. Revised in 2024. https://www.swissuniversities.ch/fileadmin/swissuniversities/Dokumente/Hochschulpolitik/Open_Access/Swiss-National-Open-Access-Strategy-2024-en.pdf

Trein, J.P. (2025). *Multilevel Governance and the Digital Transformation of Research Libraries: An Analytical Framework.*

UK Research and Innovation (2024). Research England funds for *Research and Knowledge Exchange.* https://www.ukri.org/councils/research-england/our-funds-for-research-and-knowledge-exchange/research-englands-funds-for-national-facilities-and-initiatives/

Universität Basel (2025): Vizerektorat Lehre. Organigramm, Universität Basel. https://www.unibas.ch/dam/jcr:10f7b9dc-8bb9-4086-87f6-ec64f488a378/UniBas-Organigramm-Vizerektorat-Lehre-DE.pdf

Universität Bern (n.d.): Leitung und Zentrale Dienste. Verwaltungsdirektion. https://www.unibe.ch/universitaet/organisation/leitung_und_zentralbereich/verwaltungsdirektion/startseite_verwaltungsdirektion/index_ger.html#panel450990

Universität Zürich (01.05.2025): Struktur Universitätsleitung und Zentrale Dienste. https://www.uzh.ch/de/explore/management/structure.html

Université de Neuchâtel (22.05.2023) : Organigramme du domaine central. https://www.unine.ch/wp-content/uploads/2024/02/UNINE_organigramme.pdf

van der Graaf, M., Reilly, S., Fenlon, A., Ludwig, J. (2025). *Improving access and reuse of research results by addressing copyright and data legislative and regulatory issues - A LIBER Action Plan. Zenodo.* https://doi.org/10.5281/zenodo.15183443

Vitiello, G. (2025). What Funding for a European Library Policy. IFLA Journal 51(2), 422-441. https://doi.org/10.1177/03400352241276846

Ziegler, S. (2019). More Than a Pretty Interface: The Louisiana Digital Library as a Data Hub. *Codex: the Journal of the Louisiana Chapter of the ACRL, 5 (2),* 153-171. Retrieved from https://repository.lsu.edu/libraries_pubs/91

8 Annex

8.1 List of expert interviews

- Interview with Alice Keller, Director, and Silke Bellanger, Head Digital Services, University of Basel Library, 28 August 2024.

- Interview with Andreas Kirstein, CEO, and Michèle Dünki, Head of Communications, SLSP, 6 November 2024.

- Interview with August Scherer-Hug, Head, Media Network, University of Teacher Education St. Gallen, 10 December 2024.

- Interview with Beat Immenhauser, Secretary General Swiss Academy of Humanities and Social Sciences, 13 November 2024.

- Interview with Damian Elsig, Director, and Matthias Nepfer, Head of Innovation and Information Management, Swiss National Library, 20 November 2024.

- Interview with Franziska Frey, Chief of Staff Senior Advisor for University Library Strategy, Planning and Assessment, and Ardys Kozbial, Assistant University Librarian for Content Strategies and Associate Librarian for the Faculty of Arts and Sciences, Harvard Library, 13 February 2025.

- Interview with Gabriela Lüthi, Head, Zurich University of Applied Sciences Library/President SLiNER, and Elena Šimukovič, Head of Research & Infrastructure, Zurich University of Applied Sciences Library, 27 August 2024.

- Interview with Georg Lutz, Director, FORS, 24 January 2025.

- Interview with Iris Buunk, Director of the Scientific Information Center, University of Applied Sciences and Arts Western Switzerland HES-SO, 11 December 2024.

- Interview with Isabelle Eula, Director, and Pascale Bouton, Head of Collections EPF Lausanne Library, 15 October 2024.

- Interview with Jeannette Frey, Director, Bibliothèque Cantonale et Universitaire (BCU) Lausanne, 30 October 2024.

- Interview with Rafael Ball, Director, and Michael Gasser, Deputy Director and Head of Archives and Collections, ETH Zurich Library, 2 October 2024.

- Interview with Rita Gautschy, Director, DaSCH, 14 January 2025.

- Interview with Rudolf Mumenthaler, Director, University of Zurich Library, 23 October 2024.

- Interview with Silvio Bindella, Head, University Library Lugano USI, 4 December 2024.

- Interview with Sonia Abun-Nasr, Director, and Marion Prudlo, Vice-Director and Head of Digital Services, University of Bern Library, 14 October 2024.

- Interview with Tom Kleiber, Managing Director, and Sebastian Sigloch, Head of Data & Insights and EOSC Representative, 27 November 2024.

- Interview with Ulrich Weidmann, Vice-President Infrastructure and Sustainability ETH Zurich/Vice-Chairman Board of Administrators SLSP, 8 November 2024.

- Interview with Wilfried Lochbühler, President Steering Committee and Susanne Aerni, Head of Secretariat, Consortium of Swiss Academic Libraries, 22 October 2024.

8.2 Tables and figures

8.3 Abbreviations

AI	Artificial Intelligence
AKOA	Arbeitskreis Open Access
AKORD	Arbeitskreis Open Research Data
BA	Bachelor of Arts
BCUL	Bibliothèque cantonale et universitaire de Lausanne
CAS	Certificate of Advanced Studies
CENL	Conference of European National Librarians
CPD	Continuing Professional Development
DelOS	Delegation Open Science
DFG	Deutsche Forschungsgesellschaft
DMP	Data Management Plan
EAWAG	Swiss Federal Institute of Aquatic Science and Technology
EMPA	Swiss Federal Laboratories for Materials Science and Technology
EPFL	École polytechnique fédérale de Lausanne
ERI	Education, Research, and Innovation
ETHZ	Eidgenössische Technische Hochschule Zürich
FAIR	Findable, Accessible, Interoperable, Reusable
FTE	Full Time Equivalent
GASCO	German, Austrian and Swiss Consortia Organisation
HEI	Higher Education Institution
IARLA	International Alliance of Research Library Associations
ICOLC	International Coalition of Library Consortia
IFLA	International Federation of Library Associations and Institutions
KUB	Konferenz der Universitätsbibliotheken der Schweiz
LIBER	Ligue des Bibliothèques Européennes de Recherche (Association of European Research Libraries)
Lib4RI	Library for the Research Institutes within the ETH Domain
MA	Master of Arts
OCLC	Online Computer Library Center
ORD	Open Research Data
PSI	Paul Scherrer Institute
PgB	Federal project contributions (Projektgebundene Beiträge)

RIPA	Federal Law on the Promotion of Research and Innovation (RIPA) / Research and Innovation Promotion Act
RL	Research Library
SDGs	Sustainable Development Goals
SERI	State Secretariat for Education, Research and Innovation
SLiNER	Swiss Library Network for Education and Research
SNL	Swiss National Library
SNSF	Swiss National Science Foundation
SRDSN	Swiss Research Data Support Network
SSC	Swiss Science Council
SUK	Swiss University Conference
SwissCollNet	Swiss natural history collections network
UAS	University of Applied Sciences
UKRI	United Kingdom Research and Innovation
UTE	University of Teacher Education
WSL	Swiss Federal Institute for Forest, Snow and Landscape Research
ZHB Lucerne	Zentral- und Hochschulbibliothek Luzern

Multilevel Governance and the Digital Transformation of Research Libraries: An Analytical Framework

By Prof. Dr. J. Philipp Trein, Université de Lausanne
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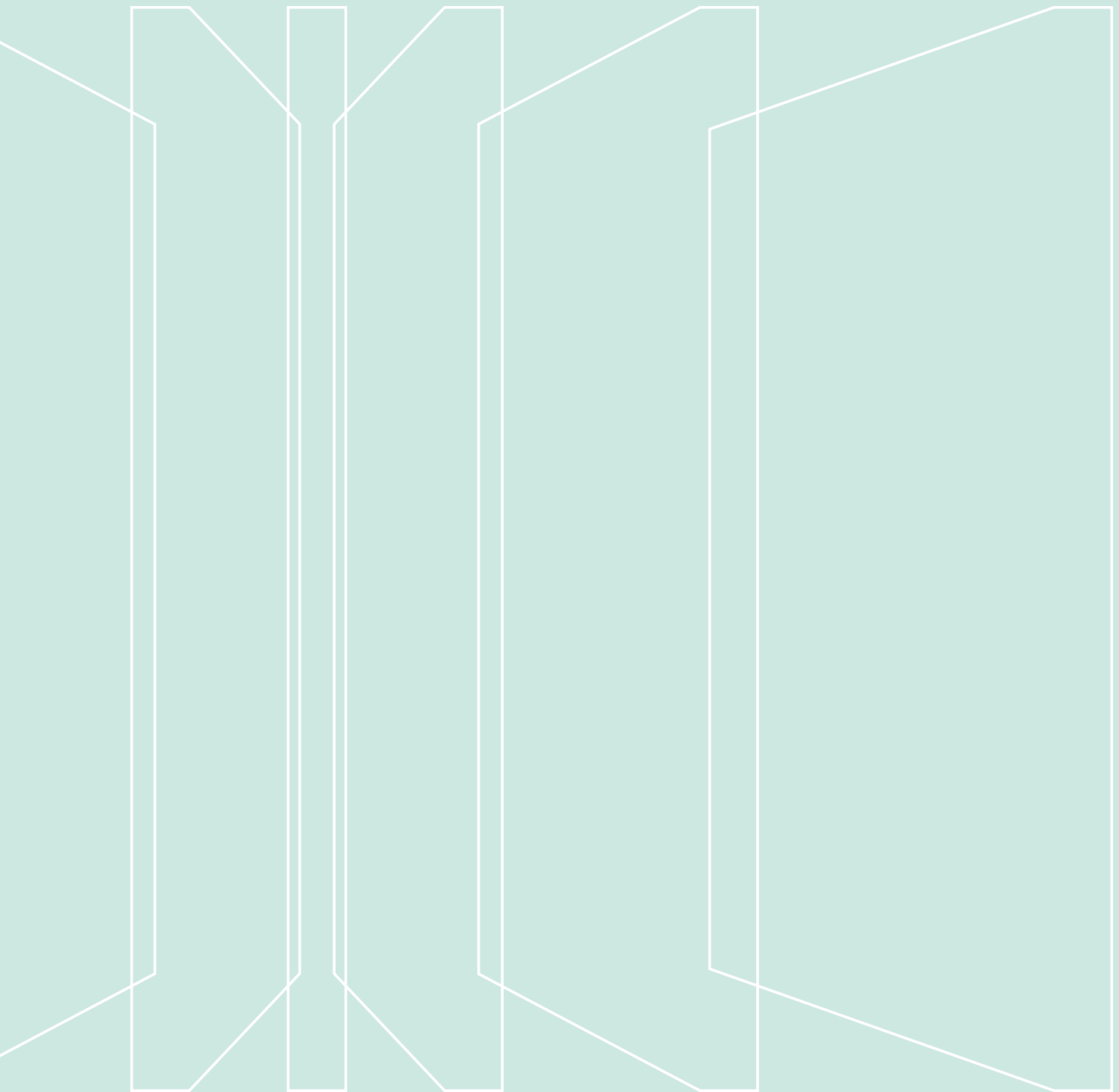
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Multilevel Governance and the Digital Transformation of Research Libraries: An Analytical Framework

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Summary

This report explores the governance and coordination challenges faced by Swiss research libraries as they transition into digital data hubs within a complex multilevel governance framework. The study is grounded in the context of Switzerland's decentralized political system, characterized by linguistic diversity, multiple jurisdictions, and fragmented library networks. It proposes an analytical framework to assess the structural and procedural elements that shape the digital transformation of these libraries. The framework is structured around five key components: (1) coordination demands, (2) coordination processes, (3) the role of state and non-state actors, (4) immediate and long-term outcomes, and (5) feedback effects. The report distinguishes between two types of multilevel governance: Type 1, involving general-purpose jurisdictions, and Type 2, focusing on task-specific jurisdictions (Section 2.2). It argues that the effectiveness of coordination efforts in the digitalization process depends on the balance between collaborative governance, characterized by trust and mutual benefit, and the challenges posed by opportunistic behavior, power imbalances, and identity-driven resistance (Section 4). The study highlights the importance of involving non-state actors, such as private companies and international organizations, which can act as both catalysts and participants in the governance of research libraries as data hubs. However, it also warns of the risks associated with centralization by stealth, where stronger actors may dominate collaborative initiatives, potentially leading to a loss of autonomy and identity among smaller research libraries. Based on the theoretical elaborations and expectations, the report concludes by proposing empirical research questions that can be explored through interviews with stakeholders and experts related to the Swiss research library system.

1. Introduction

Research libraries are a cornerstone of the infrastructure in the research process. According to a generic definition, research libraries, "are libraries that contain a large volume of academic research, peer-reviewed work, primary source materials, and a number of other fiction and non-

fiction works on a variety of topics." Oftentimes, research libraries are associated with universities (Hormia-Poutanen and Matheson 2017).[1] The role of research libraries has changed considerably in recent years. Historically, research libraries (and libraries in general) primarily served as physical repositories for the collection and documentation of knowledge in all academic disciplines. Books and peer-reviewed international journals were housed within the building, and readers could visit the library to consult or borrow these materials for a limited period. However, with the advent of the internet and the ability to publish content instantaneously online, the role of research libraries has evolved. While research libraries still provide access to books and journal articles, they now do so predominantly in digital form, allowing readers to access content remotely from their computers. The COVID-19 pandemic has accelerated the digital transformation of research libraries even more (Baxter et al. 2021).

Research libraries have a high coordination demand. Researchers from different disciplines read in a very targeted fashion and require often access to specific collections that might be physically located in other libraries. Prior the digitalization of collections, interlibrary loan was the only way to access certain publications. The availability of digital technology has created a demand and a possibility to make widely accessible collections from different libraries. Against this background, research libraries need to develop new models of collaborations – from interlibrary loan to collaborative data hubs. At the same time, each research library needs to find new ways to remain relevant as an organization. If all contents are available online, research libraires might need to re-invent their purposes as spaces of studying and learning.

Switzerland is a decentralized political system in a culturally diverse context. Four national languages and 26 cantonal governments with many competencies constitute a polity where the power to decide and to act is highly decentered and generates a high demand for coordination. The Swiss system of research libraries of Higher Education Institutes mirrors this organizational principle. It includes:

- libraries of cantonal universities;
- libraries of universities of applied sciences (UAS):
- libraries of universities of teacher education (UTE);
- libraries of the Swiss Federal Institutes of Technology in Lausanne and Zurich
- a library for the Research Institutes within the ETH Domain[2]

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[1] Linda Hall Library. 2023. What is a research Library? [https://www.lindahall.org/about/news/what-is-a-research-library/], accessed on November 7, 2024.
[2] Library for the Research Institutes within the ETH Domain (Lib4RI): Eawag, Empa, PSI & WSL.

In Switzerland, cooperation between different research libraries has increased since the turn of the millennium. Cooperation emerged due to the need acquire licenses for electronic resources. National coordination organs, such as swissuniversities and its predecessor organizations as well as the research libraries themselves made available funding for these cooperation efforts.[3] Since 2013, these cooperation projects, include explicitly the provision of IT services by several research libraries (Keller 2018b, 57). Against this backdrop, libraries in Switzerland have formed different networks within and across regions, often organized along language lines. Instead of one national network of research libraries, several fragmented networks emerged (Keller 2018b, 59–60).

Nevertheless, more recently, the growing prominence of open science has heightened the demand for coordination and cooperation among research libraries, both within and across these existing networks (Friedlein 2020, 10). Notably – as it is assumed in the present research project – research libraries ought to transform themselves into data hubs. In the Swiss context, such a transformation includes the necessity to work together across a network of multiple jurisdictions as well as with non-state actors (including international organizations). Because of these projects, the landscape of Swiss research libraries has changed. Notably, the cooperation between various research libraries has intensified, for example in the context of projects related to national licenses ("Nationallizenzen") as well as Open Access and Open Research. Furthermore, almost all main research libraries in Switzerland have cooperated in the Swiss Library Service Platform (SLSP). Eventually, since 2019, the Swiss Library Network for Education and Research (SLiNER) represents 43 research libraries, in Switzerland.[4]

This report proposes an analytical framework that allows researchers to analyze governance and coordination challenges faced by research libraries in this new digital environment. Therefore, the document proceeds in three steps. First, it explores the structural elements, notably the different types of organizations involved. Second, the report analyzes the multilevel processes that are significant in this context. Third, it works towards an analytical framework for the governance of research libraries in a multilevel context. For each section, the report will also discuss the specific

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[3] It is important to mention that after 2006, in the first wave of digitization, libraries in Europe hoped to be able to create non-profit and open alternatives to commercial projects like the one launched by Google and they realized that a cooperative effort could be more successful. And the political system at that time was open to support that (and still is, at least in the EU). Jeanneney, Jean-Noël. 2005. "Quand Google défie l'Europe." Le Monde, 22.01.2005, published online: https://www.lemonde.fr/archives/article/2005/01/22/quand-google-defie-l-europe-par-jean-noel-jeanneney_395266_1819218.html, accessed on November 5, 2024.

[4] Swissuniversities, Swiss Library Network for Education and Research [https://www.swissuniversities.ch/organisation/gremien/netzwerke-und-vertretungen/swiss-library-network-for-education-and-research], last accessed, November 5, 2024.

context of research libraries in the digital age and propose research questions that emanate from the theoretical literature.

It is important to note, that **this report does not do three things**. Firstly, the report does not make normative proposals about how to govern the digitalization of research libraries by proposing which actors should lead this process. Specifically, the report does not indicate whether the national government or a national library should lead such efforts, or whether such initiatives should emerge from the bottom-up (i.e., from different cantonal research libraries). Secondly, the report does not make an argument to what extent the contents of research libraries should be digitalized and existing organizations integrated. An important empirical and political question is how much of the contents in research libraries needs to be digital (existing contents as well as those that will be acquired in the future) and how much existing research libraries in Switzerland need to be integrated and merged. Thirdly, the report does not comment on the potentially negative consequences of digitalization for research libraries. The ability to store all information digitally and make it accessible to every researcher in Switzerland, might give rise to demands to generate one national data hub, instead of a decentralized system of diverse research libraries. The potentially limitless possibilities of technical integration might generate visions for centralization of research contents. Supporters for such ideas might evoke the abilities to save costs for infrastructure, due to centralization. Opponents might argue that such a vision will destroy the diversity of the landscape of research libraries and especially associated structures that help to preserve local information that is stored in cantonal research libraries. This report does not offer information for either of these positions.

This report does however provide a conceptual map to conduct empirical research – such as document analysis and interviews – that will allow find answers to the above-mentioned political questions in a structured manner by mobilizing insights from the existing literature on multilevel governance.

2. Multilevel governance and decision-making
2.1 Defining Multilevel Governance
The analytical framework for this study is grounded in the **literature on governance and multilevel governance**. In a recent book that rethinks governance theories, Christopher Ansell identifies three primary meanings of governance within the literature. Firstly, governance is understood as the **management of specific issues**, such as implementing policies related to healthcare, fisheries, or zoning restrictions. Applied to research libraries, this would involve

governance related to the practical implementation of a new digital system. For example, processes and operational decisions on how to create a repository to present historical documents to users publicly.

Secondly, governance refers to the interaction of various actors in the **political decision-making process** and their ability to produce outcomes that address different policy problems. This understanding of governance has been associated with the German term "Steuerung." In the context of research libraries, this refers to the collaboration among different stakeholders within the field to create projects that transform research libraries or develop new policy programs, such as a national strategy with an accompanying budget to update infrastructure and improve services. This understanding of governance would also focus on which organization(s) should take the lead in governing research libraries as data hubs.

Thirdly, governance emphasizes the **inclusion of non-state actors** in both decision-making and implementation of public policies. For research libraries, this aspect would involve incorporating private actors, such as service providers, as well as users like researchers and students, into the decision-making process (Ansell 2023, 3; Ansell and Torfing 2022).

The purpose of this report is to primarily focus on governance in the second sense—understanding how different actors collaborate and the conditions under which they can produce effective results. Nevertheless, it is important to keep in mind these three different aspects. For example, the inclusion of non-state actors, such as representatives of library users can occur at the level of decision-making, for example regarding which projects should be funded by research libraries. In addition, other private actors, such as IT providers, tend to be part of management-related government processes regarding the implementation of data sharing projects. Scholarship on research libraries has referred to co-creation as term to denote the involvement of non-state actors (e.g., users) into some library projects (Gupta 2024).[5]

Given that this project examines research libraries in **Switzerland**, it is crucial to approach governance from a **multilevel perspective**. The term "multi-level governance" (MLG) has gained prominence in political research over the past 30 years and addresses what is often referred to as the "multiplicity of scales" problem. This concept recognizes that many of the pressing issues of

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[5] It is important to note that in the public administration and governance literature, the term co-creation is used to denote the design of new services and projects from scratch, in collaboration with citizens and non-state organizations as well as different departments. If the library designs the project and proposes to users and providers to discuss and decide it together, we would refer to collaboration (Chris Ansell and Torfing 2021).

our time can only be effectively addressed by involving multiple jurisdictions and ensuring their cooperation. Originally, the concept was coined in the context of European policymaking, however, its uses have extended beyond European public policy (Hooghe and Marks 2003; Maggetti and Trein 2019; Marks 1993).

A definition of MLG in a widely cited book reads, *"Multilevel governance (MLG) is a rather popular term, widely used by students of European integration and international relations (IR) as well as by commentators and practitioners. It evokes the idea of increasingly complex arrangements for arriving at authoritative decisions **in increasingly dense networks of public and private, individual and collective actors**. In particular, it is deemed to capture important features of how binding decisions are arrived at in the EU. Yet, MLG is not just a convenient description of political mobilization leading to European policy-making, it also **points to fundamental changes in contemporary rule**. As such, it suggests that structural transformations are taking place in contemporary European states under the impact of the process of European integration. Finally, MLG prompts **reconsideration of what constitutes legitimate rule** (in both state and non-state contexts), and therefore invites normative reflection on the conditions under which binding decisions gain widespread acceptance and bestow legitimacy on the institutions that produce them"* (Piattoni 2010, 1). This definition shows the nature of MLG as an analytical concept that extends across several analytical dimensions. I will discuss these dimensions in more detail later in this report.

One of the strongest aspects of multilevel governance is its capacity to generate what scholars term **"problem-solving legitimacy."** This legitimacy is particularly important in contexts involving multiple scales that cannot be easily merged in response to every new issue but need flexible organization. Multilevel governance allows for adjustable responses to problems that require shared solutions (Scharpf 1997, 1999; Trein, Thomann, and Maggetti 2019). Although multilevel governance arrangements operate often informally, e.g., without a clear legal basis, the legitimacy of such solutions is derived from their effectiveness in addressing the problems at hand. For example, if research libraries form a consortium to buy shared licenses without creating a new organization to which they delegate these competencies definitively, they do this, because they obtain better conditions as a larger group. Still, each library can choose to leave the consortium at any point, if it decides that it is better to buy licenses alone.

Although the concept of multilevel governance was coined in the EU context, the problem it analyzes–governance in a context of complexity–is **not new to Switzerland**. Multiple jurisdictions

at different levels and an important role for non-state actors have been a fundamental part of the political system of the Swiss confederation, since its foundation in the mid-19th century (Kriesi and Trechsel 2008).

The possibilities for **digitalization** in the public sector have introduced **new challenges for coordination in multilevel settings**. Digitalization creates new opportunities for organizations to exchange information, such as data, across different entities. For example, Swiss cantons equipped with the appropriate infrastructure could establish systems to exchange health data in real-time, as seen during the pandemic. However, in a context characterized by a diversity of organizations and the multiplicity of scales, implementing such infrastructure can be challenging. This difficulty arises from the need for coordination and harmonization of systems, or at the very least, the creation and updating of interfaces between organizations.

This multilevel structure is also evident in the Swiss research library landscape, where research libraries are primarily affiliated with cantonal universities (including UAS and UTE) that must collaborate with the research libraries of the two federal polytechnic universities. Therefore, to understand the governance of research libraries in Switzerland, it is essential to analyze it from a multilevel governance perspective.

2.2 Structural Elements of Multilevel Governance

As mentioned in the introduction to the report, research on multilevel governance aims to include a multiplicity of scales. To organize such an analysis, the literature distinguishes between two types: Type 1 and Type 2 multilevel governance.

Type 1 multilevel governance involves **intergovernmental relations within general-purpose jurisdictions**, characterized by non-intersecting memberships. The number of jurisdictions is limited to a few levels, such as the national, subnational, and local levels. Additionally, there is a system-wide architecture in place. This type of governance is essentially akin to federalism, understood as a power-sharing arrangement between central and subnational governments. In this context, governance focuses on authority relations. The non-intersecting memberships mean that memberships are usually territorial, such as nation-states, with the boundaries of these jurisdictions typically being stable and durable (Hooghe and Marks 2003, 236–37). For example, countries and subnational jurisdictions, such as cantons, typically are considered general-purpose jurisdictions.

In contrast, **Type 2** multilevel governance operates differently. This form of governance involves **task-specific jurisdictions designed to address particular issues**, with intersecting memberships, meaning that an organization can belong to multiple task-specific jurisdictions. There is no limit to the number of jurisdictional levels, and the design of these jurisdictions, or governance arrangements, is flexible. This approach looks at government in a disaggregated form comprising of various sectors, such as the welfare sector, the health service sector, or the transportation sector, rather than viewing the delivery of public services as a monolithic function of government. Type 2 governance is widespread at the local level, such as in Switzerland, where so-called "Zweckverbände"—goal-oriented and functional associations—play a significant role in providing public services. In Switzerland, "Zweckverbände" are common at the local level, where different municipalities cooperate for the provision of public services. Such arrangements are also common in other Western countries, including the United States, at regional and municipal levels of government (Hooghe and Marks 2003, 237–38).

Multilevel governance, and Type 2 jurisdictions specifically, describe what has been named **"functional, overlapping, and competing jurisdictions"** by economists from Switzerland, like Frey and Eichenberger. Elinor Ostrom has also referred to this phenomenon as "polycentricity," a term that captures the coexistence of multiple centers of decision-making (Frey and Eichenberger 1999; Hooghe and Marks 2003, 237–338; Ostrom 2010). In the public policy literature, authors have coined the concept of functional regulatory spaces to denote the necessity to cooperate across jurisdictional borders (Varone et al. 2013).

In addition to the two types of governance that focus predominantly on public-sector actors, recent research on multilevel governance has also highlighted the **growing importance of international actors**. Notably, the increasing role of regulatory agencies at the European level, as well as the integration and configuration of these agencies, has sparked research that extends beyond the European Union. Scholars have also emphasized the significance of other international organizations that contribute to problem-solving in governance at the local level by providing expertise and various policy initiatives (Hooghe 2019; Maggetti, Di Mascio, and Natalini 2020). International organizations also are venues for the exchange of ideas and best practices in a multilevel setting, similar to intergovernmental exchange in federal countries (Ania and Wagener 2014; Kerber and Eckardt 2007).

Another development in the evolution of governance research concerns the role of **private actors**. Research on polycentric governance and other forms of governance underscores the

necessity of involving private actors in the design and decision-making processes of governance solutions. Their involvement is crucial because they provide the necessary expertise and pragmatism to produce relevant and effective policy solutions (Bache, Bartle, and Flinders 2016; Mende 2021; Trein 2022). On the other hand, reliance on private actors can lead to a loss of control, as governments must ensure that these processes remain transparent while also safeguarding data protection, especially when individual data is involved.

The distinction of Type 1 and Type 2 jurisdictions can be used in two ways to analyze Swiss research library governance. In the first perspective, the typology allows to distinguish on the one hand agendas, interests, and steering measures that belong to the cantonal side, which is to maintain research libraries as a part of the cantonal identity. Here cantons take the role of a Type 1 jurisdiction. On the other, any inter-cantonal governance of research libraries that delegates competencies in the field of research libraries away from cantonal authority can be considered a Type 2 jurisdiction.

The theoretical elements discussed have significant implications for the research project titled "Research Libraries as Data Hubs," to which this report aims to contribute theoretical insights. Regarding the first research question—concerning the effects of digital transformation on the services of Swiss research libraries and their framework conditions—the key issue is whether the **digital transformation should be addressed through Type 1 governance or Type 2 governance**. Specifically, this involves determining to what extent and regarding which problems the response to digitalization should be responded by collaborations between all research libraries in one general framework, and for which type of problem it makes more sense to respond through task-specific collaborations. For example, Type 1 collaborations would entail a coordinated framework to access all contents from a few publishers for all research libraries, in Switzerland, across academic disciplines.[6] On the contrary, a Type 2 governance approach might involve creating collaborations that focus on specific fields, such as art history, connecting different research libraries in Switzerland and potentially including research libraries abroad, particularly those in regions with similar languages.[7]

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[6] One example for this type of cooperation is the *Consortium of Swiss Academic Libraries* [https://consortium.ch/?lang=en], last accessed, November 5, 2022.

[7] One example for this type of cooperation is the "Specialised Information Services" Program, in Germany [https://www.dfg.de/en/research-funding/funding-opportunities/programmes/infrastructure/lis/funding-opportunities/specialised-info-services], last accessed, November 10, 2022.

2.3 Processes in multilevel governance

Both political and economic research have highlighted that multilevel governance often entails decision-making in contexts where traditional hierarchies are absent. As a result, an important question arises: how can decisions be reached, particularly when constituent units possess significant power, whether they operate at lower levels or within task-specific governance arrangements?

Negotiation: One answer to this question lies in the importance of **negotiation** and **bargaining** as forms of decision-making in multilevel governance. In the absence of a clear hierarchical structure, actors in multilevel contexts must negotiate to establish shared solutions to common problems and may need to bargain over specific contextual aspects. The advantage of this type of cooperation is that it assumes voluntary participation, meaning those involved in the negotiation process are genuinely interested in achieving a shared outcome (Ansell 2000; Kohler-Koch and Rittberger 2006). An important aspect to highlight regarding the significance of negotiation in multilevel governance is the role of informal relations. In the previous section, we discussed the importance of Type II jurisdictions, which often operate in informal settings, especially during the initial stages of coordination or at the beginning of a project. As a result, negotiation becomes the key form of interaction, as there is no formal structure establishing a hierarchy or any other decision-making process.

For example, an important actor in the collaboration between Swiss research libraries is the Consortium of Swiss Academic Libraries.[8] This organization plays a crucial role in collectively purchasing services for all research libraries as well as in the funding of projects, for example the shared acquisition of licenses for journals and databases. Until 2020, the Consortium was based at the ETH Zurich and lacked elements of formal institutionalization, as outlined in a 2018 article: "*Das Konsortium agiert seit Anbeginn nach dem schweizerischen Gesellschaftsrecht als einfache Gesellschaft und besitzt als an der ETH Zürich angesiedeltes Projekt weder Rechtspersönlichkeit noch rechtliche Handlungsfähigkeit. Daher ist es eines der wichtigsten und dringendsten Ziele der strategischen Ausrichtung, das Konsortium in eine dauerhafte Rechtsform überzuführen und dabei auch die Finanzierung auf lange Sicht sicherzustellen*" (Ball and Boutsiouci 2018, 158). As of 2020, the Consortium is administrated by the Swiss Library Service Platform (SLSP) (Heller 2020, 16). This has been an important step towards the formalization of the role of this organization.

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[8] *Consortium of Swiss Academic Libraries* [https://consortium.ch/?lang=en], last accessed, November 5, 2022.

The consortium is (or has been since the mentioned text dates from 2018) an example of the reliance on informal relationships within the multilevel system of Swiss research libraries. In such a context, negotiations of rational actors trying to maximize their individual utility might challenge coordination, especially if there is legal uncertainty. For these reasons, it is useful to look at the literature on collaborative governance.

Collaboration: To better understand how problem-solving might work in other contexts, we can draw on the literature on **collaborative governance**, which addresses issues like those in multilevel governance research. Collaborative governance is a concept used to examine decision-making in situations where public agencies involve non-state actors in addressing public problems. Although the research primarily focuses on public administrations and their interactions with society, it offers valuable insights into decision-making in contexts with diverse actors and the absence of formal, enduring jurisdictional boundaries. Scholars have emphasized that successful collaborative outcomes depend on the formation of **trust relationships** among participating actors, a **willingness to cooperate**, and the creation of **"win-win"** elements that benefit all parties not only at the conclusion but throughout the negotiation process (Ansell and Gash 2008; Emerson, Nabatchi, and Balogh 2012).

Collaborative governance is often applied to complex problems that require cooperation across jurisdictions, which makes its lessons interesting to study the digitalization of research libraries in a decentralized setting like Switzerland. Additionally, collaborative governance models account for **power differentials**, which is particularly relevant when considering the digitalization of research libraries in Switzerland. For instance, federal polytechnic libraries wield more influence, and certain academic disciplines might hold greater political power than others, in the collaboration amongst research libraries (Heller 2022, 69–70). Furthermore, collaborative governance might be worthwhile to consider for the governance of research libraries because it has been adapted to problems for which interdisciplinarity plays an important role (Fish, Ioris, and Watson 2010).

The main difference between negotiation and bargaining, on the one hand, and collaboration, on the other, is that the latter is more result oriented. In the collaborative governance literature, there is an underlying assumption that actors participate with a willingness to reach a shared solution. In contrast, in multilevel settings, negotiations may involve actors who have little interest in finding a shared solution but must participate because they are part of the overall framework.

When examining the governance of the transformation of research libraries in Switzerland, it is crucial to fully distinguish between these two dimensions.

Learning: Another important theoretical element concerning processes and multilevel governance is learning. In social and political sciences, a substantial body of literature addresses policy learning, encompassing a variety of aspects. Learning may involve the use of scientific evidence for policymaking, changes in public policies resulting from failures, or processes in which decision-makers collectively update their beliefs in light of new information (Dunlop and Radaelli 2018; Dunlop, Radaelli, and Trein 2018; Heikkila and Gerlak 2013; Vagionaki and Trein 2020).

Research on learning is highly relevant to the governance of research libraries, particularly in the context of multilevel governance. Firstly, **learning takes place in venues** such as the conferences, where representatives of research libraries come together to exchange information about best practices. However, in the context of the digitalization of the library system, learning also occurs through international cooperation. Research on European integration has highlighted how the European Commission has encouraged countries to learn from one another to improve their social and economic policies (Ania and Wagener 2014; Kerber and Eckardt 2007). This model is also suitable for the transformation of research libraries into data hubs, as some of the challenges are similar in a transformation towards more digitalization. Exchanging information with international counterparts, especially in other multilevel contexts such as those in Europe and the United States, could enhance cooperation between research libraries and contribute to better governance practices.

Furthermore, the literature on network governance, another approach to discussing multilevel governance, emphasizes the significance of **learning results**. Drawing on the distinction between single-loop and double-loop learning, scholars have underscored the extent to which public policies and governance arrangements may change within multilevel settings. Single-loop learning typically results in adaptations of existing systems and processes, such as adjustments to the digital infrastructure of research libraries that is already present. In contrast, double-loop learning involves the introduction of new ways of doing things, for example new infrastructures and processes, due to changes in values. According to Moynihan, who quotes Argyris and Schön, double-loop learning is, "'learning that results in a change in the values of theory-in-use, as well as in its strategies and assumptions.... Strategies and assumptions may change concurrently with, or as a consequence of, change in values'" (Moynihan 2005, 204; Pahl-Wostl 2009).

However, examples from Swiss governance of research libraries suggest that major changes indicative of double-loop learning are rare. The project-based nature of digitalization might have, in fact, hindered research libraries from achieving groundbreaking advancements in the digitalization of their services. Such transformations are especially difficult if a durable budget is lacking – project-based financing often implies that the end of the project also means the end of financing cooperations (Keller 2018a, 495-497). In the Swiss system of research libraries federal project contributions (Projektgebundene Beiträge, PgB) are an important source of funding for cooperation projects. Nevertheless, it is important to keep in mind that it is not at all clear if the change towards developing research libraries into data hubs requires double-loop learning, i.e., a fundamental change of the different principles that define a research library. This aspect is a question for empirical research and practice.

Customization and opportunism in policy implementation: A fourth important process in multilevel governance is the customization of policies during implementation. The federalism literature has long established that national or federal public policies, which must be implemented by constituent units, are adapted in various ways across a country (Sager and Thomann 2017; Thomann 2015; Thomann and Sager 2017). For instance, significant differences exist between cantons in Switzerland regarding how they implement federal policies. Similarly, research on European public policy has shown that EU member states comply with directives in different ways, tailoring European public policies to fit their national systems. While this customization can enhance policy effectiveness, it may also lead to inconsistent application across jurisdictions.

In contrast, literature analyzing political dynamics in federal countries, particularly through the lens of rational choice theories of federalism, emphasizes that in a multilevel governance context, actors at different levels may behave opportunistically, seeking to avoid the costs of policymaking (Rodden 2006; Weingast 2009). This behavior can manifest in several ways: actors may fail to fully implement national policies, misuse funds for unintended purposes, or shift the blame for unpopular policies or governmental inaction to other levels of government (Braun and Trein 2014). In Switzerland, this issue is evident in the realm of social policy reforms, where both the federal government and the cantons have taken action to shift the costs of social policies onto each other (Bonoli and Trein 2016).

This problem may also be relevant for the governance of research libraries as data hubs. Research libraries financed by the cantons, for instance, might either refrain from acting and wait for the

federal government to intervene, or they may blame the national government for any perceived inaction.

Regarding the digitalization of public sector organizations more generally, customization and opportunism present a challenge. One of the key advantages of digital technologies is their ability to standardize the presentation and exchange of data. However, different participating organizations and jurisdictions may be either unwilling or unable to agree on specific methods for managing and implementing digital solutions. For example, if there are incompatible software systems or if creating interfaces between systems proves difficult, the customization of processes and practices can become an obstacle to the successful implementation of digital reforms in multilevel governance systems. In practical terms, the question is whether research libraries tend to have succeeded in standardizing formats and increasing interoperability, especially regarding the digital transformation of research libraries into data hubs.

On the other hand, the pressure towards harmonization in the context of digitalization might reinforce the integration of several networks of research libraries within Switzerland and increase the difficulties of cooperation between them. Specifically, if there are competing networks, that are well integrated and homogenous internally and invest into interoperability with the network members, the important question is whether it will be possible to also foster interoperability between networks. Again, this problem is essentially an empirical question about whether competing networks are a problem for Switzerland, or, whether this aspect is an issue rather at the international level.

3. *Challenges for the digitalization of research libraries in a multilevel environment*

In this section, the report will explore the challenges of digitalizing research libraries within a multilevel governance environment. The report now turns to the question of what could go wrong—in other words, we will discuss the factors that might obstruct successful coordination in multilevel settings. For this research project, which aims to examine research libraries as data hubs, it is crucial to consider these factors to understand how digitalization should be governed within a context of multiple scales.

3.1 Identity

The first element that poses a challenge for coordination in multilevel governance is the role of identity. In their seminal article, Hooghe and Marks outline the **importance of identity and community as potential obstacles to coordination in multilevel settings**. The authors argue that Type 1 jurisdictions, such as those in most federal countries, often prioritize preserving their

identity when it comes to sharing responsibilities or transferring authority to more specialized, purpose-specific jurisdictions (Hooghe and Marks 2003, 240–41). The complex relationship between Switzerland and the European Union is a prime example of such dynamics.

When it comes to the governance of research libraries in the age of digitalization, identity may also influence the success or failure of new projects that aim to coordinate or even integrate parts of, or entire, research libraries to create data hubs.

- The first level at which identity might play a role in Switzerland is the **regional level**, particularly concerning language. It is easy to imagine that in certain contexts, French- and German-speaking cantons, as well as Italian-speaking Ticino, might feel that their cultural identity is threatened if research libraries are ought to be integrated or required to coordinate through a digital project. Especially if they felt that something like this came at the expense of their own minority identity compared to the German-speaking identity of most of the Swiss population. Obviously it is possible to overcome this challenge in the governance of Swiss research libraries as the example of the Swiss Library Service Platform (SLSP) shows (Heller 2022).

- Secondly, identity plays a role in the **diversity of library organizations**. For instance, cantonal university libraries have a dual role as both cantonal libraries and university research libraries. On the other hand, the libraries of universities of applied sciences have different needs than university libraries, as their education is more practice oriented. The libraries of the federal polytechnic universities might have distinct identities as well, given their focus on the hard sciences (Eglin-Chappuis 2009; Keller and Uhl 2018). The question of identity at the organizational level could go even further, as each library may have a specific organizational culture, habits, and processes that could be challenged by digitalization projects requiring coordination or integration.

- Thirdly, identity may manifest along **academic disciplinary lines**. Disciplinary practices and preferences can create significant obstacles to the creation of digitalization projects. The highly interdisciplinary nature of universities might necessitate considering different disciplines when establishing digitalization projects for these research libraries.

However, **identity can also foster cooperation**, especially when faced with a common problem perceived as an external threat (Kritzinger et al. 2021), which could unify the diverse actors within the Swiss library system. For example, if a project requires negotiation with a powerful international publisher, research libraries might band together despite their differences in

language, organizational culture, and academic disciplines. One example for this type of cooperation is the *Consortium of Swiss Academic Libraries*.

3.2 Opportunism

The second coordination challenge for research libraries in Switzerland relates to the potential for **opportunistic behavior by the organizations involved**. As discussed above, there is a body of literature on federalism that examines how constituent units often act strategically to avoid costs (Braun and Trein 2014; Rodden 2006). In the context of research library governance, this implies that different research libraries might hesitate to take the initiative in proposing projects or be reluctant to allocate funds if they are uncertain about receiving adequate returns on their investments (Keller 2018a). Furthermore, these research libraries may attempt to shift costs to other cantonal libraries or the national level to minimize their own contributions and maximize their utility. A main problem for the Swiss case is that in the cooperation between research libraries that is based on projects, long-term financing is not guaranteed.

An example of this behavior can be observed in the reluctance to invest in the durability of projects without secure financial planning and commitments from other participating research libraries. This issue can also be linked to a **lack of capacity**. The COVID-19 pandemic revealed a significant deficiency in essential data-sharing capabilities. Although such a system was established at the cantonal level during the pandemic, once it became apparent that the virus could be contained through vaccination, many cantons reduced their data collection and sharing capacities to cut costs. The consequence of such actions is that it will be much more difficult to retain valuable experiences and be adequately prepared for future outbreaks (Interface 2022). This problem implies for the digitalization of research libraries that project-based funding needs to be turned into long-term investments to establish durable data hubs.

3.3 Centralization by stealth

The next important factor in understanding multilevel governance in the context of digitalization involves a phenomenon referred to as **"centralization by stealth."** This term, primarily used in discussions of European integration, describes how, within certain contexts of multilevel governance—particularly those involving negotiation among various partners—power tends to gravitate toward the strongest actors. For instance, in European public policy, Germany and France, as the most powerful states, tend to have (somewhat) more influence in the European Council compared to other states (Golub 2012). Similarly, the role of the European Commission has de facto expanded over time, even without a formal increase in its competencies (Bauer and

Becker 2014). Additionally, the European Central Bank has been described as an instance of centralization by stealth (Boin 2019), because the delegation of monetary policy powers to it has had spillover effects on other policy areas, such as fiscal policy, thereby diminishing the actual capacities of member states.

Given this context, some scholars have long questioned whether multilevel governance is a "Faustian bargain," as power consistently shifts to the strongest actors (Pierre and Peters 2005). In such cases, the transfer of competence does not necessarily occur explicitly; instead, the **discursive power** (Purdy 2012) **of dominant actors may create a bandwagon effect**, leading others to follow. This mechanism was evident in the establishment of the SLSP project, which has been cited as a successful example of collaboration among diverse research libraries in Switzerland. However, the study evaluating the project indicates that it would not have been feasible without the participation of the Federal Institute of Technology in Zurich and its natural leadership (Heller 2022, 69–70). Thus, while this may not represent immediate centralization, collaborations might be more likely to succeed under the leadership of the structurally strongest actor with a constant disadvantage for weaker actors.

Centralization by stealth can also result from the absence of capacity, particularly financial capacity, among some participating units in collaborative efforts. For example, the electronic health record project in Switzerland was initially conceived as a decentralized system with multiple competing providers, which would theoretically enhance service quality through market competition (Pietro and Francetic 2018). However, the federal government did not allocate funding at the outset, and the decentralized model ultimately failed, since very few patients registered.[9] Now, there are only a limited number of providers, and cantons have begun requesting that the federal government centralize certain aspects of the National Health Record,[10] a project that necessitates data sharing among various cantonal actors. In this context, it is crucial to examine whether projects aiming at establishing data hubs within Switzerland's research library landscape inadvertently leads to, or requires, some degree of centralization or central steering to function effectively. Furthermore, it raises the question whether the integration of digital data hubs will threaten the existence of regional and local research libraries, because funding bodies question the necessity to finance physical collections at different places within the same country.

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[9] Das elektronische Patientendossier in Zahlen (OFSP) https://www.bag.admin.ch/dam/bag/de/dokumente/nat-gesundheitsstrategien/strategie-ehealth/gesetzgebung-elektronisches-patientendossier/dokumente/faktenblaetter-epd/epd-in-zahlen.pdf.download.pdf/Das-elektronische-Patientendossier-in-Zahlen.pdf, last access 18.06.2024.
[10] GDK, September 11, 2023: [https://www.gdk-cds.ch/de/die-gdk/medienmitteilungen/detail/elektronisches-patientendossier-gesundheitsdirektorenkonferenz-schlaegt-zentralisierung-vor-2], last accessed October 28, 2023.

3.4 Lack of "input" legitimacy and accountability

Finally, multilevel governance, as discussed earlier, often entails a legitimacy challenge, particularly in terms of what is known as input legitimacy. At the beginning of the report, we noted that the legitimacy of multilevel governance solutions arises from their problem-solving capacity. However, a significant downside of many multilevel arrangements, especially those in the intergovernmental realm, is a lack of input legitimacy, which refers to the support of voters (Scharpf 1999). This deficit frequently results in limited democratic accountability, with policy decisions in multilevel settings, such as the European Union, lacking direct democratic oversight (Papadopoulos 2003). One of the challenges in integrating Switzerland into the European model is the country's emphasis on direct democracy, which ensures strong input legitimacy for all major policy decisions.

In the context of research library governance, this problem takes on a slightly different form. Here, the issue may stem from the absence of a legal framework for certain types of collaborations, particularly those that do not involve an entire university or research library but rather focus on a specific aspect or discipline. Furthermore, without a legal foundation, it becomes difficult to sustain such projects and allocate funding. Research on the sustainability of projects within the governance of Swiss research libraries has highlighted this as a significant challenge (Friedlein 2020; Keller 2018a, 2018b). There are also examples for successful long-term collaboration, such as SWISSUbase[11] or swisscollections.[12] The lack of formal structures and the resulting inability to establish accountability mechanisms pose a risk that partners may withdraw from projects if they are uncertain about the future and sustainability of these endeavors.[13] These are especially agreements about long-term commitments to collaborations, e.g., regarding financial aspects. This risk is particularly acute in collaborations that cross boundaries, such as those between countries. Therefore, the governance of research libraries must ensure the establishment of accountability and certainty to encourage participation, especially in innovative projects.

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[11] SWISSUbase, [https://www.swissubase.ch/en/], accessed, November 6, 2024.
[12] Swisscollections, [https://swisscollections.ch/About], accessed, November 6, 2024.
[13] This idea is based on research on federalism in the European Union: (Jachtenfuchs and Kasack 2017).

4. Towards an analytical framework for the analysis of research libraries as Data Hubs, in Switzerland

In the following, the report focuses on how the theoretical elements discussed above can be integrated into an analytical framework for analyzing the governance of Swiss research libraries as data hubs. The analytical model builds on two assumptions. Firstly, as discussed above, multilevel settings are networks of diverse jurisdictions/organizations (in this case research libraries) across different levels. Secondly, digitalization in multilevel settings generates pressure towards technical coordination and potentially towards harmonization (Heuberger 2022; Mergel 2021), to ensure access to digital services and exploit economies of scale. Figure 1 summarizes the different theoretical items and indicates relationships between them. Furthermore, the graph highlights the relationships that are theorized as more specific expectations and those that are plausible but did not receive further theoretical reflections. The following analysis focuses on those theoretical expectations that are plausible according to the existing literature on Swiss research libraries.

4.1 Coordination demands

Figure 1 illustrates how the elements discussed above can be integrated into an **analytical framework**. The framework contains five elements: coordination demands, processes, non-state actors and power resources, immediate and long-term results, and feedback effects. The starting point are (1) **coordination demands**, which may arise in various contexts, such as the development of a framework for collaboration on transforming research libraries into research hubs, or the management and implementation of existing projects.

This demand for coordination can manifest in two primary forms. First, coordination may involve entire research libraries within Switzerland, and potentially even abroad. An example of such coordination is the acquisition of or agreements with publishing houses that span across most disciplines represented in the library. This type of coordination aligns with what has been described as Type 1 coordination, characteristic of general-purpose jurisdictions. In the context of research libraries, the term "general-purpose jurisdiction" refers to the entire library.

Second, coordination may be more specific, targeting particular fields within the library or specific services within a library. For instance, there could be a project across Switzerland, or even involving research libraries in some European countries, focused on presenting documents related to digital humanities. Alternatively, a national project might enable each Canton with (or even without) a research library to present documents on cantonal history within a unified,

harmonized IT framework, which is easier to maintain across scales. This type of coordination resembles Type 2 coordination, which focuses on task-specific jurisdictions. Examples for such cooperations in Switzerland are e-manuscripta,[14] e-rara,[15] or ZentralGut.[16] It is important to keep in mind that the distinction between Type 1 and Type 2 jurisdiction is ideal typical and real examples might show elements of both; researchers must determine to which type a specific case resembles.

Figure 1: Analytical framework on multilevel governance and research libraries
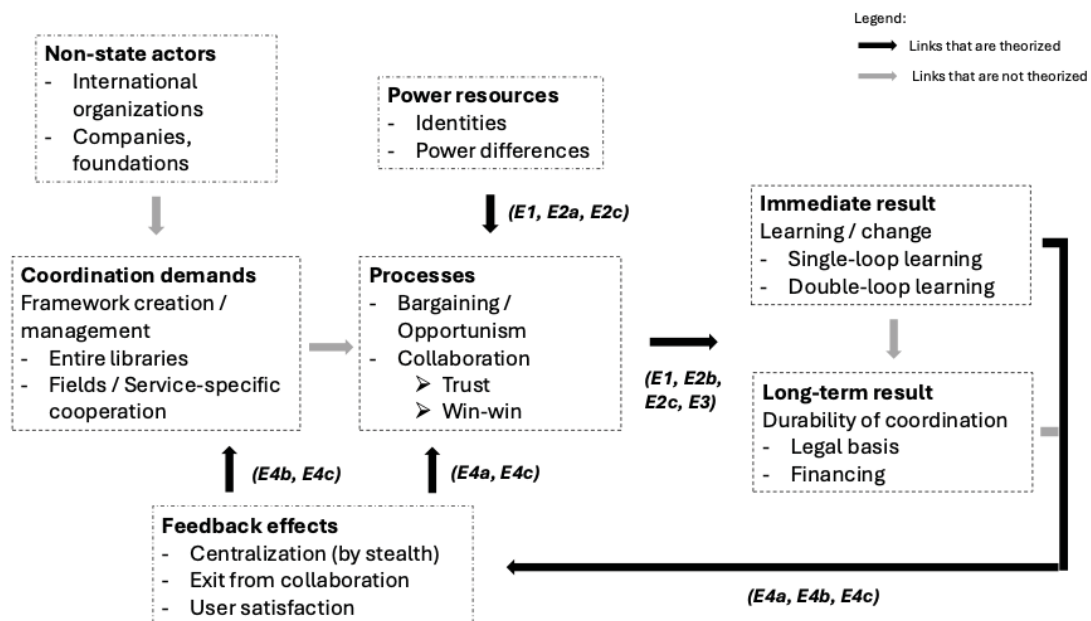
4.2 Coordination processes

The second element of the analytical framework addresses the (2) **coordination process**, which aims to reach an understanding of multilevel coordination demands. The empirical question here is whether this process is primarily dominated by bargaining and opportunism, or whether it is characterized by a more collaborative spirit, where participants develop a willingness to cooperate in a group, establish some level of mutual trust, and strive to produce win-win solutions.

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[14] e-manuscripta, [https://www.e-manuscripta.ch/], accessed, November 6, 2024.

[15] e-rara, [https://www.e-rara.ch/], accessed, November 6, 2024.

[16] ZentralGut, [https://zentralgut.ch/index/], accessed, November 6, 2024.

Such coordination processes are happening between different actors (individual or collective agents)[17] that are involved in the governance of research libraries. These actor constellations vary between different research libraries and centers. Notably, they involve actors that are part of research libraries as well as the actors that are outside of the narrower library organization. In the case of university libraries, this is often the university leadership. University libraries are often only partially (or not at all) independent from university leadership. It is important to keep in mind that multilevel governance entails cooperation in networks that operate in the absence or shadow of hierarchies. Within a university, university libraries might be formally dependent on university leadership, but the library possesses the knowledge to launch cooperation with other university libraries. Across the entire system of research libraries, multilevel governance assumes that a bottom-up approach where specific research libraries initiate cooperations in general or discipline-specific cooperations is the norm.

Depending on the nature of the collaborative process, we can formulate expectations regarding the outcomes of coordination in a multilevel setting, with implications for both immediate and long-term results. This link will be discussed below.[18]

4.3 State and non-state actors / power resources

The third element of the analytical framework addresses the role of **non-state actors**, which may either participate in the network responding to coordination demands within a multilevel setting or serve as catalysts for the creation of a coordinated response by research libraries in Switzerland and abroad. Non-state actors can be categorized into two main types. The first type includes **international organizations**, which may either be cooperative organs of research libraries at the European or international level or libraries from abroad that are part of broader research or university networks. The second type comprises **companies or foundations** that provide digital services, potentially prompting research libraries to seek coordinated action to ensure access to journals or other content provided by publishing houses.

The implications of this distinction are threefold. First, multilevel cooperation can integrate these non-state actors into the network. In this case, they simply become part of a governance arrangement, for example in a cooperation network of research libraries across borders. Second,

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[17] For example, library directors, university leadership, faculty boards, research offices, but also actors related to the cantonal or the federal administrations.

[18] We focus at this point on expectations regarding the success of coordination. Nevertheless, the following elements can also become a starting point for analyzing coordination failures. Here some of the public administration literature that does not deal with multilevel governance can be of help (Peters 2015).

international organizations (state or non-state actors) are venues for learning from international actors. Third, non-state actors may explain why research libraries choose to collaborate. In this case, a network of research libraries establishes a cooperation against a private company. For example, research libraries cooperate to obtain better access conditions for contents from leading international publishers.

The second part of this third element concerns **power resources**, which encompass two phenomena in this context. The first is the role of identity, as discussed in the previous section. Identity may resist or challenge cooperation within networks, and this can manifest in various forms, such as linguistic, regional, or cantonal identities in the Swiss context, or identities related to specific academic fields. The second aspect of power involves existing power differentials among network actors. Research libraries, for instance, may differ in their influence and importance within the network, thereby affecting their response to coordination demands. This could lead to certain research libraries assuming informal leadership roles in collaborative initiatives.

Against the background of the elements discussed thus far, we can formulate the following **expectations**:

- ***Expectation 1 (E1)***: When research libraries are required to coordinate against powerful non-state actors, such as publishing houses, the likelihood of collaboration based on trust and mutual benefits might increase.

Regarding power resources, there are three plausible expectations regarding their link to coordination processes.

- ***Expectation 2a (E2a)***: diverse identities, as previously defined, may hinder the initiation of genuine collaboration, leading instead to mere bargaining and opportunistic behavior.

- ***Expectation 2b (E2b)***: if there is a strong and widely accepted leading actor within the network, this actor's discursive power might improve the results of collaboration. In the Swiss library system, the "ETH Bibliothek" has taken such a role in the past.

- ***Expectation 2c (E2c)***: Conversely, significant power disparities among the involved actors could undermine collaborative efforts, if identity differences collide with the agenda of the most powerful actor in the collaborative setting. For example, conflicts between disciplinary identities within research libraries or the related universities might lead to non-participation in network activities related only to "smaller" disciplines.

4.4 Immediate and long-term results

The analytical model distinguishes between **two dimensions of outcomes**. The first dimension concerns the **immediate results**, particularly the type of policy change or learning that occurs. For example, new digitalization projects that represent only slight adjustments or reconfigurations of existing systems would be considered single-loop learning, reflecting minor innovations or changes. In contrast, double-loop learning involves new processes based on changes in values, due to the need to adapt to digitalization (Moynihan 2005, 204). For instance, projects that transform research libraries into data hubs represent double-loop learning elements, if they come along with a change in values about how to work as a library. Research libraries face this problem in the context of artificial intelligence (AI) development. For example, if discipline-oriented large language models begin to replace collections of books and start to answer research questions in a structured way. However, research and evaluations of existing projects related to the collaboration of research libraries in digitalization suggest that, thus far, in Switzerland, most innovations have been incremental rather than transformative in that sense (Keller 2018a), for example because of short-term funding. This finding could be re-assessed in the light of the present analytical framework.

The second dimension concerns the **durability of the coordination**. The empirical question here is whether the outcomes of the collaborative process include a shared legal agreement to institutionalize the cooperation, and whether there is durable funding for collaboration from any source. Against this background, we can formulate the following recommendation:

- ***Expectation 3 (E3):*** we expect that a collaborative spirit—characterized by win-win elements in the collaborative process and trust—is more likely to lead to successful, significant, and durable collaboration (including double-loop learning). In contrast, a coordination process dominated by bargaining and opportunistic negotiation tends to produce smaller changes (i.e., single-loop learning), with a higher risk that the collaborations will be less durable.

4.5 Feedback effects

The final aspect of this analytical framework crucial for understanding multilevel governance in Swiss research library system is the concept of feedback effects. Feedback effects refer to the **consequences of policy decisions** that impact the future functioning and nature of the Swiss research library system, for example regarding the autonomy of individual research libraries.

As previously mentioned, one outcome of coordination arrangements in multilevel settings can be the centralization of authority, either overtly or subtly. Such centralization could result in independent research libraries losing their autonomy and flexibility, as they become increasingly integrated into data hubs requiring harmonized structures, processes, and (perhaps even) contents. It is important to note that this observation is not intended to be normative, suggesting that harmonization and centralization are inherently negative. However, it does raise the potential for conflicts, particularly given that research libraries at the cantonal level often serve dual roles as both university and regional research libraries. Harmonization in a multilevel setting is a problem if it implies centralization, and loss of authority for lower jurisdictions. In the following, the report focuses on centralization (implicitly and explicitly).

One consequence of centralization—whether objective, anticipated, or perceived—could be a **loss of identity** among research libraries. This perceived loss might lead these institutions to withdraw from collaborative efforts if they feel unable to fulfill their functions effectively. Alternatively, there may be political pressure on research libraries to reduce their engagement in data hubs and refocus on local tasks, especially if they have a double role. Another potential issue is that harmonization of services and integration into data hubs may lead to the discontinuation of certain services. This could result in pressure on research libraries to reduce some offerings in favor of others, potentially disadvantaging smaller, less prominent disciplines relative to more dominant scientific approaches.

Against this background, the following expectation is plausible:
- ***Expectation 4a (E4a)***: Collaborations between research libraries that involve double-loop learning—meaning those that depart from the status quo by introducing new values and principles and generating more durable cooperation—are more likely to result in real or perceived centralization. This centralization may, in turn, lead to the exit of some actors from these collaborations or other parts of the research library system, because they feel a loss of identity.
- ***Expectation 4b (E4b)***: The transformation of research libraries into data hubs might lead to calls to abandon physical libraires as we know them. Funding bodies might feel compelled to save the cost of running libraries if all content is available in an online system.
- ***Expectation 4c (E4c):*** The transformation of research libraries into data hubs might lead to positive feedback from users (students, researchers, faculty), which in turn might reinforce the collaboration process and lead to new coordination demands.

5. Implications for interviews

Finally, this report now attempts to make a link between the analytical framework and the main research questions outlined by the larger project on research library as data hubs, by proposing several themes that could be discussed in interviews with stakeholders and other actors in the Swiss research library system. These are the questions outlined by the wider research project: *Q1: What are the effects of the digital transformation on the services of Swiss research libraries (collection, access, preservation, publication, training) and their framework conditions (governance, legal issues, funding, technologies)? Q2: What are good practices from abroad to address these effects? Q3: What measures can be taken to secure and improve the services of Swiss research libraries and their framework conditions against the backdrop of the digital transformation?*

Against the background of the analytical framework, these three larger research questions could be analyzed along the lines of the following questions that could guide interviews with different actors in the Swiss research library system:

1. Which are the main material reform challenges to place research libraries data hubs and what needs to be done to her ensure digital services? What is a research library as a data hub?

2. What are the key coordination demands between research libraries in the context of the digitalization?

3. How do the actors involved in the digitalization of research libraries prefer to address these challenges? What is the significance of collaborations among research libraries as entire organizations, and how important are discipline-specific collaborations?

4. At what scale do actors consider collaborations effective in this context—nationally within Switzerland, regionally, or internationally? What jurisdictional boundaries must be crossed to achieve effective collaboration?

5. How can these coordination demands be met through collaborations based on trust and mutually beneficial processes? How relevant are (egoistic) opportunism competition, and what impact does it have on existing collaborations?

6. How significant are differences in organizational identities, regions, or disciplines, and how do they affect the ability to cooperate in the digitalization or shared digitalization of research libraries?

7. To what extent does a collaborative spirit, grounded in trust, lead to more significant and enduring collaborations? Does it influence in changes of the operating principles within

the collaboration of research libraries, or does it rather lead to minor adjustments of existing practices?

8. Are other factors, such as the availability of sufficient funding, political pressure, equally (or more) important in fostering enduring collaborations?

9. What are the consequences of increased integration of research libraries? Does it lead to greater centralization or increased fragmentation? If fragmentation occurs, how can the resulting secondary coordination challenges, such as those between two or three well-integrated networks of research libraries within Switzerland, be effectively managed?

Bibliography:

Ania, Ana B., and Andreas Wagener. 2014. "Laboratory Federalism: The Open Method of Coordination (OMC) as an Evolutionary Learning Process." *Journal of Public Economic Theory* 16(5): 767–95. doi:10.1111/jpet.12079.

Ansell, Chris. 2023. *Rethinking Theories of Governance*. Cheltenham: Edward Elgar Publishing. doi:10.4337/9781789909197.

Ansell, Chris, and Jacob Torfing. 2021. *Public Governance as Co-Creation: A Strategy for Revitalizing the Public Sector and Rejuvenating Democracy*. Cambridge: Cambridge University Press. https://www.cambridge.org/core/books/public-governance-as-cocreation/CC484BDA41539533853FE80397C03616 (October 2, 2020).

Ansell, Christopher. 2000. "The Networked Polity: Regional Development in Western Europe." *Governance* 13(2): 279–91. doi:10.1111/0952-1895.00136.

Ansell, Christopher, and Alison Gash. 2008. "Collaborative Governance in Theory and Practice." *Journal of Public Administration Research and Theory* 18(4): 543–71. doi:10.1093/jopart/mum032.

Ansell, Christopher, and Jacob Torfing. 2022. *Handbook on Theories of Governance*. Cheltenham: Edward Elgar Publishing.

Bache, Ian, Ian Bartle, and Matthew Flinders. 2016. "Multi-Level Governance." In *Handbook on Theories of Governance*, eds. Ansell Ansell Christopher and Jakob Torfing. Edward Elgar Publishing, 486–98. https://www.elgaronline.com/view/edcoll/9781782548492/9781782548492.00052.xml (June 9, 2021).

Ball, Rafael, and Pascalia Boutsiouci. 2018. "Literaturversorgung, Collection Management und das Konsortium der Schweizer Hochschulbibliotheken." In *Bibliotheken der Schweiz: Innovation durch Kooperation; Festschrift für Susanna Bliggenstorfer anlässlich ihres Rücktrittes als Direktorin der Zentralbibliothek Zürich*, eds. Alice Keller and Susanne Uhl. Berlin, Boston: De Gruyter, 145–59.

Bauer, Michael W., and Stefan Becker. 2014. "The Unexpected Winner of the Crisis: The European Commission's Strengthened Role in Economic Governance." *Journal of European Integration* 36(3): 213–29. doi:10.1080/07036337.2014.885750.

Baxter, Guy, Lorraine Beard, Gavin Beattie, Michelle Blake, Matthew Greenhall, Kirsty Lingstadt, William J. Nixon, and Torsten Reimer. 2021. "Covid-19 and the Future of the Digital Shift amongst Research Libraries: An RLUK Perspective in Context." *New Review of Academic Librarianship* 27(3): 322–48. doi:10.1080/13614533.2021.1976232.

Boin, Arjen. 2019. "The Transboundary Crisis: Why We Are Unprepared and the Road Ahead." *Journal of Contingencies and Crisis Management* 27(1): 94–99. doi:10.1111/1468-5973.12241.

Bonoli, Giuliano, and Philipp Trein. 2016. "Cost-Shifting in Multitiered Welfare States: Responding to Rising Welfare Caseloads in Germany and Switzerland." *Publius: The Journal of Federalism* 46(4): 596–622. doi:10.1093/publius/pjw022.

Braun, Dietmar, and Philipp Trein. 2014. "Federal Dynamics in Times of Economic and Financial Crisis." *European Journal of Political Research* 53(4): 803–21. doi:10.1111/1475-6765.12056.

Dunlop, Claire A., and Claudio M. Radaelli. 2018. "Does Policy Learning Meet the Standards of an Analytical Framework of the Policy Process?" *Policy Studies Journal* 46(S1): S48–68. doi:10.1111/psj.12250.

Dunlop, Claire A., Claudio M. Radaelli, and Philipp Trein, eds. 2018. *Learning in Public Policy: Analysis, Modes and Outcomes*. Cham: Palgrave Macmillan.

Eglin-Chappuis, Noëmi. 2009. *Governance von Universitätsbibliotheken: Optimierungsmöglichkeiten aus institutioneller Sicht*. Chavannes-Lausanne: Idheap, Inst. de Hautes Études en Administration Publique.

Emerson, Kirk, Tina Nabatchi, and Stephen Balogh. 2012. "An Integrative Framework for Collaborative Governance." *Journal of Public Administration Research and Theory* 22(1): 1–29. doi:10.1093/jopart/mur011.

Fish, Rob D., Antonio A. R. Ioris, and Nigel M. Watson. 2010. "Integrating Water and Agricultural Management: Collaborative Governance for a Complex Policy Problem." *Science of The Total Environment* 408(23): 5623–30. doi:10.1016/j.scitotenv.2009.10.010.

Frey, Bruno, and Reiner Eichenberger. 1999. *The New Democratic Federalism For Europe: Functional, Overlapping, and Competing Jurisdictions*. Cheltenham: Edward Elgar. https://ideas.repec.org//b/elg/eebook/1679.html (August 16, 2024).

Friedlein, Sabine. 2020. *Nachhaltigkeit von Swissuniversities P-2/P-5 Geförderten Projekten: Problematik Und Lösungsansätze Am Beispiel Der Projekte Des Konsortiums Der Schweizer Hochschulbibliotheken*. Zurich: University of Zurich.

Golub, Jonathan. 2012. "How the European Union Does Not Work: National Bargaining Success in the Council of Ministers." *Journal of European Public Policy* 19(9): 1294–1315. doi:10.1080/13501763.2012.693413.

Gupta, Varun. 2024. "Innovating Library Services: Co-Creation, Experimentation, and Enhanced Business Value Tool for Technological Advancements." *Public Library Quarterly* forthcoming: 1–17. doi:10.1080/01616846.2024.2364522.

Heikkila, Tanya, and Andrea K. Gerlak. 2013. "Building a Conceptual Approach to Collective Learning: Lessons for Public Policy Scholars." *Policy Studies Journal* 41(3): 484–512. doi:https://doi.org/10.1111/psj.12026.

Heller, Lisa. 2022. *Zur Genese eines nationalen Bibliotheksprojekts: Swiss Library Service Platform (SLSP)*. Chur: University of Applied Sciences, Graubünden.

Heuberger, Moritz. 2022. "Coordinating Digital Government : Explaining Coordination Challenges Regarding the Digital Transformation of Public Administration in a Federal Context." Universität Potsdam. doi:10.25932/publishup-56269.

Hooghe, Liesbet. 2019. *Volume Iv: Community, Scale & Design of Intl Organization*. New product edition. New York, NY: Oxford University Press.

Hooghe, Liesbet, and Gary Marks. 2003. "Unraveling the Central State, but How? Types of Multi-Level Governance." *American Political Science Review* 97(2): 233–43. doi:10.1017/S0003055403000649.

Hormia-Poutanen, K, and A Matheson. 2017. "LIBER Definition of Research Library: Background Paper."

Interface. 2022. *Evaluation der Krisenbewältigung Covid-19*. Luzern: Interface.

Jachtenfuchs, Markus, and Christiane Kasack. 2017. "Balancing Sub-Unit Autonomy and Collective Problem-Solving by Varying Exit and Voice. An Analytical Framework." *Journal of European Public Policy* 24(4): 598–614. doi:10.1080/13501763.2016.1273376.

Keller, Alice. 2018a. "Ein Ausblick zu Nachhaltigkeit und Erneuerungspotenzial an Schweizer Bibliotheken." In *Bibliotheken der Schweiz: Innovation durch Kooperation*, eds. Zentralbibliothek Zürich, Alice Keller, and Susanne Uhl. Berlin,

Boston: De Gruyter, 493–502. doi:10.1515/9783110553796-036.

Keller, Alice. 2018b. "Nationale Förderprogramme und -strukturen in der Schweiz." In *Bibliotheken der Schweiz: Innovation durch Kooperation*, eds. Zentralbibliothek Zürich, Alice Keller, and Susanne Uhl. Berlin, Boston: De Gruyter, 57–77. doi:10.1515/9783110553796-002.

Keller, Alice, and Susanne Uhl, eds. 2018. *Bibliotheken der Schweiz: Innovation durch Kooperation: Festschrift für Susanna Bliggenstorfer anlässlich ihres Rücktrittes als Direktorin der Zentralbibliothek Zürich*. Berlin: De Gruyter. doi:10.1515/9783110553796.

Kerber, Wolfgang, and Martina Eckardt. 2007. "Policy Learning in Europe: The Open Method of Co-Ordination and Laboratory Federalism." *Journal of European Public Policy* 14(2): 227–47. doi:10.1080/13501760601122480.

Kohler-Koch, Beate, and Berthold Rittberger. 2006. "The Governance Turn in EU Studies Review Article." *Journal of Common Market Studies* 44: 27–50.

Kriesi, Hanspeter, and Alexander H. Trechsel. 2008. *The Politics of Switzerland: Continuity and Change in a Consensus Democracy*. Cambridge: Cambridge University Press. https://cadmus.eui.eu//handle/1814/34905 (August 14, 2020).

Kritzinger, Sylvia, Martial Foucault, Romain Lachat, Julia Partheymüller, Carolina Plescia, and Sylvain Brouard. 2021. "'Rally Round the Flag': The COVID-19 Crisis and Trust in the National Government." *West European Politics* 44(5–6): 1205–31. doi:10.1080/01402382.2021.1925017.

Maggetti, Martino, Fabrizio Di Mascio, and Alessandro Natalini. 2020. "National Regulators, Regulatory Networks, and European Agencies: Connecting the Dots." *Public Policy and Administration*: 095207671988674. doi:10.1177/0952076719886748.

Maggetti, Martino, and Philipp Trein. 2019. "Multilevel Governance and Problem-Solving: Towards a Dynamic Theory of Multilevel Policy-Making?" *Public Administration* 97(2): 355–69. doi:10.1111/padm.12573.

Marks, Gary. 1993. "Structural Policy and Multilevel Governance in the EC." In *The Maastricht Debates and Beyond*, eds. Alain W. Cafruny and Glenda G. Rosenthal. Boulder: Lynne Riener, 391–409. https://ci.nii.ac.jp/naid/10026888003/ (June 11, 2021).

Mende, Janne. 2021. "Private Actors, NGOs and Civil Society in Multilevel Governance." In *A Research Agenda for Multilevel Governance*, Edward Elgar Publishing, 171–89. https://www.elgaronline.com/edcollchap/edcoll/9781789908367/9781789908367.00017.xml (August 16, 2024).

Mergel, Ines. 2021. "Digital Transformation of the German State." In *Public Administration in Germany*, eds. Sabine Kuhlmann, Isabella Proeller, Dieter Schimanke, and Jan Ziekow. Cham: Springer International Publishing, 331–55. doi:10.1007/978-3-030-53697-8_19.

Moynihan, Donald P. 2005. "Goal-Based Learning and the Future of Performance Management." *Public Administration Review* 65(2): 203–16. doi:10.1111/j.1540-6210.2005.00445.x.

Ostrom, Elinor. 2010. "Beyond Markets and States: Polycentric Governance of Complex Economic Systems." *American Economic Review* 100(3): 641–72. doi:10.1257/aer.100.3.641.

Pahl-Wostl, Claudia. 2009. "A Conceptual Framework for Analysing Adaptive Capacity

and Multi-Level Learning Processes in Resource Governance Regimes." *Global Environmental Change* 19(3): 354–65. doi:10.1016/j.gloenvcha.2009.06.001.

Papadopoulos, Yannis. 2003. "Cooperative Forms of Governance: Problems of Democratic Accountability in Complex Environments." *European Journal of Political Research* 42(4): 473–501. doi:10.1111/1475-6765.00093.

Peters, B. Guy. 2015. *Pursuing Horizontal Management: The Politics of Public Sector Coordination*. Lawrence: University Press of Kansas. https://muse.jhu.edu/book/46028 (March 17, 2020).

Piattoni, Simona. 2010. *The Theory of Multilevel Governance. Conceptual, Empirical, and Normative Challenges*. Oxford: Oxford University Press.

Pierre, Jon, and B. Guy Peters. 2005. "Multilevel Governance: A Faustian Bargain?" In *Governing Complex Societies*, London: Palgrave Macmillan UK, 80–100. doi:10.1057/9780230512641_5.

Pietro, Carlo, and Igor Francetic. 2018. "E-Health in Switzerland: The Laborious Adoption of the Federal Law on Electronic Health Records (EHR) and Health Information Exchange (HIE) Networks." *Health Policy* 122(2): 69–74. doi:10.1016/j.healthpol.2017.11.005.

Purdy, Jill M. 2012. "A Framework for Assessing Power in Collaborative Governance Processes." *Public Administration Review* 72(3): 409–17. doi:10.1111/j.1540-6210.2011.02525.x.

Rodden, Jonathan. 2006. *Hamilton's Paradox: The Promise and Peril of Fiscal Federalism*. Cambridge: Cambridge University Press.

Sager, Fritz, and Eva Thomann. 2017. "Multiple Streams in Member State Implementation: Politics, Problem Construction and Policy Paths in Swiss Asylum Policy." *Journal of Public Policy* 37(3): 287–314. doi:10.1017/S0143814X1600009X.

Scharpf, Fritz W. 1997. "Introduction: The Problem-Solving Capacity of Multi-Level Governance." *Journal of European Public Policy* 4(4): 520–38. doi:10.1080/135017697344046.

Scharpf, Fritz W. 1999. *Governing in Europe: Effective and Democratic?* Oxford: Oxford University Press. doi:10.1093/acprof:oso/9780198295457.001.0001.

Thomann, Eva. 2015. "Customizing Europe: Transposition as Bottom-up Implementation." *Journal of European Public Policy* 22(10): 1368–87. doi:10.1080/13501763.2015.1008554.

Thomann, Eva, and Fritz Sager. 2017. "Moving beyond Legal Compliance: Innovative Approaches to EU Multilevel Implementation." *Journal of European Public Policy* 24(9): 1253–68. doi:10.1080/13501763.2017.1314541.

Trein, Philipp. 2022. "Multilevel Governance." In *Elgar Encyclopedia of European Union Public Policy*, Edward Elgar Publishing, 62–70. https://www.elgaronline.com/display/book/9781800881112/ch07.xml (August 16, 2024).

Trein, Philipp, Eva Thomann, and Martino Maggetti. 2019. "Integration, Functional Differentiation and Problem-Solving in Multilevel Governance." *Public Administration* 97(2): 339–54. doi:10.1111/padm.12595.

Vagionaki, Thenia, and Philipp Trein. 2020. "Learning in Political Analysis." *Political Studies Review* 18(2): 304–19. doi:10.1177/1478929919834863.

Varone, Frédéric, Stéphane Nahrath, David Aubin, and Jean-David Gerber. 2013. "Functional Regulatory Spaces." *Policy Sciences* 46(4): 311–33. doi:10.1007/s11077-013-9174-1.

Weingast, Barry R. 2009. "Second Generation Fiscal Federalism: The Implications of Fiscal Incentives." *Journal of Urban Economics* 65(3): 279–93. doi:10.1016/j.jue.2008.12.005.

Abbreviations:

ETH   Federal Institutes of Technology
MLG   Multilevel governance
SLiNER   Swiss Library Network for Education and Research
SLSP   Swiss Library Service Platform
UAS   Universities of Applied Sciences
UTE   Universities of Teacher Education

Research Libraries as Data Hubs - Good Practices from Abroad

By Dr. Ana Petrus, scivia LLC
June 2025. Expert report prepared for the SSC.

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Research Libraries as Data Hubs

Good Practices from Abroad

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Executive Summary

Research libraries are undergoing a profound digital shift to better support open science, data management, and digital scholarship. Based on interviews with international experts and current literature, this study, commissioned by the Swiss Science Council SSC in the context of its project on research libraries in Switzerland, identifies practices relevant to Switzerland and argues that research libraries must be seen not as mere support units, but as strategic institutions at the heart of re-search infrastructure and academic innovation. To realise this role, libraries must be structurally embedded in institutional governance and policymaking. They make valuable contributions across the entire research lifecycle, from data planning to publication and preservation, but their potential remains constrained without strategic visibility. Library leaders should be actively involved in shaping digital and research strategies, with a voice in senior committees on AI, infrastructure, and data governance.

High-quality research depends on robust research data management. Research libraries play a key role here, especially when combining central support with embedded, subject-specific expertise. To sustain these services, staff development is essential, particularly in areas such as AI, FAIR data, communication and project management. Updating LIS education and securing long-term funding for core roles are vital steps to ensure continuity and institutional resilience. Repositories maintained by research libraries are another foundational element of the re-search ecosystem. To remain fit for purpose, they must be modernised to support interoperability, FAIR principles, and long-term digital preservation. Libraries should continue to lead efforts in advancing infrastructure standards and best practices in digital curation.

As AI becomes more embedded in research and scholarly communication, research libraries must help guide its ethical and transparent use. Internally, they should adopt AI tools responsibly. Externally, they must advocate for fair licensing and defend research content against misuse. Collaboration is equally vital. No single institution can meet all needs alone. Federated models and practitioner-led networks, both national and international, can enable research libraries to share responsibilities, avoid duplication, and scale their capabilities more effectively. At the same time, digital progress must be balanced with the social, environmental, and physical dimensions of library work. Research libraries remain important public spaces for learning, collaboration as well as holders of physical collections and their digital future should be developed with sustainable development goals in mind.

Swiss research libraries are well-positioned to play a pivotal role in the national digital re-search infrastructure. To fulfil this potential, they need strategic inclusion, sustained investment, and a clearly defined mandate. Recognising libraries as data hubs is not only timely, but also essential for building a trustworthy, sustainable, and open research future.

Résumé

Les bibliothèques de recherche (BR) subissent une transformation numérique pour mieux soutenir la science ouverte, la gestion des données et la recherche numérique. Fondée sur des entretiens avec des experts internationaux et une revue de la littérature actuelle, cette étude, réalisée à la demande du Conseil suisse de la science CSS dans le cadre de son projet sur la BR en Suisse, identifie des pratiques pertinentes pour la Suisse et affirme que les bibliothèques de recherche ne doivent pas être perçues comme de simples unités de service, mais comme des institutions stratégiques au cœur de l'infrastructure de recherche et de l'innovation académique. Pour assumer ce rôle, elles doivent être intégrées à la gouvernance institutionnelle et aux processus décisionnels. Leur contribution au cycle de recherche – de la planification des données à la publication et à la préservation – est essentielle, mais reste sous-exploitée sans une reconnaissance claire. Leur participation aux comités stratégiques sur l'intelligence artificielle (IA), l'infrastructure et la gouvernance des données est indispensable.

Une recherche de qualité repose sur une gestion rigoureuse des données, où les BR jouent un rôle central en alliant services mutualisés et expertise disciplinaire. Pour garantir la pérennité de ces services, il est essentiel de renforcer les compétences du personnel, notamment en IA, données FAIR, communication et gestion de projet. Cela nécessite une actualisation des formations en bibliothéconomie et un financement durable des postes clés. Les référentiels gérés par les bibliothèques sont également essentiels : ils doivent être modernisés pour assurer interopérabilité, conformité FAIR et préservation à long terme. Les bibliothèques doivent rester actives dans le développement de standards et de bonnes pratiques en matière de conservation numérique.

Avec l'intégration croissante de l'intelligence artificielle dans la recherche et la communication scientifique, les bibliothèques doivent en garantir un usage éthique et transparent. Cela implique une adoption responsable en interne et, en externe, la défense de licences équitables et la protection des contenus scientifiques. La coopération est tout aussi essentielle : aucun établissement ne peut répondre seul aux défis actuels. Des modèles fédérés et des réseaux professionnels, à l'échelle nationale et internationale, permettent de mutualiser les efforts et d'optimiser les ressources. Enfin, le développement numérique doit rester compatible avec les missions sociales, environnementales et physiques des bibliothèques, qui demeurent des lieux publics de savoir et de mémoire. Leur évolution numérique doit s'inscrire dans une perspective durable et alignée sur les objectifs du développement durable.

Les BR suisses sont idéalement positionnées pour jouer un rôle central dans l'infrastructure nationale de recherche numérique. Pour réaliser pleinement ce potentiel, elles doivent bénéficier d'une reconnaissance stratégique, d'investissements durables et d'un mandat clair. Reconnaître les bibliothèques comme des pôles de données n'est pas seulement opportun, c'est essentiel pour bâtir un avenir de la recherche fondé sur la confiance, la durabilité et l'ouverture.

Zusammenfassung

Forschungsbibliotheken (FB) befinden sich in einem umfassenden digitalen Wandel, um Open Science, Forschungsdatenmanagement und digitale Forschung besser zu unterstützen. Diese im Auftrag des Schweizerischen Wissenschaftsrats SWR im Rahmen seines Projekts zu FB in der Schweiz erstellte Studie basiert auf Interviews mit internationalen Expertinnen und Experten sowie aktueller Fachliteratur. Sie zeigt übertragbare Ansätze für die Schweiz und plädiert dafür, FB als strategische Akteure der Forschungsinfrastruktur und Innovation anzuerkennen; nicht nur als Dienstleister. Voraussetzung dafür ist ihre strukturelle Einbindung in die institutionelle Governance und strategische Entscheidungsprozesse. Obwohl FB bereits entlang des gesamten Forschungszyklus, von der Datenplanung bis zur Archivierung, wesentliche Beiträge leisten, bleibt ihr Potenzial begrenzt, solange sie in zentralen Gremien zu Digitalisierung, Datenpolitik und Künstlicher Intelligenz (KI) nicht formell vertreten sind.

Forschungsdatenmanagement ist ein zentrales Handlungsfeld, in dem FB eine Schlüsselrolle spielen, besonders durch die Kombination zentraler Services mit fachspezifischer Expertise vor Ort. Um diese Leistungen nachhaltig zu sichern, braucht es gezielten Kompetenzaufbau in FAIR Data, Projektmanagement, Kommunikation und KI. Dafür sind eine Aktualisierung der bibliotheks- und informationswissenschaftlichen Ausbildung sowie eine langfristige Finanzierung strategischer Stellen unerlässlich. Auch Repositorien, betrieben von Bibliotheken, sind tragende Bestandteile der digitalen Infrastruktur. Um zukunftsfähig zu bleiben, müssen sie modernisiert werden mit Blick auf Interoperabilität, FAIR-Prinzipien und Langzeitarchivierung. Bibliotheken sollen zudem weiterhin eine führende Rolle in der Entwicklung von Standards und Best Practices der digitalen Kuration übernehmen.

Mit der zunehmenden Verbreitung von KI in Wissenschaft und Forschung wächst auch die Verantwortung der FB für deren ethischen und transparenten Einsatz. Das betrifft einerseits den reflektierten Einsatz von KI-Tools im eigenen Betrieb, andererseits das Eintreten für faire Lizenzbedingungen und den Schutz wissenschaftlicher Inhalte. Da datengetriebene Wissenschaft komplexe Anforderungen mit sich bringt, ist eine enge institutionenübergreifende Zusammenarbeit notwendig. Föderierte Modelle und praxisnahe Netzwerke (national wie international) ermöglichen klare Rollenverteilungen, vermeiden Doppelspurigkeit und erhöhen die Wirksamkeit. Die digitale Transformation muss zudem mit den sozialen, ökologischen und physischen Funktionen der Bibliotheken im Einklang stehen. Als öffentliche Räume für Bildung, Teilhabe und kulturelles Erbe sollte ihre Weiterentwicklung nachhaltig gestaltet werden.

FB in der Schweiz sind gut aufgestellt, um eine tragende Rolle in der nationalen digitalen Forschungsinfrastruktur einzunehmen. Dazu braucht es eine klare strategische Verankerung, langfristige Investitionen und ein explizites Mandat. Die Anerkennung von Bibliotheken als Data Hubs ist deshalb nicht nur angemessen, sie ist eine Voraussetzung für eine offene, vertrauenswürdige und nachhaltige Zukunft der Forschung.

Table of Contents

Abbreviations

AI	Artificial Intelligence
CAUL	Council of Australasian University Librarians
DMP	Data Management Plan
FAIR	Findable, Accessible, Interoperable, Reusable
GASCO	German, Austrian and Swiss Consortia Organisation
GDPR	General Data Protection Regulation
IFLA	International Federation of Library Associations and Institutions
LIBER	Ligue des Bibliothèques Européennes de Recherche – Association of European Researsch Libraries
LIS	Library and Information Sciences
OCLC	Online Computer Library Center
ORD	Open Research Data
RDM	Research Data Management
RL	Research Libraries
SLUB	Sächsische Landesbibliothek – Staats- und Universitätsbibliothek Dresden – Saxon State and University Library Dresden
SSC	Swiss Science Council
TDM	Text and Data Mining
TIB	Leibniz Information Centre for Science and Technology University Library
UNSW	University of New South Wales in Sydney
VU	Vrije Universiteit Amsterdam
ZBW	Leibniz Informationszentrum Wirtschaft – Leibniz Information Centre for Economics

List of Figures

List of Tables

1   Introduction

Digital transformation has fundamentally reshaped every sector of society, and research libraries are no exception. Traditionally known for preserving physical collections and providing reference services, research libraries now face an era where digital data management, online access, and innovative training services are critical – even more so than when they were first starting to be implemented some two to three decades ago. This study, commissioned by the Swiss Science Council SSC (SSC)[1] in the context of its project on research libraries in Switzerland, examines current international best practices with the aim of informing and guiding the future development of Swiss research libraries amid rapidly ongoing changes in the digital landscape.

1.1   Background & Context

Research libraries (LIBER, 2017) play a crucial role in the ongoing digital transformation of academia. As scholarly communication and education increasingly shift online, libraries are reimagining their services and infrastructures to support digital scholarship, open science, and new forms of learning. No longer merely repositories of printed knowledge, leading academic libraries have become key agents of change in a data-rich, networked environment. They curate extensive digital collections, manage research data, and provide expertise in information literacy and digital skills. The significance of this transformation is further emphasised by global drivers: rapid technological advances, such as artificial intelligence and data analytics, are accelerating the digital shift in research, while funders and society call for greater openness and accessibility of knowledge. Libraries must respond proactively to remain relevant and impactful in supporting world-class research and equitable education (ACRL Research Planning and Review Committee, 2024).

In this context, Swiss research libraries face both challenges and opportunities. Like their international counterparts, they must navigate issues of governance (how to organise and finance digital initiatives), collaboration (working with national and international partners), standardisation (adopting common standards and platforms), and technology development (building or integrating new tools). At stake is the capacity of Swiss libraries to meet the evolving needs of researchers – for example, by managing research data in line with FAIR principles (Wilkinson et al., 2016), providing seamless access to digital collections, and offering training in digital scholarship. This is also established in the Swiss National Open Research Data (ORD) Strategy, developed by swissuniversities and mandated by the State Secretariat for Education, Research and Innovation (SERI) (swissuniversities, 2021). Keeping pace with international best practices will ensure that Swiss libraries continue to facilitate excellence in research and learning.

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[1] https://wissenschaftsrat.ch

1.2   Objectives of the Mandate

This study seeks to identify international best practices in digital transformation that are most relevant to Swiss research libraries. It aims to draw insights from exemplary library networks, national programmes, and individual institutions that have successfully modernised their services. The primary objective is to develop evidence-based recommendations for Swiss academic and university libraries to improve their governance, collaborations, service models, and sustainability in the digital era. By examining successful initiatives implemented elsewhere, Swiss libraries may avoid duplicating efforts and expedite their own innovation processes.

1.3   Scope

The report focuses on three levels of analysis to provide a comprehensive assessment of international best practices in the digital transformation of research libraries:

International networks and organisations: The strategies and frameworks established by transnational library networks and professional bodies are examined. This includes organisations such as LIBER (Association of European Research Libraries), IFLA (International Federation of Library Associations and Institutions), OCLC (Online Computer Library Center), GASCO (German, Austrian, and Swiss Consortia Organisation), and the Council of Australasian University Librarians (CAUL)[2]. These organisations set strategic priorities, such as those outlined in LIBER's Strategic Roadmap 2023–2027 (LIBER, 2022) and the IFLA Strategy 2024-2029 (IFLA, 2024a) and facilitate knowledge exchange and collaboration across research libraries.

National networks and innovation incubators: The role of national-level initiatives in driving digital transformation is assessed. These include the National Library of Finland (Kansalliskirjasto) and the National Library of the Netherlands (Koninklijke Bibliotheek), both of which lead large-scale digitisation, open science, and digital infrastructure initiatives. Additionally, specialist information centres such as TIB (Germany's National Library of Science and Technology) and ZBW (Germany's National Library of Economics)[3] function as innovation hubs, developing digital research infrastructure and fostering collaboration at both national and international levels. The governance structures, funding models, and collaborative frameworks employed by these institutions are examined to understand their impact on library digital innovation.

Individual research libraries: Case studies of leading research libraries that have successfully implemented digital transformation strategies are explored. These include the Saxon State and University Library Dresden (SLUB Dresden) in Germany, Universitätsbibliothek Wien (Vienna

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[2] LIBER: https://libereurope.eu , IFLA: https://www.ifla.org, OCLC: https://www.oclc.org, GASCO: https://www.hbz-nrw.de/produkte/digitale-inhalte/gasco, CAUL: https://www.caul.edu.au
[3] National Library of Finland: https://www.kansalliskirjasto.fi, National Library of the Netherlands: https://www.kb.nl, TIB: https://www.tib.eu, ZBW: https://www.zbw.eu

University Library) in Austria, the University of Leeds Library in the UK, and the University Library of the Vrije Universiteit (VU) Amsterdam in the Netherlands[4]. Each of these institutions has introduced significant innovations, such as SLUB Dresden's Open Science Lab and digital preservation efforts, Vienna University Library's comprehensive service catalogue, Leeds University Library's extensive collections and VU Amsterdam's Pop-up Library[5]. Their approaches to research data management, digital collections, user services, and workforce development are assessed to identify transferable best practices for Swiss research libraries.

See also Appendix A for the list of analysed institutions. Within each of the focus areas listed above, the analysis considers several core themes that are integral to the digital transformation of research libraries (Figure 1).

Governance: How libraries (or library networks) plan and steer digital initiatives. This includes strategy development, policy frameworks, decision-making structures, and stakeholder involvement. For example, do libraries have a clear digital strategy? Is there high-level support and defined leadership for innovation?

Collaboration: The role of partnerships and consortium models. The ways in which libraries collaborate - with each other, with IT and data organisations, with research institutions, and with private sector partners - are examined. Particular attention is paid to international consortia for digital licensing and open-access initiatives, as well as collaborative platforms that enhance resource-sharing.

Standardisation: Adoption of common standards and systems for interoperability. Digital transformation often requires alignment on standards (metadata schemas, protocols like IIIF for images, DOI for datasets, etc.). The role of international networks such as IFLA and OCLC in promoting these standards, as well as the implementation of standardised systems by individual libraries, is analysed.

Technology development: How libraries develop or implement new technologies – be it digital repositories, discovery systems, data analytics, or AI – and whether they build in-house, co-develop with partners, or leverage open-source solutions. Examples of library-led software

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[4] SLUB Dresden: https://www.slub-dresden.de , Vienna University Library: https://bibliothek.univie.ac.at, University of Leeds Library: https://library.leeds.ac.uk, University Library of the Vrije Universiteit Amsterdam: https://vu.nl/en/about-vu/divisions/university-library
[5] SLUB Dresden Open Science Lab: https://www.slub-dresden.de/mitmachen/slub-open-science-lab, Services of the Vienna University Library: https://www.univie.ac.at/en/about-us/further-information/contact-services-a-z/?r=0, University of Leeds Library Special Collections: https://library.leeds.ac.uk/info/1500/special_collections, Pop-up Library at the VU Amsterdam: https://vu.nl/en/about-vu/divisions/university-library/more-about/pop-up-library

development, open-source platform adoption, and AI applications in library services (e.g., machine learning for cataloguing and user services) are examined.
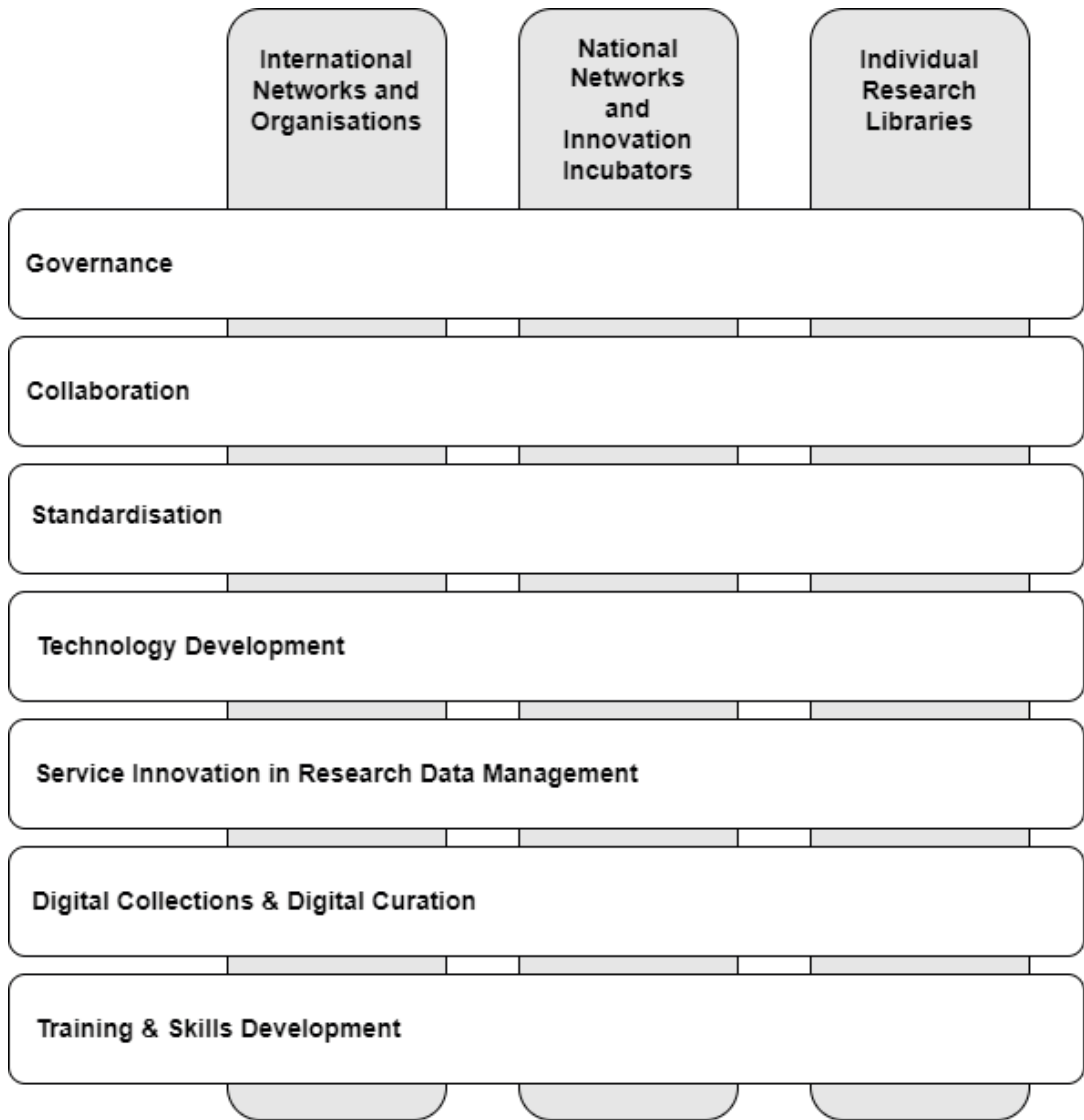
Figure 1 - Overview of researched aspects

Service innovation in research data management (RDM): Given the growing emphasis on data-driven research, the provision of RDM services by research libraries is a key area of analysis. This includes research data repositories, data curation support, and advisory services on data management planning. The role of libraries in facilitating the entire research lifecycle, from data creation to long-term preservation, is explored.

Digital collections & digital curation: Strategies for the digitisation and management of both analogue and born-digital materials are assessed. This includes large-scale digitisation projects, digital heritage platforms, and long-term digital preservation strategies. Best practices in digital legal deposit, web archiving, and open-access digital collections are reviewed.

Training & skills development: The role of research libraries in enhancing digital competencies among staff, researchers, and students is examined. This includes formal training

programmes in digital literacy, research data skills, and digital scholarship methodologies (e.g., text and data mining). Additionally, informal learning opportunities such as hackathons, Open Science Labs, and collaborative research events are considered.

By covering these aspects across the international, national, and institutional levels, this report provides a multi-dimensional view of how research libraries can successfully navigate digital transformation. The focus is on current trends and practices, emphasizing what libraries are doing today to remain relevant in the digital era and how they are preparing for the near future.

1.4 Methodology

A mixed-methods approach, primarily centred on qualitative desk research and planned expert interviews, was employed to conduct this study. This methodology facilitates a comprehensive review of documented best practices, while also incorporating insights from practitioners with direct experience in the field.

1.4.1 Desk Research

The initial phase of the study involved an extensive literature review and policy analysis. Strategic documents, reports, and published case studies from the international organisations, national bodies, and libraries within the scope of the study were gathered and analysed. Sources included official strategy papers, such as the LIBER 2023–2027 strategy (LIBER, 2022). In addition, research reports by library organisations, including OCLC research reports on data management such as (Bryant et al., 2023), conference papers and presentations, and articles in library science journals, were reviewed. Online resources, such as organisational websites, blogs like the ZBW MediaTalk[6] blog on open science, and reports on best practices, were also examined.

Only academic publications in English, German and French were considered. While certain older publications were considered because of their content and importance, focus was given to content published in the last 10 years, i.e. between 2015 and 2025. Information was gathered using following tools and databases: Google Scholar, Semantic Scholar, Clarivate Web of Science, EBSCO LISTA and ProQuest LISA[7].

This desk research enabled the identification of recurring themes, successful initiatives, and illustrative examples of digital transformation in research libraries. A comparative approach was adopted to explore how different contexts - global, national, and local - shape approaches to digital transformation. For instance, comparisons were made between how an international

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[6] https://www.zbw-mediatalk.eu

[7] Google Scholar https://scholar.google.com, Semantic Scholar https://www.semanticscholar.org, Web of Science https://www.webofscience.com/wos, Library, Information Science and Technology Abstracts (LISTA) http://www.libraryresearch.com, Library & Information Science Abstracts (LISA) https://www.proquest.com/lisa

organisation like IFLA frames digital library principles and how these principles are implemented by a single university library. Key areas of best practice and exemplary case studies were documented, forming the foundation for the analysis.

1.4.2   Expert Interviews

In order to complement the document-based findings with expert perspectives, a series of semi-structured interviews have been conducted. A range of decision-makers from national and international networks, as well as research libraries of interest (mentioned in chapter 1.3) has been selected. The selection criteria focused on individuals with strategic oversight or leadership roles and has been decided in discussion with SSC. See also Appendix A for a comprehensive list of interviewed experts at each institution.

The interviews have been designed as semi-structured conversations, guided by a set of core questions (see Appendix B) but allowing flexibility for each expert to highlight what they consider most pertinent. The covered topics were decided in coordination with the SSC and included:

Digital transformation governance: How is digital strategy formulated and led in their context? What governance structures (e.g., steering committees, working groups) have been effective? How is institutional buy-in and funding secured for digital initiatives?

Collaboration and networks: In what ways do they collaborate with other institutions? What success factors for collaboration have been identified, and what challenges have been encountered in cross-institutional efforts?

Standards and interoperability: How important is standardisation (e.g., metadata standards, open APIs) in their initiatives? Can examples be provided of adopting or contributing to international standards or open-source platforms?

Technology development: A discussion of any innovative technologies developed or deployed, such as digital repositories, discovery systems, AI tools, or digital preservation systems. How is the decision made whether to build technology in-house, collaborate, or purchase?

Research data management (RDM): What services are offered for RDM, and how were these developed? Questions will address institutional data repositories, support for data management plans, data curation expertise, and the measurement of impact.

Digital collections & open access: How are digitisation and digital content delivery managed? Are national or regional platforms used? Have open access publishing or open educational resources been engaged with?

Training and user services: How is the digital skills of researchers, students, and library staff ensured? Discussion will include formal training programmes, communities of practice, and user outreach efforts.

Each interview was recorded (with permission) and transcribed for analysis. The interviews were analysed to extract themes and corroborate or enrich the findings from the literature review. The qualitative insights informed the comparative analysis and recommendations sections of this report, ensuring that the conclusions are grounded in both documented evidence and current expert opinion. The questionnaires with interview notes for each expert are confidential.

1.5 Report Structure

The report is organised into several chapters to systematically present the findings and recommendations. Following this introduction, the subsequent chapters are structured as follows:

Chapter 2: International Networks and Organizations – A detailed review of the key international organizations, their policy frameworks, and initiatives that drive digital transformation in research libraries.

Chapter 3: National Networks as Innovation Incubators – An analysis of national organizations and consortia that have successfully implemented digital strategies and innovation in library services.

Chapter 4: Case Studies of Individual Research Libraries – In-depth examinations of select research libraries that have pioneered innovative digital services, focusing on areas such as research data management, digital collections, and training.

Chapter 5: Comparative Analysis of Interviews and their Relevance for Swiss Research Libraries – A synthesis of international and national practices, evaluating their relevance and potential applicability to the Swiss context.

Chapter 6: Long-Term Perspective of Digital Collections in Libraries – examination of the historical depth of library collections and their role for the future.

Chapter 7: Future Scenarios for Swiss Research Libraries – Development of potential future scenarios based on current trends, challenges, and opportunities in the digital realm.

Chapter 8: Conclusions and Potential Strategic Directions – A summary of key insights and a forward-looking discussion on the potential strategic evolution of Swiss research libraries.

Appendices and References – Supplementary materials, including list of interview partners and interview questionnaire.

2 International Networks & Organisations

International library networks and organisations play a significant role in setting global best practices by providing frameworks, advocacy, and collaborative platforms. This section reviews key players – LIBER, GASCO, OCLC, IFLA, and the CAUL – and analyses their policies, strategies, and initiatives that influence digital transformation in research libraries.

2.1 LIBER – Ligue des Bibliothèques Européennes de Recherche – Association of European Research Libraries

2.1.1 General Overview

LIBER is Europe's largest network of research libraries, with over 450 members across more than 40 countries. It functions as a strategic and operational platform for academic and research libraries, aiming to support their transformation into open, digitally advanced, and user-centred institutions. As stated in its 2023–2027 Strategy (LIBER, 2022), LIBER envisions research libraries as "engaged and trusted hubs" that lead in open science, develop advanced digital services, and uphold academic values in a changing technological landscape.

LIBER's role has evolved significantly over the past 10–15 years: research libraries are "no longer simply access providers but infrastructure managers and curators of digital content", as stated in the interview. The organisation provides guidance, tools, and frameworks that help libraries respond to the growing complexity of scholarly communication, especially in relation to open access, data stewardship, and artificial intelligence (AI). It actively promotes knowledge sharing through working groups, steering committees, strategic reports, and annual conferences. LIBER also acts as a conduit between libraries and European policy agendas, advocating for legal frameworks that support research, data sharing, and equitable digital infrastructures.

2.1.2 Policies and Governance

LIBER's governance is structured as a foundation based in the Netherlands, overseen by an Executive Board composed of senior library leaders. Strategic implementation is organised through three Steering Committees and multiple working groups aligned with LIBER's strategic priorities: Research Libraries as Engaged and Trusted Hubs, Providers of State-of-the-Art Services, Advancing Open Science, Upskilling the Workforce and Upholding Rights and Values.

More than 200 professionals contribute voluntarily to these initiatives by participating in LIBER Working Groups (LIBER, 2025). Libraries are urged to be proactive in policy development at the institutional, national, and European levels, especially in areas such as data governance, AI legislation, and copyright reform. According to the interview, nowadays "the director of a library needs to be involved in policies - convincing vice-rectors and university presidents to move in the right direction".

LIBER is funded through membership fees and sponsorships. While LIBER provides strategic direction, it does not directly fund digital initiatives at member institutions. It encourages members to develop institutional strategies and secure sustainable internal or consortial funding for digital transformation.

2.1.3 Key Initiatives & Relevance to Swiss Research Libraries

LIBER's strategic initiatives are particularly relevant for Swiss research libraries, many of which are active members. However, Universities of Teacher Education and several Universities of Applied Sciences are not yet represented, which limits the national reach and visibility of these institutions in European discussions.

Strategic Priorities and Working Groups

LIBER's 2023–2027 Strategy outlines five key priorities that strongly align with Swiss national strategies on Open Research Data and digital education:

Engaged and Trusted Hubs: Libraries are encouraged to act as connectors across university departments (IT, legal, research offices), contributing to institutional governance. As stated in the interview, "Libraries must act as spiders in the web", building bridges rather than remaining in service silos.

State-of-the-Art Services: LIBER promotes development of state-of-the-art services, which aligns closely with ongoing efforts in Switzerland, such as swissuniversities' Open Science Programme[8] and SLSP's services[9]. Topics like e.g. those in the context of text-and-data mining are worked on in different LIBER Working Groups, depending on the perspective taken.

Advancing Open Science: LIBER strongly supports the integration of libraries in European Open Science Cloud (EOSC) initiatives and FAIR data stewardship. Nevertheless, it has been observed by the interviewees that EOSC is "currently poorly connected to research institutions". Libraries are seen as the missing intermediary to all research performing organisations and are called upon to bridge this gap.

Upskilling the Library Workforce: Continuous professional development is regarded as essential. LIBER highlights the urgent need for interdisciplinary profiles and soft skills in project management and communication. "Many projects fail because of poor communication from libraries," one expert of LIBER stated. Swiss libraries could benefit from national training programmes modelled on LIBER's Digital Scholarship and Digital Cultural Heritage Collections Working Group[10].

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[8] https://www.swissuniversities.ch/en/topics/open-science/open-science-programme
[9] https://slsp.ch/en/service-offer/
[10] https://libereurope.eu/working-group/digital-scholarship-and-digital-cultural-heritage-collections-working-group/

Upholding Rights & Values: Libraries are urged to be vocal in shaping policy frameworks that support text and data mining and AI-enhanced services. LIBER's engagement in the EU's copyright reform is cited as a success, whereas the current lack of strong library involvement in further shaping the AI Act (European Union, 2024) is viewed as an opportunity that needs more focus. This work is mainly being done by the LIBER Copyright and Legal Matters Working Group[11].

Collaboration and Leadership Models

LIBER promotes collaboration as essential for sustainable digital transformation. In the interview, the redundant efforts across Europe were criticised: "We are reinventing the wheel in several different places […] - we need to collaborate". For Swiss libraries, this supports the case for stronger participation in European consortia and shared infrastructure development, including with institutions of applied sciences and teacher education.

Examples of proactive library-led initiatives are cited at the University of Göttingen (Germany) and the University of Lille (France), where library leadership initiated institutional open science policies. Swiss libraries are encouraged to adopt similar approaches, becoming co-creators of university research strategy.

Role of Libraries in Data Stewardship

LIBER views libraries as central to research data management. While engagement is strong in STEM disciplines (e.g., biology, physics), other areas such as humanities and medicine are underdeveloped. The challenge is to customise services to discipline-specific needs while maintaining a baseline of shared infrastructure. As a respondent noted: "80% of content can be standardised, but 20% still needs to be tailor-made."

A further challenge is the persistent gap between policy and practice: despite years of advocacy, FAIR data uptake remains low. "There is a gap between what policies push for in FAIR data and the actual uptake by researchers", an interviewee said. LIBER advocates addressing this through targeted support for early-career researchers - especially PhD students - as key multipliers in shaping future academic norms.

2.1.4 Conclusion

LIBER provides a robust framework for strategic transformation in research libraries, with a clear emphasis on openness, digital innovation, and institutional leadership. Swiss research libraries, particularly those already active in LIBER, can benefit directly from its tools, working groups, and policy influence.

However, broader participation from underrepresented sectors - especially Universities of Applied Sciences and Teacher Education - is essential to ensure that the diversity of the Swiss academic landscape is reflected and supported at the European level. Engagement with LIBER

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[11] https://libereurope.eu/working-group/liber-copyright-legal-matters-working-group/

offers these institutions not only visibility but also access to shared resources, policy influence, and professional development. Swiss research libraries are perceived by LIBER as having deep expertise in both digital and physical long-term preservation and curation of materials, that both LIBER and Europe could benefit from. Furthermore, LIBER perceives multilingualism to be key for the future of social sciences and humanities. Switzerland, as a multilingual country, and its research libraries should promote and support that.

Overall, LIBER encourages libraries to step out of traditional roles and to position themselves as co-creators of research infrastructure and policy, fully engaged in the transformation of scholarly communication in the digital era.

2.2 GASCO – German, Austrian and Swiss Consortia Organisation

2.2.1 General Overview

GASCO is a supra-regional forum comprising library consortia from Germany, Austria, Switzerland and Luxembourg. It plays a pivotal role in the digital transformation of academic libraries, particularly by enabling collective licensing and negotiation strategies for electronic resources. While it does not operate as a traditional professional network such as LIBER, GASCO serves as a cooperative platform for strategic alignment among consortia in the DACH region, thereby enhancing the purchasing power and negotiating leverage of libraries within the scholarly publishing ecosystem.

Its member consortia represent mainly regional library systems, national science organisations, and subject-specific national libraries as well as the Max Planck Digital Services gGmbH, which operates the DEAL Consortium. GASCO is mainly an exchange platform, which occasionally undertakes joint action. GASCO members enable libraries to secure favourable terms for accessing electronic content while supporting the wider shift toward open access and digital scholarship.

For Swiss research libraries, participation in GASCO via the national Consortium of Swiss Academic Libraries[12] supports its licencing activities by sharing information and integrates Swiss institutions into broader European initiatives on open science and licensing reform.

2.2.2 Policies & Governance

Although GASCO does not have a formal, centralised digital transformation strategy, digital operations are integral to all its activities. The organisation's governance structure is decentralised and comprises independent national and regional consortia, each of which operates with its own mandates and governance models. Exchange and decision-making are coordinated informally.

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[12] http://www.consortium.ch

Key elements of GASCO's policy and governance model include:

Transformative Agreements: Negotiations increasingly focus on publish-and-read models that include both access and open access (OA) publishing rights. In principle, these are considered a fundamental contribution to the transition to open science. At the same time, GASCO engages in the discussion about how transformative these agreements really are and how to move forward with this type of agreement.

Standardisation and Interoperability: GASCO facilitates the harmonisation of contract structures and metadata delivery formats. Tools like LAS:eR, an electronic resource management system (ERMS) developed by the hbz, are widely adopted and contribute to the alignment of licensing data across consortia[13].

Forum 13+: GASCO works in close alignment with Forum 13+, an initiative that complements transformative efforts like the DEAL consortium[14]. There is considerable overlap in membership between these two groups.

Legal and Ethical Governance: There is growing concern regarding licensing clauses that restrict AI-based text and data mining (TDM). GASCO actively monitors such developments and aims to negotiate contracts that protect non-commercial research reuse and researcher rights.

2.2.3   Key Initiatives & Relevance to Swiss Research Libraries

Negotiation of Transformative and Open Access Agreements

One of the core functions of GASCO members is negotiating transformative agreements with academic publishers. These agreements are becoming standardised across the member countries and include provisions for open access publishing (including hybrid and gold OA), long-term access and preservation clauses (e.g. via Portico[15]), and rights for reuse, including for TDM and AI applications. Swiss research libraries benefit especially from mutual information exchange through the Swiss Library Consortium's participation in GASCO.

Support for Shared Infrastructure and Standardisation

Through GASCO, Swiss research libraries gain access to common contract templates and negotiation guidelines, shared metadata standards for e-resources, and participation in consortial tools such as the LAS:eR GASCO-Monitor[16], which allows a central point to find information about licences. These contributions are particularly relevant in the context of Switzerland's

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[13] LAS:eR https://laser.hbz-nrw.de, Hochschulbibliothekszentrum (hbz) Nordrhein-Westfalen https://www.hbz-nrw.de
[14] https://deal-konsortium.de
[15] https://www.portico.org
[16] https://laser.hbz-nrw.de/gasco

fragmented institutional structure, as they enable libraries across cantons and disciplines to operate within shared digital frameworks.

Addressing Strategic Challenges

GASCO has identified several emerging challenges that are also relevant to the current situation at Swiss research libraries:

- Hybrid journals remain dominant, despite transformative contracts, indicating slow systemic change.
- Concern regarding licensing clauses that restrict AI-based text and data mining (TDM).
- There is a recognised need for libraries to become more visible and active in defining policy, especially concerning AI, licensing, ethics, and content reuse.

Swiss libraries can draw on GASCO's experience to position themselves as advocates for transparency and ethical digital practices in national and international negotiations.

2.2.4   Conclusion

GASCO is a prime example of how regional consortial collaboration can serve as a strategic governance mechanism for advancing the digital transformation of academic libraries. By coordinating licensing, establishing shared standards, and aligning policies, GASCO assists member libraries in transitioning toward open science, while addressing emerging challenges concerning AI, metadata interoperability, and sustainable infrastructure.

For Swiss research libraries, active participation in GASCO ensures access to global content, enables influence over policy through aligned negotiations, and provides a proven model for balancing decentralisation with strategic coherence. In a time where open science policy and AI applications are reshaping scholarly communication, GASCO offers Swiss research libraries a stable, collaborative framework through which they can enhance their services, ensure legal compliance, and contribute to the development of a robust and equitable information ecosystem.

2.3   OCLC – Online Computer Library Center

2.3.1   General Overview

OCLC is a global library cooperative that provides technological infrastructure, metadata services, and strategic research for thousands of libraries across over 100 countries. Its mission is to empower libraries through collaboration and innovation, thereby enhancing knowledge access and discovery. OCLC is best known for WorldCat, the world's largest union catalogue, and for pioneering metadata standards such as MARC and Dublin Core[17].

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[17] WorldCat: https://search.worldcat.org , MARC: https://www.loc.gov/marc, Dublin Core: https://www.dublincore.org

In addition to service provision, OCLC operates a dedicated research division - OCLC Research - that engages in applied research, community consultation, and trend analysis. It acts as a global knowledge broker, supporting the digital evolution of research libraries through shared infrastructure, metadata interoperability, and foresight studies on emerging technologies. The organisation brings together libraries in its Research Library Partnership (RLP)[18] to address shared challenges, notably in areas such as linked data, AI adoption, and research data management (RDM).

OCLC thus serves not only as a technical enabler but also as a policy influencer and community convener, offering strategic insights and scalable solutions that are directly applicable to research libraries' digital transformation trajectories.

2.3.2 Policies & Governance

OCLC's governance model is based on cooperative membership, funded primarily through service fees paid by participating libraries. It does not operate under a traditional public mandate but instead functions as a not-for-profit technology provider guided by library needs and priorities.

Its approach to digital transformation is driven by long-term investment in shared platforms, interoperability frameworks, and global collaboration. A major strategic aim is to move libraries from institution-specific solutions to collectively maintained infrastructures, thereby improving sustainability and reducing duplication of effort.

In the realm of standardisation, OCLC has played a foundational role historically (e.g., MARC, Dublin Core) and continues to lead in the implementation of linked data, entity management, and persistent identifiers (such as DOIs[19] and VIAF[20]). These efforts aim to make bibliographic and institutional metadata more discoverable and interoperable across systems and jurisdictions.

Metadata quality and fragmentation remain significant barriers to efficient discovery and service integration. The expert interview emphasised that while libraries are "collections-focused," the modern landscape requires them to become service-focused partners in the research lifecycle instead, especially in managing and stewarding complex data infrastructures.

Governance of digital initiatives within institutions remains a challenge as well. Many libraries are excluded from university-wide digital or data governance bodies, reducing their ability to influence strategic planning. OCLC advocates for greater inclusion of library leadership in

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[18] https://www.oclc.org/research/partnership.html
[19] https://www.doi.org
[20] https://viaf.org

institutional data governance and research strategy formulation, stressing that libraries should be represented on steering committees and policy-setting forums.

2.3.3   Key Initiatives & Relevance to Swiss Research Libraries

OCLC has launched and supported several initiatives that are directly relevant to Swiss research libraries, particularly in the context of open science, data services, and technological integration.

Research Data Management (RDM) and Capacity Building

OCLC's 2023 report, Building Research Data Management Capacity: Case Studies in Strategic Library Collaboration (Bryant et al., 2023), presents a series of international best practices for scaling RDM services via consortia. Examples include the Texas Digital Library[21] and Canada's Portage Network (now subsumed within the Digital Research Alliance of Canada[22]), both of which have demonstrated how shared infrastructure and coordinated governance can overcome the limitations of decentralised, underfunded institutional repositories.

Another very useful example is that of the Data Curation Network[23], a membership organisation of institutional and non-profit data repositories. Based at the University of Minnesota, they facilitate a shared-curation workflow, in which datasets from one institution are matched with an expert at a different member institution (see Figure 2).

This could be of particular interest to Switzerland, as it offers a model of how universities, which otherwise lack the human and financial resources to provide support on data curation, could pool their resources. A first attempt at a similar solution was made with swissuniversities funded DLCM project[24] and an establishment of a Coordination Desk. However, due to a lack of sustainable funding and a lack of adoption among researchers (among other things due to a lack of visibility of the service), the project had to be sunset. It remains to be seen if now, ten years later, a second chance at such an offer would be more successful and viable.

The key lesson is that collaboration enables scale, but success depends on shared definitions, governance clarity, cost-sharing, and trust (Bryant et al., 2020). For Swiss libraries - many of which operate in a fragmented environment with diverse funding models - these models

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[21] https://www.tdl.org

[22] https://alliancecan.ca

[23] https://datacurationnetwork.org

[24] https://www.dlcm.ch/services/dlcm-training The goal of the DLCM Coordination Desk was that "any Swiss researcher, research institution or HEI can freely ask for general or specific information on research data management, and it is also possible to request the organisation of trainings on different RDM subjects. Depending on the nature of your demand, DLCM's Coordination Desk [would] contact or link you to the most appropriate RDM expert, through a network of 8 HEI from all over the Switzerland."

provide useful templates for national coordination and strategic alignment under the Open Research Data Strategy led by swissuniversities.
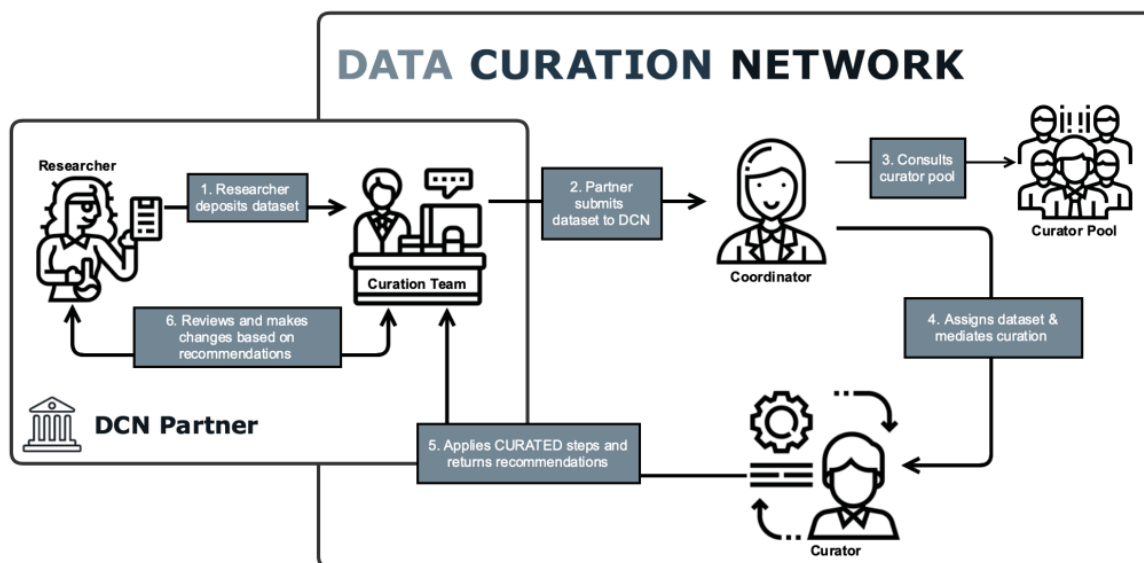

Figure 2 - Shared curation workflow within the Data Curation Network (source: https://datacurationnetwork.org/about-the-dcn/)

Artificial Intelligence and Metadata Automation

OCLC's Research Library Partnership (RLP) includes an active Metadata Managers Working Group, which is convening a Managing AI in Metadata Workflows working group[25], which explores the application of machine learning to cataloguing workflows, metadata enrichment, and service personalisation. Lessons learned will be shared on Hanging Together[26], the OCLC Research blog.

AI is seen as a transformational opportunity, particularly in enhancing metadata precision. However, AI must be ethically embedded and legally compliant, with attention to issues of privacy, bias, and long-term sustainability, as also discussed in a recent blog post (Rajapatirana, 2025). Swiss libraries considering AI-enhanced discovery tools (such as e.g. ScienceDirect.AI[27]) must also prepare for licensing costs and ensure that AI services are integrated into workflows, rather than offered as standalone, underused tools. Staff training and ethical awareness are critical in this regard.

Linked Data and Interoperability Standards

OCLC supports the development and implementation of linked data frameworks, helping libraries to expose their collections in formats that are web-native, semantically rich, and

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[25] https://www.oclc.org/research/partnership/working-groups/managing-ai-metadata-managers-wg.html
[26] https://hangingtogether.org
[27] https://www.elsevier.com/products/sciencedirect/sciencedirect-ai

machine-readable. With Meridian[28], they offer a web application and set of APIs that allows the creation, curation and connection of linked data entities. Persistent identifiers such as DOIs, OR-CID, and VIAF are integral to this ecosystem, and Swiss institutions are already contributing to and benefiting from these infrastructures.

Challenges remain, particularly in metadata harmonisation and systems interoperability. The interview highlighted that many library systems are not yet aligned with broader research infrastructures, such as the European Open Science Cloud (EOSC)[29], and this fragmentation hinders data discovery and reuse. Swiss libraries working on national ORD infrastructure can benefit from OCLC's frameworks and case studies to avoid duplicative or siloed development.

Addressing Visibility and Institutional Impact

OCLC's research underscores a recurring problem across libraries: low institutional visibility. Researchers frequently make use of library-provided services (e.g., publication access) without realising the library's role. The interviewee observed that "the biggest strategic investment libraries could make is hiring professional communicators."

This insight is particularly relevant for Swiss research libraries, many of which operate in decentralised governance structures and must justify their value to university leadership. Strategic communication, user-centred service design, and data-driven impact reporting are all areas where OCLC offers templates and practical guidance.

Support for Social Interoperability and Staff Development

A key concept advanced by OCLC is that of social interoperability - the capacity to work effectively across departments, organisations, and stakeholder communities. In addition to technical solutions, digital transformation depends on strong interpersonal and strategic skills among library staff. Project management, institutional advocacy, and change leadership are seen as critical competencies, especially in negotiating data governance, AI adoption, and open science mandates.

Swiss libraries are encouraged to invest in continuous professional development, not only in technical domains but also in communication, advocacy, and policy engagement - areas where OCLC's reports and training materials provide a valuable resource.

2.3.4   Conclusions

OCLC plays a leading role in the global library landscape by providing shared infrastructure, advancing metadata standards, and generating actionable research on digital transformation. Its

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[28] https://www.oclc.org/en/meridian.html
[29] https://eosc.eu

experience with collaborative RDM initiatives, AI implementation, and linked data interoperability offers a robust foundation from which Swiss research libraries can learn.

By engaging with OCLC's research outputs and participating in its Research Library Partnership, Swiss libraries can accelerate their digital transformation while avoiding common pitfalls such as infrastructure fragmentation, invisible labour, and lack of strategic alignment. Moreover, OCLC's emphasis on social interoperability, governance integration, and institutional visibility resonates strongly with the current challenges facing Swiss libraries.

In an environment increasingly defined by AI, open science, and global interoperability, OCLC provides not only technical tools but also strategic models for how libraries can evolve from collection curators to integrated research infrastructure partners. For Swiss institutions navigating decentralised structures and multilingual mandates, this combination of practical support and conceptual clarity is particularly valuable.

2.4 IFLA – International Federation of Library Associations and Institutions

2.4.1 General Overview

IFLA is the leading international organisation representing library and information services worldwide. Its mission is to serve as the global voice of the library and information community, advocating for equitable access to information, cultural heritage, and knowledge through libraries. In the context of research libraries, IFLA offers a normative framework that promotes global standards, professional ethics, and coordinated action on emerging digital challenges.

While not a service provider like OCLC or a European coordination platform like LIBER, IFLA holds a unique position as a global policy and advocacy organisation. It brings together professionals, associations, and institutions across diverse geographic and disciplinary boundaries. Through manifestos, trend reports, working groups, and participation in multilateral policy processes (e.g. UNESCO and the UN), IFLA provides guidance that helps research libraries define their values and align their digital development with international benchmarks.

Swiss research libraries benefit from their participation in IFLA through bibliosuisse[30], the Swiss Library Association, which is a member, as well as direct memberships of big research libraries like the ETH Library, the libraries of the universities of Bern and St. Gallen, etc (IFLA, 2025). This ensures access to global debates, trend monitoring, and advocacy tools that support local and national digital transformation efforts.

2.4.2 Policies & Governance

IFLA operates as a membership-based organisation governed by an elected Governing Board, supported by advisory committees and professional sections. It does not provide direct

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[30] https://www.bibliosuisse.ch

funding for digital transformation but instead influences global policy, coordinates professional communities, and produces technical guidelines and advocacy tools. Funding stems from membership fees, event revenues (notably the IFLA World Library and Information Congress), and project-based grants.

A cornerstone of IFLA's policy influence is the IFLA/UNESCO Manifesto for Digital Libraries (IFLA, 2011), which defines principles for access, interoperability, preservation, and intellectual property. It emphasises the obligation of libraries to provide equitable and permanent access to digital information, respect user privacy, and collaborate on digital infrastructures.

IFLA's governance model embraces decentralisation and regional inclusivity, recognising the diversity of library systems across the globe. It collaborates with organisations such as SPARC Europe, Creative Commons, and the International Science Council to advance open science and digital rights agendas[31].

From a digital transformation perspective, IFLA promotes professionalisation, ethical standards, and sustainability. However, as the expert interview reveals, many libraries still operate reactively rather than proactively: "Many libraries are responding to others' agendas rather than setting their own. Libraries should be proactive in defining digital transformation priorities and resource needs."

Moreover, while open-source is the preferred model for repositories and open access platforms, many libraries - especially in smaller countries or institutions - lack the IT capacity to implement and maintain them independently. IFLA encourages consortial solutions and the sharing of technical and policy expertise, a model well-suited to the Swiss higher education landscape.

2.4.3 Key Initiatives & Relevance to Swiss Research Libraries

Normative Frameworks and Advocacy

IFLA provides foundational frameworks that define the ethical, inclusive, and interoperable development of digital library services. The Trend Report 2024 (IFLA, 2024b) is especially relevant, also for Swiss research libraries, as it urges libraries to prepare for developments in:

Changing Knowledge Systems: Diverse voices are reshaping knowledge creation, but misinformation and algorithmic silos threaten equity and truth.

Technological Transformation: AI, mixed realities, and digital twins are redefining information access and creation, raising ethical, legal, and environmental concerns.

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[31] SPARC Europe: https://sparceurope.org , Creative Commons: https://creativecommons.org, International Science Council: https://council.science

Erosion of Trust: Trust in institutions, media, and information systems is declining, highlighting the need for transparency, digital rights, and open infrastructures.

Growing Skills Gaps: Critical, digital, and media literacies are essential as complexity increases; libraries must lead lifelong learning and misinformation resilience.

Digital and Environmental Inequities: Uneven access to technology and rising digital resource use demand inclusive, sustainable, community-centred responses.

IFLA also acts as a policy actor on the global stage. It supports the UNESCO Recommendation on Open Science (UNESCO, 2021) and engages in coalitions for publishing reform and copyright modernisation - areas of concern for Swiss institutions navigating the regulatory frameworks of both Swiss and EU jurisdictions.

Research Data Management and Open Science

IFLA promotes awareness and implementation of FAIR principles and open science infrastructure. However, the interview highlights significant variability across countries and institutions. While open access and open data are widely recognised, practices like citizen science or reward reform remain less understood. The interview notes: "Libraries struggle to prioritise which areas of Open Science to support […]. Libraries need clearer priorities within the broad Open Science landscape."

Swiss research libraries - many of which are in the process of implementing Open Research Data strategies - can benefit from IFLA's global perspective and guidance on how to align local practice with international open science agendas. Additionally, decentralised systems like NII Institutional Repositories Program in Japan and DABAR (Digital Academic Archives and Repositories) in Croatia, which focus on interoperability between independent repositories, may serve as a model for Switzerland, where university repositories remain institutionally fragmented[32].

Training and Digital Skills

Digital transformation depends heavily on human capital. IFLA has emphasised the need to train not only users but also library staff in areas such as Open science and data stewardship, AI ethics and application, as well as project management and policy engagement.

The interview emphasises that: "Few librarians specialise in Open Science or data. Many are active in multiple voluntary committees, leading to burnout… Professionalisation and institutional support are needed.". Swiss libraries, particularly those at smaller institutions, face similar challenges. Engagement in IFLA's capacity-building initiatives can support the upskilling of staff

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[32] NII Institutional Repositories Program: https://www.nii.ac.jp/irp/, DABAR Digital Academic Archives and Repositories: https://dabar.srce.hr/en/dabar

and help standardise competencies across institutions. Moreover, IFLA highlights the importance of professional advocacy, viewing it as a core responsibility rather than a volunteer activity.

Institutional Visibility and Social Interoperability

A recurring theme in the interview is the invisible value that libraries provide: "The more seamless the service, the more invisible the library becomes.". This is particularly acute in digital environments, where users often access library-funded services without recognising the library's role. IFLA encourages libraries to address this through strategic communication and visible engagement in research workflows. It also emphasises "social interoperability" - the ability to operate across departments, sectors, and borders - as a critical success factor.

Swiss research libraries, many of which operate within decentralised federal structures, must build bridges between institutions, funders, and researchers. IFLA offers both the philosophical rationale and practical examples for how this can be achieved.

2.4.4   Conclusions

IFLA plays a central role in shaping the global values, policies, and professional standards that underpin the digital transformation of libraries. Its emphasis on ethical frameworks, inclusivity, collaboration, and sustainability ensures that digital innovation in libraries remains aligned with public good and scholarly freedom.

For Swiss research libraries, IFLA provides:

- A normative compass for digital strategy and open science alignment
- Practical guidelines on digitisation, preservation, and metadata quality
- A global platform for advocacy, training, and partnership building

While IFLA does not deliver infrastructure or funding, it equips libraries with the tools to engage meaningfully in digital transformation and policy development. Its emphasis on proactive leadership, professional advocacy, and social interoperability is especially relevant for Swiss libraries seeking to maintain their relevance, impact, and integrity in an increasingly data-driven and AI-mediated research environment.

By participating actively in IFLA's programmes and adopting its guidance, Swiss research libraries can help shape a globally connected and ethically robust information ecosystem - one that reflects both international best practice and national priorities.

2.5   CAUL – Council of Australasian University Librarians

2.5.1   General Overview

The Council of Australasian University Librarians (CAUL) represents the university libraries in Australia and Aotearoa / New Zealand. It acts as a national consortium and coordination body, promoting strategic alignment, innovation, and collective capability across the region's

academic libraries. CAUL fosters cooperation between university libraries on shared challenges in digital transformation, scholarly communication, and open education. Its activities extend beyond operational matters to shaping national policy and research infrastructure, ensuring that libraries play a strategic role in supporting teaching, research, and innovation (CAUL, 2025, n.d.).

An example of a CAUL library that has undergone a full transition to digital-first operations, is the University of New South Wales (UNSW) Sydney Library[33] with virtually all its new acquisitions being digital. While analogue collections remain, the emphasis of UNSW Library is firmly on delivering digital services, supporting open access and research data sharing, and maintaining visibility and influence within academic institutions and policy environments.

2.5.2 Policies & Governance

CAUL does not directly govern individual libraries but provides shared strategic frameworks, coordination platforms, and collective bargaining power. It plays a significant role in shaping national-level policy alignment, particularly through partnerships with organisations such as e.g. Open Access Australasia, COAR, and SCOSS[34].

One of CAUL's distinguishing features is its collaborative governance model: member libraries jointly develop programmes and policy positions, often piloting initiatives that can then be scaled nationally. For example, CAUL's Content Procurement Service negotiates e-resource licences for all member libraries, ensuring favourable terms and reducing duplication.

Funding for digital initiatives primarily originates from institutional budgets, with CAUL providing the coordination framework rather than direct financial support. In earlier phases, Australia benefitted from substantial federal investment in national research infrastructure, much of which is still operational. However, as the expert interview points out, Australia remains infrastructure-led rather than policy-led, lacking a national open science framework or coherent rights retention policy.

Despite this, CAUL members such as UNSW demonstrate institutional alignment through governance structures, including steering committees and advisory roles across faculties, ensuring that the library is embedded in strategic planning. This governance approach ensures agility, alignment, and visibility, all of which are crucial for successful digital transformation.

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[33] https://www.library.unsw.edu.au

[34] Open Access Australasia: https://oaaustralasia.org, Confederation of Open Access Repositories (COAR) https://coar-repositories.org, Global Sustainability Coalition for Open Science Services (SCOSS) https://scoss.org

2.5.3   Key Initiatives & Relevance to Swiss Research Libraries

Digital Dexterity Framework

CAUL's Digital Dexterity Framework (2017–2019) defined a digital skills framework for both library professionals and users (CAUL, 2019). It led to the creation of a Community of Practice that continues to share resources and training initiatives across institutions. This programme is widely recognised as a best practice in workforce development. Australian research libraries identified the need for upskilling in areas such as data science, digital pedagogy, and scholarly communication, and responded with a collective approach, rather than fragmented institutional efforts.

Swiss libraries - particularly those in smaller or decentralised institutions - could adapt this model, by creating shared digital skills frameworks and training networks that support sustainable professional development.

Advancing Open Scholarship and Open Educational Resources (OER) Collective

CAUL's Advancing Open Scholarship (FAIR) programme[35] supports the implementation of open access, open data, and FAIR principles across its membership. At UNSW, for example, this is reflected in a comprehensive open access policy that includes publications, theses, and data, and is supported by tools for research data planning, storage, and sharing (UNSW Sydney, 2021). As for CAUL's Open Educational Resources (OER) Collective[36], it enables member libraries to collaboratively create and share open teaching materials. This approach not only reduces costs but also promotes equity in education and enhances the visibility of library-led educational innovation.

As for Switzerland, the "special interest group OER" of the Swiss e-learning-community eduhub exists and "Switch OER", Switzerland's OER repository for Swiss higher education is hosted at Switch. As of spring 2025 Switch OER content is also discoverable via OERSI, the Open Educational Resources Search Index[37]. Despite these efforts, the OER landscape in Switzerland is not harmonised yet. Switch OER hosts mostly content from ZHAW (Zurich University of Applied Sciences) and FHNW (University of Applied Sciences and Arts Northwestern Switzerland), while other universities, although offering OER as well, have their OER material either on their own repositories, on Zenodo, spread out on websites, or on private websites and/or Github of researchers and lecturers who took sharing OER content in their own hands[38]. It remains open to

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[35] https://www.caul.edu.au/programs-projects/advancing-open-scholarship-fair
[36] https://www.caul.edu.au/services-programs/OER-Collective
[37] Special interest group OER Switzerland: https://oer-schweiz.ch, eduhub: https://www.eduhub.ch, Sitch OER: https://oer.switch.ch, OERSI Open Educational Resources Search Index: https://oersi.org/resources
[38] ZHAW: https://www.zhaw.ch, FHNW: https://www.fhnw.ch, Zenodo: https://zenodo.org, Github: https://github.com

discussion, whether Swiss research libraries could play a stronger role in supporting OER in Switzerland and pushing OER policies at universities.

Institutional Repositories and Research Data Management (RDM)

CAUL members like UNSW operate repositories such as UNSWorks[39], which support both publications and research data. These platforms are integrated into wider research ecosystems, and RDM is considered a core library function, supported by collaboration with specialised research infrastructure teams. Importantly, in the example of UNSW as a large CAUL member-library, they do not attempt to centralise everything. Instead, UNSW allows researchers to publish in disciplinary repositories and international repositories (e.g. Figshare, Dryad)[40], while harvesting metadata from those platforms. This flexible, researcher-centred approach helps maintain compliance without creating resistance or redundancy.

Swiss libraries navigating repository fragmentation can take note: forcing researchers to use centralised systems risks failure. Instead, libraries should focus on aggregating and aligning metadata, ensuring interoperability with discipline-specific services while maintaining national visibility through harvesting and linking.

Visibility, Advocacy, and Cultural Change

CAUL emphasises the need for library visibility within institutions and among stakeholders. As observed in the expert interview, libraries that are deeply embedded in faculty spaces, participate in steering committees, and maintain a strong digital presence are more likely to secure institutional support and sustained investment.

UNSW, for instance, positions all staff as "front of house," contributing to an embedded culture of engagement. The library also issues impact reports to academic faculties, shares updates in student and staff newsletters, and ensures its role in institutional communication is visible and valued.

Swiss research libraries can enhance their strategic positioning by adopting similar practices: embedding librarians in faculty processes, reporting usage and value metrics, and investing in targeted advocacy campaigns. This visibility is critical for securing funding and for embedding library expertise in the digital research lifecycle.

Addressing Challenges and Sustainability

The absence of a national open science policy in Australia has led to a fragmented but resilient ecosystem, where individual institutions lead infrastructure development but often lack coordinated legal or strategic frameworks. As the interviewee noted: "Sometimes, something needs to go wrong for funding to come. It's the curse of competence - if everything works, no one

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[39] https://unsworks.unsw.edu.au
[40] Figshare: https://figshare.com, Dryad: https://datadryad.org

notices.". Having said that, CAUL libraries have embraced a continuous improvement mindset, acknowledging that perfectionism can be an obstacle. Emphasis is placed on good-enough solutions, interoperability, and sustainability through diversified infrastructure and modular service models.

Swiss libraries, known for their high-quality services, may benefit from this pragmatic approach, especially when facing resource constraints. Reducing dependence on bespoke systems, adopting shared platforms, and embracing imperfection as a step toward iteration can enable faster, more scalable innovation.

2.5.4   Conclusions

CAUL exemplifies how a coordinated, national consortium can drive digital transformation across research libraries by facilitating shared infrastructure, joint policy development, and workforce capacity building. Its emphasis on collaboration, visibility, and continuous improvement provides a replicable model for systems such as Switzerland's, where decentralisation presents both a challenge and an opportunity.

For Swiss research libraries, CAUL offers the following transferable insights:

- Build shared digital skills frameworks via a Community of Practice model.
- Develop coordinated open access and OER platforms aligned with national policy.
- Embrace metadata harvesting from subject repositories rather than enforcing centralised deposit.
- Advocate for library value through embedded engagement and institutional reporting.
- Focus on interoperability, scalability, and sustainability over perfectionism.

Ultimately, CAUL demonstrates that no library should face digital transformation alone. Through national alignment, strategic collaboration, and collective innovation, even the smallest libraries can benefit from sector-wide progress - and help shape the future of scholarly communication.

3   National Networks as Innovation Incubators

This chapter looks at national-level networks and organisations in driving successful implementation of digital services in the research library space. By exploring how these institutions support collaboration and long-term planning, the chapter highlights practical models that could inform similar efforts in Switzerland.

3.1   National Library of Finland (NL Finland)

3.1.1   Strategic Priorities and Mission

The National Library of Finland defines digital transformation not as a separate programme but as a core expression of its public mission. Anchored in the institutional pillars of openness, renewal, and *Bildung* - a term encompassing education or intellectual and cultural cultivation - the library embeds digital services across all domains (National Library of Finland, 2020). These include national infrastructures such as Finna.fi[41], Finland's central access portal for cultural and scientific heritage.

Finna, a central discovery interface co-developed with archives, museums, and libraries, has become the most used service, serving researchers and the general public alike. It aggregates metadata across institutional repositories without hosting the content directly, thus enabling federated access while maintaining local custodianship.

The National Library's statutory responsibility, codified in the *Finnish Universities Act* (Ministry of Education and Culture, Finland, 2009), explicitly mandates it to support and develop services for all types of libraries and to promote national and international cooperation. This legal framework ensures a baseline for alignment while allowing flexibility in execution. The National Library functions not only as a technical platform provider but also as a mediator of access, inclusion, and memory. In addition to the Universities Act, the tasks of the National Library are also mandated in the *Act on Collecting and Preserving Cultural Materials* (legal deposit activities) (Ministry of Education and Culture, Finland, 2007).

3.1.2   Digitisation and Collections Infrastructure

Digitisation is central to the National Library's strategy and tightly coupled to its long-term preservation goals. The *National Library of Finland Digitisation Programme 2025-2028* (2025) outlines a multi-year roadmap prioritising accessibility, metadata enrichment, and legal sustainability. The digitisation focusses on newspapers and audio materials, with additional OCR processing of the printed material to maximise discoverability. While less than five percent of analogue collections have been digitised, the ambition is to scale efforts within environmental and fiscal constraints.

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[41] https://finna.fi

Preservation of digitised content is managed via CSC - IT Center for Science, which provides archiving infrastructure. Persistent identifiers and metadata standards ensure that digitised resources remain accessible and interoperable across time and platforms. The library's carbon neutrality target for 2030 has led to sustainability being explicitly integrated into digitisation workflows, including assessments of the energy footprint of digital storage and use. Another important aspect of sustainability is the preference of *green ICT*[42] and open-source technologies where possible, e.g. with Finna being based on VuFind[43]. Software for the digitising process however, is not open-source (docWizz[44]).

3.1.3 Metadata, Standards, and AI Integration

Finland's metadata ecosystem is notably mature. Services such as Melinda (national metadata repository and collaborative cataloguing environment), Fennica (national bibliography), and Asteri (authority data) form a consistent metadata backbone[45]. These are underpinned by conceptual models (RDA, BIBFRAME) and persistent identifiers (e.g., ISNI)[46]. The open-source tools Finto and Skosmos support vocabulary management and subject indexing[47].

AI technologies are being integrated effectively. Tools like Annif and Finto AI support automated subject indexing using controlled vocabularies and are now widely used in production with high acceptance among staff[48]. Along this all, the library maintains a "human in the loop" approach (like at the ZBW, see chapter 3.4.2), emphasising transparency and editorial oversight. While AI works well for subject indexing, full bibliographic description remains at low quality as of yet.

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[42] Green ICT, or Green Information and Communication Technology, is the practice of designing, using, and disposing of digital technologies in ways that are environmentally responsible. It focuses on reducing the ecological impact of information and communication technologies, from laptops and smartphones to servers and data centers. This includes lowering energy consumption, choosing materials that are easier to recycle, and building devices that last longer or can be more easily repaired.

[43] https://vufind.org/vufind/ VuFind discovery system

[44] https://content-conversion.com/software/docwizz/

[45] Melinda: https://melinda.kansalliskirjasto.fi, Fennica: https://www.kansalliskirjasto.fi/en/services/fennica-finnish-national-bibliography, Asteri: https://www.kiwi.fi/display/melinda/Auktoriteettitietokanta+Asteri

[46] RDA: https://www.rdatoolkit.org, BIBFRAME: https://www.loc.gov/bibframe/, ISNI: https://isni.org

[47] https://finto.fi/en/ Finto.fi is a centralized service for interoperable thesauri, ontologies and classification schemes for different subject areas. https://www.skosmos.org Skosmos is an open-source web-based SKOS (Simple Knowledge Organization System https://www.w3.org/TR/skos-reference/) browser and publishing tool.

[48] https://annif.org Annif is a tool for automated subject indexing and classification. https://ai.finto.fi/?locale=en Finto AI, a service for automated subject indexing based on artificial intelligence. Finto AI suggests subject headings for texts from a vocabulary. The subjects can be utilised to support information retrieval.

The principal concern voiced in the interview is the increasing restrictiveness of licensing agreements with large commercial publishers. The rising costs and narrowing permissions are hindering Open Science objectives and equitable access. Efforts are ongoing to address copyright challenges related to AI training and reuse. A dedicated national task force[49] is currently working on topics pertaining to AI and copyright, e.g. exploring opt-out mechanisms for content creators and negotiating fair-use provisions in the AI context.

3.1.4   Collaboration and Governance

The National Library's strategic approach relies on collaboration at multiple levels. Networks such as FUN (Finnish University Libraries Network), AMKIT (consortium coordinating the cooperation among the Universities of Applied Sciences libraries), ErikN (special libraries council) and YKN (public libraries council) are very active and act also as links to the Ministry of Education and Culture, thus giving the libraries a voice on the policy level[50]. The Finna platform is a successful example of shared development and collaboration, as it is a national discovery layer maintained collaboratively across libraries, archives, and museums. Further governance structures include researcher advisory groups and internal steering boards, aligned with institutional and national legislation.

The library is also a core partner in the FIN-CLARIAH[51] consortium, which supports humanities and social science research infrastructure in Finland. Here, the National Library contributes not only metadata expertise but also data collections.

3.1.5   Staff Skills and Future Direction

Staff at the National Library benefit from a strong national LIS education pipeline, with multiple universities offering degrees up to the doctoral level. Many staff are recruited from research backgrounds, bringing with them domain knowledge that strengthens service alignment. While IT recruitment is constrained by public-sector pay scales, the library's open culture and mission-driven environment provide strong non-monetary incentives. Internally, there is a growing emphasis on communication skills and stakeholder engagement. Staff development increasingly targets these "soft skills," recognising that modern librarianship requires negotiation, advocacy, and service design as much as technical knowledge.

Looking into the future, key digital trends for research libraries include expanding open access, scaling up digitisation, using AI for metadata, and adopting shared data standards. Strong collaboration between libraries, archives, and museums supports shared systems and smoother user experiences. Environmental sustainability is also becoming part of digital planning,

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[49] https://okm.fi/en/project?tunnus=OKM024:00/2024
[50] FUN: https://yliopistokirjastot.fi/en/, AMKIT: https://www.amkit.fi/en/amkit-consortium/, ErikN: https://www.kirjastot.fi/erik/erikn, YKN: https://www.kirjastot.fi/neuvosto/
[51] https://www.kielipankki.fi/organization/fin-clariah/

The National Library's model demonstrates how a statutory mandate can be coupled with collaborative governance, technical innovation, and cultural stewardship to position the library as a central infrastructure actor in the digital research ecosystem. To stay relevant, research libraries need to move beyond passive custodianship of collections and become active supporters of research, learning, and digital work.

As one of the interviewees said, "In a world of TikTok, you still need librarians." Libraries are still essential places for trustworthy information and learning. To play that role well, libraries should be more involved in the everyday work of universities and research communities. But their role doesn't stop there, they also need to help to keep children reading and support digital skills for everyone. Being visible matters. Libraries need to be online, active, and easy to find wherever research and learning are happening. A great example is the E-library[52] service, which now works as a mobile app.

3.2   KB (Koninklijke Bibliotheek, National Library of the Netherlands)

3.2.1   Governance and Organisational Structure

The KB operates as a digital-first institution, embedding digital operations across all services and departments. Rather than having a standalone digital strategy, the KB asserts that "our strategy *is* digital," reflecting a holistic integration of digital thinking into all aspects of library management.

The governance model of KB is non-hierarchical, inspired by agile practices such as the Spotify model (Kniberg & Ivarsson, 2012). The organisation is structured in cross-functional teams where staff from various departments (e.g., IT, collections, user services) collaborate in service-oriented units. This circular organisational model is still evolving but represents a significant shift away from the classical siloed structures typical of national and research libraries. As reported in the interview: "Multidisciplinary teams are where most of the actual work is being done, with scrum and lean management at its core.". Leadership is shared across departments, and services such as Delpher[53] are developed and maintained by agile teams with shared responsibilities, rather than by isolated departments.

3.2.2   Funding Models and Sustainability

The KB is primarily funded by the Dutch government, with additional support from competitive project-based funding, including through the Dutch Research Council (NWO)[54]. Digital services are supported as part of the KB's legal mandate, particularly in the areas of digital preservation and access to cultural heritage. However, funding pressures are intensifying due to the rapid increase in digital data volume and the rising costs of digital preservation. The KB notes

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[52] https://www.kansalliskirjasto.fi/en/e-library
[53] https://www.delpher.nl
[54] https://www.nwo.nl

that: "Funding doesn't keep pace with the needs piled upon the libraries. We need to keep talking with the government.".

Sustainability is addressed by prioritising services, lobbying for governmental support, and making difficult decisions about which platforms and services to continue or sunset. Moreover, the KB incorporates environmental sustainability into its funding and operational decisions, including assessments of the energy impact of digital infrastructure such as Delpher. Sustainable access to holdings and the contribution to Sustainable Development Goals are explicitly stated in KB's current policy plan (KB national library of the Netherlands, 2023).

3.2.3 Collaboration Initiatives

Collaboration is considered fundamental to the KB's strategy, both nationally and internationally. As the interviewee notes, the KB is "convinced we can only help our customers (whether they are academics, non-academics or public library users) by collaboration within several networks and between several networks." Examples of such partnerships are as follows:

- University libraries in the Netherlands, for mass digitisation and heritage data initiatives.
- CLARIAH (Common Lab Research Infrastructure for the Arts and Humanities)[55], supporting open, linkable humanities data.
- The Dutch Digital Heritage Network[56], which enables interoperability across cultural institutions.
- Wikipedia/Wikimedia, where digitised images with open licences are shared, generating hundreds of millions of views annually[57].

Due to these collaborations, the KB plays a relatively large role within the Dutch academic research landscape.

Another key insight from the KB's approach is the emphasis on bottom-up infrastructure development: "The humanities field created their infrastructures bottom-up, starting from the actual researcher needs.".

3.2.4 Technology and Standardisation

The KB maintains a long-standing commitment to digitisation, linked data, and open access. The mass digitisation of the KB's collections began over 20 years ago and is supported by full-text search (OCR) and APIs. It serves both public and academic users via platforms such as Delpher,

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[55] https://www.clariah.nl
[56] https://netwerkdigitaalerfgoed.nl
[57] KB Wikipedia/Wikimedia project: https://www.kb.nl/over-ons/projecten/wikipedia-wikimedia, service usage statistics: https://www.kb.nl/nieuws/kb-diensten-uitzonderlijk-veel-gebruikt-voor-wetenschappelijk-onderzoek

which receives over two million visits per year and is widely used in the humanities (75% of Dutch humanities researchers use KB services at least once per year)[58].

Key technological and policy priorities include:

- Linked Data: Considered a default standard, with significant efforts to reverse-engineer older metadata for compliance.
- AI Integration[59]: The KB formulated AI principles (Van Wessel, 2020), is developing an AI roadmap and is starting to use AI in internal processes such as cataloguing. External-facing AI projects, like chatbots and conversational interfaces with historical texts, are part of their research and development activities.
- Preservation: Digital preservation is a core legal mandate, treated with equal priority to physical preservation. However, challenges include legacy file formats, system obsolescence, and format migration over time.
- Digital Sovereignty: The KB aims to use open-source solutions and national infrastructure providers (e.g. SURF, analogous to Switzerland's Switch)[60] where possible, balancing openness with geopolitical and security considerations.

3.2.5 Legal and Policy Frameworks

The legal context in the Netherlands presents both enablers and barriers. Notably, in contrast to Switzerland, the country does not have a legal deposit law for both physical as well as digital publications, requiring the KB to negotiate individually with rights holders. This complicates systematic collection building.

Additionally, the KB is concerned about AI training on copyrighted materials. As the interviewee notes: "[We are] scraped by LLM companies all the time, and we cannot do anything against it.". This is why the KB published a statement on this and advocates for updated copyright and AI legislation to protect publicly funded collections from commercial exploitation and to support academic research and ethical innovation in AI applications.

3.2.6 Capacity and Workforce Development

A significant internal challenge at the KB is the digital skills gap among staff. With an average age of 49 and many employees trained in traditional librarianship, the transition to digital librarianship is incomplete. Only a small number of staff (6–7 out of 500) are currently equipped to fully support the service called "Data-services"[61]. To address this, the KB is setting up internal training and upskilling programmes, inspired by national training initiatives such as the Library Basics

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[58] https://www.kb.nl/nieuws/kb-diensten-uitzonderlijk-veel-gebruikt-voor-wetenschappelijk-onderzoek

[59] https://www.kb.nl/en/over-ons/expertises/artificial-intelligence

[60] SURF: https://www.surf.nl, Switch: https://www.switch.ch

[61] https://www.kb.nl/en/research-find/for-researchers/data-services-apis-and-downloads

course[62], and actively advocates for the revival of information science education, which has disappeared from the Dutch academic landscape.

The message to Switzerland is clear: "Don't let your information science study programmes die out.". With the currently declining student numbers in Swiss Information Science BSc and MSc courses, a timely message, as the long-term viability of research libraries as data hubs depends on sustained investment in professional education and interdisciplinary expertise.

3.2.7 Environmental Sustainability

The KB is among the few national libraries that explicitly address the climate impact of digital services. Sustainability assessments[63] have been conducted for services like Delpher. This pioneering work positions the KB as a "green digital library" and offers a model for libraries worldwide that seek to balance digital innovation with environmental responsibility.

3.2.8 Conclusion

The KB demonstrates a holistic and mature model of digital transformation grounded in strategic governance, public infrastructure, and deep collaboration. It combines a digital-first organisational culture with responsible AI integration, open linked data, and cross-institutional partnerships.

Key lessons for Swiss research libraries include:

- Embedding digital priorities across all operations rather than isolating them in a standalone strategy
- Investing in cross-functional, agile teams as a means of organisational transformation
- Prioritising digital sovereignty, legal compliance, and environmental sustainability
- Supporting the professionalisation of staff through structured training and national coordination
- Leveraging visibility through partnerships with platforms like Wikipedia and by positioning services where users already are

The KB's experience highlights the importance of flexible, researcher-driven infrastructure, sustained public funding, and clear institutional commitment to openness, ethics, and long-term stewardship in the digital age. Its model of balancing innovation, preservation, and societal impact offers an exemplary roadmap for other national and research libraries, including those in Switzerland.

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[62] https://ukb.nl/nieuws/meld-je-aan-voor-de-training-library-basics-2025-26/
[63] https://netwerkdigitaalerfgoed.nl/activiteiten/green-it-milieu-impact-van-digitaal-erfgoed/

3.3   TIB (Leibniz Information Centre for Science & Technology, Uni Hannover)

3.3.1   Governance, Funding and Strategic Structure

TIB is a key infrastructure institution within the German Leibniz Association[64] and plays a prominent role in both national and international research policy contexts. Its governance model is deliberately pragmatic: rather than relying on hierarchical structures, leadership favours agile, operational collaboration. As noted in the interview, libraries often "create too many governance structures that lead to navel-gazing." Strategic alignment at TIB is achieved through participation in initiatives such as Leibniz-KIM[65] and through close cooperation with researchers and infrastructure providers. Digital initiatives are led by service teams and developed responsively, grounded in community needs rather than top-down mandates.

TIB's funding model combines core institutional support from the Leibniz Association with national grants (e.g. from the DFG[66] and NFDI[67]), institutional contributions, and project-based funding. Although financially stable, the organisation remains conscious of the risk of service proliferation and resource fragmentation: "There are nearly too many services around and keeping them all relevant […] is a time-consuming task.". To mitigate these risks, TIB prioritises core infrastructure and participates in shared frameworks such as the European Open Science Cloud (EOSC).

3.3.2   Collaboration and Infrastructure Development

TIB is internationally recognised for its co-development of research infrastructures, serving as both technical host and community convenor. It is a lead partner in projects such as the:

- Open Research Knowledge Graph (ORKG)[68] – a semantic platform for scholarly knowledge representation

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[64] The Leibniz Association connects 96 independent research institutions in Germany that range in focus from natural, engineering and environmental sciences to economics, spatial and social sciences and the humanities. https://www.leibniz-gemeinschaft.de

[65] Ständige Kommission für wissenschaftliche Infrastruktureinrichtungen und Forschungsmuseen (KIM). The Standing Committee on Research Infrastructure Facilities and Research Museums is a forum for sharing experience and collaboration and also advises the Executive Board on all matters relating to research infrastructure at Leibniz institutions, including eight Leibniz research museums. 25 Leibniz institutions are currently members of the standing committee, and four additional Leibniz institutions are represented via Section mandates. The spokespersons of the Leibniz working groups on libraries, archives and research data take part in the standing committee's meetings as guests.

[66] Deutsche Forschungsgemeinschaft (DFG). German Research Foundation. https://www.dfg.de

[67] Nationale Forschungsdaten Infrastruktur (NFDI). National research data infrastructure of Germany. https://www.nfdi.de

[68] https://orkg.org

- AV-Portal[69] – a media platform for scientific video, featuring automated indexing and multilingual search
- Leibniz Data Manager[70] – a federated RDM system enabling FAIR-compliant metadata workflows and long-term preservation

The TIB also contributes to large-scale initiatives including arXiv and Zenodo (as infrastructure contributors), OpenAlex (as a data integrity partner), national projects in the National Research Data Infrastructure (NFDI) and international networks such as EOSC, RDA, and COAR[71].

Furthermore, TIB collaborates with universities, publishers, IT services, and research data centres, focusing on interoperable, open-source, and community-aligned services. Its infrastructure offerings serve both as institutional services and scalable national solutions. As stated in the interview: "We believe in building sustainable, flexible and community-owned infrastructure - not short-term projects.".

3.3.3 Metadata, Standards and Interoperability

As Germany's DOI registration agency via DataCite[72], TIB plays a central role in global metadata infrastructure. It leads the development of machine-actionable metadata, ontologies, and persistent identifier (PID) integration. Key technologies include Linked Open Data using domain-specific ontologies; metadata formats such as Dublin Core, METS, and PREMIS-based DNX; APIs and semantic interfaces for dataset discovery and integration.

TIB also provides the TIB AV-Portal with semantic video indexing, powered by AI-generated metadata and multilingual search interfaces, and has released tools for linking publications and datasets using PIDs and controlled vocabularies. Its metadata strategy is informed by the principle that standards must serve the communities that produce and use data, rather than being imposed through library-centric models.

3.3.4 Open Science, Researcher Support and AI

TIB offers a broad range of services to researchers, such as:

- Open Access publishing via TIB Open Publishing, a diamond OA platform
- Data stewardship support for DFG-funded collaborative projects
- RDM and FAIR training for early-career researchers and data stewards
- DOI assignment, metadata curation, and long-term data archiving

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[69] https://av.tib.eu
[70] https://projects.tib.eu/datamanager
[71] arXiv: https://arxiv.org, Zenodo: https://zenodo.org, OpenAlex: https://openalex.org, NFDI: https://www.nfdi.de, EOSC: https://eosc.eu, RDA: https://www.rd-alliance.org, COAR: https://coar-repositories.org
[72] https://datacite.org

In parallel, TIB is leading the development of AI applications for scholarly communication, including ORKG Ask[73] (a natural language interface to research knowledge graphs), automated metadata extraction from scientific videos and datasets and secure deployment of GPT models for internal workflows. These initiatives aim to make research more discoverable, reproducible, and machine-actionable. TIB also advocates for responsible AI use, transparency, and inclusion of libraries in AI legislation and rights frameworks. As emphasised in both the TIB and LIBER interviews: "Libraries were not involved in shaping the AI Act - this needs to change.".

3.3.5 Workforce, Skills, and Cultural Change

TIB understands that digital transformation depends on a multi-skilled, interdisciplinary workforce. Alongside experts in librarianship and information science, it recruits staff with backgrounds in computer science, data engineering, and scientific software development.

To address evolving demands, TIB promotes continuous learning and participates in national-level training initiatives. However, it also recognises the need for cultural adaptation. As the interviewee noted, "staff need not just technical training, but a shift in mindset towards lifelong digital learning." Internally, TIB uses agile, cross-functional teams composed of project managers, developers, and metadata experts to deliver services and iterate on innovation.

3.3.6 Key Challenges and Future Directions

TIB identifies three overarching challenges that currently confront the research library sector. The first is fragmentation: a proliferation of overlapping services across institutions and consortia weakens the visibility, coherence, and long-term sustainability of library infrastructure. The second challenge is a loss of influence, as libraries risk being sidelined in the formulation of digital research strategies and national policy agendas unless they assert their leadership more forcefully. The third is institutional insularity. Libraries must break out of the so-called "library bubble" by engaging more directly with the wider research ecosystem, including research funders, IT services, and domain scientists.

The vision of the TIB in response to these challenges is, according to the interview, that "research libraries need to evolve from content curators to platform and service providers.". To this end, TIB advocates a number of strategic priorities. These include the development of cross-institutional infrastructure built on open standards, and the promotion of library-led innovation in areas such as artificial intelligence, persistent identifiers, and semantic metadata. In parallel, TIB supports the creation of legal frameworks that protect publicly funded research datasets from commercial exploitation, and calls for a principled commitment to transparency, ethics, and sustainability in the design of digital services.

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[73] https://ask.orkg.org

3.3.7 Conclusion

TIB presents a mature, pragmatic model for a digital research library. It is deeply embedded in scientific workflows, prioritises collaborative infrastructure, and balances innovation with sustainability. It demonstrates that:

Libraries must redefine their strategic role: The long-standing notion of libraries as sole gatekeepers of scholarly knowledge is no longer tenable. In a context where researchers access content through a multitude of platforms and digital services, libraries must shift their identity from content holders to infrastructure partners and service innovators. This requires a conscious repositioning. Not merely adding digital services, but redefining institutional value in terms of data support, interoperability, and strategic alignment with research workflows.

Innovation requires flattened governance and empowered practitioners: Excessive top-down structures and bureaucratic inertia remain barriers to innovation. Many libraries operate within rigid institutional frameworks that stifle agility and delay digital reform. A key lesson is that digital transformation cannot be successfully imposed from above; it must be co-created with those doing the work. Empowering practitioner networks - particularly data stewards, subject librarians, and research support staff - enables change to emerge from within, based on real needs and institutional knowledge. Rather than establishing new centralised consortia, which risk reproducing formalism without function, more effective outcomes are achieved through flexible, distributed models of governance where different institutions contribute according to capacity and expertise.

Researcher-centred service design is essential: Libraries must engage directly with researchers to understand and respond to their everyday practices. Services should not be designed based on legacy assumptions or internal capabilities alone. Co-designing with researchers ensures alignment with disciplinary norms, enhances adoption, and fosters trust. This shift from service provision to partnership demands not only technical competence but also strong interpersonal and communication skills across library staff.

Shared infrastructure is a prerequisite for national cohesion: Decentralised systems (such as those in Switzerland) are prone to fragmentation, with duplication of effort and inconsistent standards. Not every institution needs to become a data hub, but all must contribute to a coherent ecosystem. This means investing in shared, open infrastructure; adopting interoperable standards; and committing to collective governance models. Institutions with more capacity may take the lead on specific components, but impact is maximised only when services are interconnected and jointly stewarded.

Libraries must take a strategic position on AI and platform governance: Artificial intelligence and platform monopolies pose new challenges to the autonomy and ethics of scholarly communication. Libraries must move beyond passive adaptation and take a proactive role in negotiating terms with commercial publishers and technology providers. This includes advocating for

responsible AI use, negotiating research-friendly licensing clauses (particularly around text and data mining), and ensuring researcher rights are preserved in data governance models. Without a coordinated policy stance, libraries risk being sidelined in decisions that fundamentally re-shape their future.

For Swiss research libraries, TIB thus offers an example of how national mandate can be combined with international collaboration, technical sophistication with service pragmatism, and infrastructure development with policy advocacy. It is a model of how libraries can grow into research-integrated, data-driven institutions without losing sight of their values or their users.

3.4   ZBW (Leibniz Information Centre for Economics, Kiel)

3.4.1   Governance, Organisational Strategy and Funding

ZBW serves as Germany's central subject-specific research library for economics and oper-ates under a national mandate. As a member of the Leibniz Association, it is governed through a multi-layered structure composed of programme areas - such as metadata, user services, and digital infrastructures - and central service units, including IT, marketing, and administration. Each programme area is organised around cross-functional departments that take responsibility for service innovation, the development of digital strategy, and user engagement.

ZBW's approach to digital transformation is structured around four strategic pillars, as elab-orated in their current strategy (ZBW - Leibniz-Informationszentrum Wirtschaft, 2021). The first, *Understand*, focuses on monitoring and analysing trends in digital scholarship and information behaviour. The second, *Research*, involves applied research in computer science and the devel-opment of digital services. The third, *Implement*, is dedicated to building and deploying scalable, user-centred infrastructures. The fourth, *Enable*, concentrates on internal staff development and change management to support organisational adaptation.

These pillars are complemented by ZBW's long-term strategic vision, titled "Digital Library 2035." This initiative seeks to reconfigure internal workflows, moving from traditional library functions toward integrated models of information organisation and access. One consequence of this shift is the partial decentralisation of the library's holdings, with a growing proportion of content now hosted on publisher servers under national licensing agreements.

ZBW's funding model draws from multiple sources. Core institutional funding is provided by the federal government of Germany, the State of Schleswig-Holstein and the State of Hamburg, supplemented by occasional project-based grants from the DFG[74], the former federal ministry for

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[74] The Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) is the central self-governing research funding organisation in Germany. The DFG serves the sciences and humani-ties and promotes research of the highest quality in all its forms and disciplines at universities and non-university research institutions. https://www.dfg.de

Science and Education, and other federal ministries. In addition, strategic investment funds have been earmarked specifically for digital transformation and the library also maintains a substantial acquisitions budget.

Digital transformation imposes dual financial pressures: the need to sustain legacy systems while simultaneously investing in new infrastructure. ZBW addresses this tension through dedicated transformation pools and long-term strategic planning. Because Germany's research funding system does not offer continuous project-based support for digital library infrastructures, sustainability is ensured primarily through institutional budgeting, permanent staffing for core services, and early-stage assessment of a project's long-term viability.

3.4.2   Collaboration and National Role

ZBW maintains extensive collaborative relationships across Germany. A total of approximately 3,000 universities in Germany and abroad are institutionally affiliated with the ZBW, and 474 partnerships exist with libraries within the framework of national licences for economics. This shows the importance of ZBW as a leading player in negotiating national licences for electronic resources in the field of economics.

Among its principal collaboration initiatives are joint repositories developed with other infrastructure organisations, such as the University of Mannheim and GESIS[75] to support research data sharing, as well as the development of open access platforms, including the Journal of Comments and Replications in Economics[76]. ZBW is also actively engaged at the European level through its participation in the European Open Science Cloud (EOSC), where it holds a seat on the board of directors and has submitted applications together with other German research institutions to become one of the first EU service nodes.

In addition to its licensing and access work, ZBW leads several large-scale efforts in digital preservation and semantic infrastructure. These include the use of the Rosetta system for preservation, the publication of the STW Thesaurus for Economics[77] as linked open data, and the integration of knowledge graphs to enrich metadata and enhance information discovery services.

Given the complexity and resource demands of digital transformation, collaboration is seen as essential to ZBW's strategy. At the same time, the organisation remains wary of overly bureaucratic consortial models and instead prioritises agile, outcome-driven partnerships that deliver concrete results.

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[75] GESIS – Leibniz Institute for the Social Sciences https://www.gesis.org
[76] JCRE – Journal of Comments and Replications in Economics https://www.jcr-econ.org
[77] https://www.zbw.eu/stw/version/latest/about.en.html

3.4.3 Technology, Innovation and Infrastructure

ZBW is a committed advocate of open-source technology and operates a hybrid infrastructure that combines in-house servers with external Infrastructure-as-a-Service (IaaS) platforms. Its core systems include Invenio and DSpace for repository management, FOLIO for library services, and a suite of Atlassian tools to support internal knowledge sharing and workflow coordination[78].

The library continues to innovate across its technical environment. Among recent developments are AI-assisted cataloguing workflows that employ a "human-in-the-loop" approach to ensure quality and oversight, the integration of chatbots and AI-driven functions within discovery systems, and the launch of the Open Economics Guide[79], a digital platform designed to embed training and literacy into everyday research and learning workflows with respect to Open Science.

ZBW's infrastructure is designed with modularity and redundancy in mind, ensuring both long-term sustainability and resilience. According to the interview, cybersecurity is a growing priority, reflected in the library's rising investments in protective measures in response to escalating threats.

To support service continuity, ZBW assigns its core infrastructure to permanent staff and emphasises detailed documentation and succession planning. This approach ensures institutional memory and system stability across evolving project lifecycles.

3.4.4 Metadata, Standards, and Interoperability

ZBW is responsible for producing approximately 90% of all economics-related metadata in Germany, a role that demands high standards of quality, consistency, and interoperability. To meet this responsibility, ZBW ensures that its metadata is optimised not only for reuse but also for processing by artificial intelligence systems and integration into semantic web frameworks.

Its metadata infrastructure is built around several key elements. These include strict adherence to both national and international metadata standards such as Dublin Core, MARC21, and PREMIS. The use of persistent identifiers, specifically DOIs issued via DataCite, is a central part of its strategy to ensure traceability and long-term accessibility. ZBW also employs linked data architectures and maintains open APIs to support semantic interoperability with external systems. Furthermore, the Thesaurus for Economics (mentioned in chapter 3.4.2), a key controlled vocabulary developed by ZBW, has been published as a fully open and linked data resource.

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[78] Invenio: https://inveniosoftware.org, DSpace: https://dspace.org, FOLIO: https://folio.org, Atlassian: https://www.atlassian.com

[79] https://openeconomics.zbw.eu

Despite this robust internal framework, ZBW faces significant challenges in integrating external metadata. Many existing data infrastructures lack sufficient quality or standardisation, creating obstacles to seamless interoperability and limiting the utility of aggregated research data. Addressing these disparities remains a priority for ZBW's metadata strategy.

3.4.5 Open Science, Researcher Support, and Training

ZBW plays a leading national role in advancing open science, both as a policy advocate and as a provider of services. Since 2012, it has supported open access publishing and research data management (RDM), and it treats openness as a fundamental institutional value. Its key offerings in this area include EconStor, an open access repository with almost 300'000 open access documents, the previously mentioned Open Economics Guide, an annual Open Science conference[80], DOI registration services, and RDM tools that are embedded directly into the workflows of economic research. It also provides training on data lifecycle management and compliance with FAIR principles.

Economists within ZBW's community are generally familiar with open science practices, driven in part by publisher and funder mandates. Nevertheless, ZBW continues to push for broader cultural change, recognising that traditional publishing models and habits still exert influence in the field.

Staff training is a continuous process and is widely appreciated within the organisation. Tools from Atlassian, such as Confluence and Jira, are used extensively to support internal collaboration[81]. Training programmes focus on areas such as cataloguing, AI integration, and digital systems management. Upskilling has been a central part of ZBW's professional culture since the early days of workflow automation in 2010.

3.4.6 Challenges and Strategic Outlook

ZBW identifies several pressing challenges facing the research library sector. Foremost among these is the pace of technological change, which continues to outstrip the sector's capacity to adapt, leading to significant gaps in both skills and infrastructure. Legal uncertainty surrounding artificial intelligence and text and data mining (TDM) further complicates the landscape, as does the ongoing dominance of commercial publishers in controlling access to scientific outputs, such as research data and publications, often at the expense of open reuse. In parallel, the threat of cyberattacks is growing, posing substantial risks to the security and integrity of library systems.

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[80] EconStore: https://www.econstor.eu, Open Science Conference: https://www.open-science-conference.eu
[81] Confluence: https://www.atlassian.com/software/confluence, Jira: https://www.atlassian.com/software/jira

In response, ZBW has outlined a number of future priorities. A key focus is the deployment of AI as a supportive tool, particularly in areas such as metadata enhancement, content discovery, and user-facing services. To strengthen resilience, ZBW is also committed to advancing digital sovereignty through the adoption of open-source technologies and diversified infrastructure models.

Importantly, ZBW calls for a conceptual shift in how libraries define their mission. Metadata must be treated not simply as administrative by-product, but as research data in its own right. Libraries, accordingly, should position themselves as infrastructure providers, offering trusted, policy-aligned platforms for knowledge management, rather than merely acting as content custodians. ZBW maintains that embracing this expanded role is essential if research libraries are to remain central to the academic ecosystem and relevant in national and EU-level policy dialogues.

3.4.7 Conclusion

ZBW exemplifies a well-funded, discipline-specific research library that has successfully transformed into a digital, data-driven institution. Its governance combines strategic oversight with agile implementation. Its funding model allows for sustained investment in infrastructure. Its collaborations underpin national coordination and open science leadership.

For Swiss research libraries, ZBW provides the following lessons learned:

Innovation must be matched by organisational readiness: The pace of technological development, especially in the area of AI, has outstripped the ability of many library systems and workflows to adapt. This mismatch creates both strategic and operational risks. Libraries must be agile enough to explore new tools while remaining anchored in their institutional missions. One emerging solution is to embed AI as a supportive tool within human-centred workflows. This enables staff to focus on higher-value services, such as research support, curation, and policy engagement.

Libraries must defend researcher rights in the evolving licensing landscape: As publishers revise contracts to retain rights over text-and-data mining (TDM) and AI training, libraries must remain vigilant in protecting the interests of researchers and the public. Without proactive negotiation, there is a risk that access to openly available content may be restricted or monetised under new terms. This challenge underscores the need for libraries to take an active role in policy and licensing discussions, ensuring that research outputs remain reusable, interoperable, and machine-readable. Advocacy for permissive, research-friendly clauses in publisher agreements should be a core function of library leadership.

Metadata quality determines service value: Low-quality metadata remains a persistent obstacle to discoverability, interoperability, and automation. If metadata is inconsistent, incomplete, or locked within proprietary systems, the impact of digital services is significantly diminished. A priority for libraries must be to invest in both the creation and the liberation of metadata.

This means freeing library data from closed library management systems and exposing it through APIs and open formats so it can be used in research, AI applications, and discovery environments. It also requires human oversight to ensure semantic quality and alignment with disciplinary vocabularies.

Upskilling and staff retention are strategic priorities: Rapid digital transformation places new demands on staff, not only in technical areas such as data engineering and digital preservation, but also in soft skills such as communication, project management, and strategic thinking. Libraries must therefore invest in continuous professional development and offer attractive career pathways to retain experienced staff. Upskilling must be embedded into organisational culture, not treated as an occasional response to system changes.

Open, cooperative infrastructure offers a resilient path forward: Finally, the growing complexity of the digital environment makes collaboration indispensable. Libraries cannot address all challenges alone. Shared infrastructure, open standards, and federated services reduce duplication and allow institutions to scale services sustainably. Prioritising openness - not just in content, but in infrastructure design - will be key to long-term resilience. By working together, libraries can build ecosystems that support research, protect rights, and enable innovation across institutions and borders.

4 Case Studies of Individual Research Libraries

This chapter explores research libraries leading the way in digital transformation. It highlights how they're rethinking their roles, developing new business models, and building digital services that support modern research. The focus is on how these libraries manage change, work with others, and build flexible infrastructure in an increasingly data-driven environment.

4.1 University Library of the Vrije Universiteit (VU) Amsterdam

4.1.1 Governance

The University Library of the Vrije Universiteit (VU) Amsterdam plays a leading role in shaping the university's digital research infrastructure, with formal responsibility for the institutional policies on Research Data Management (RDM) and research software (Vrije Universiteit Amsterdam, 2024). It coordinates updates in direct collaboration with university leadership, including research heads and service stakeholders. Digital initiatives are overseen through a steering committee on research and research support, comprising representatives from the library, faculties, IT services, and central research offices. This inclusive structure ensures alignment across departments and promotes strategic buy-in.

According to the interview, the library prioritises pragmatism and service uptake over making sure that everyone knows exactly where the services are hosted. For instance, helpdesk services provided by the library are not necessarily branded as such, reflecting an operational philosophy that values functionality and user satisfaction above recognition. VU's governance approach is thus defined by shared responsibility, embedded expertise, and a division of labour between central support services and faculty-embedded roles.

4.1.2 Funding Models

Digital services at VU are primarily funded through internal university allocations and steering group-managed project and innovation budgets. The library coordinates with institutional governance structures to secure (national) funding for Open Science and RDM-related initiatives. The success of funding efforts depends heavily on internal advocacy and leadership engagement. Building trust and understanding with university decision-makers is crucial for long-term sustainability. Soft skills, such as effective communication, negotiation, and strategic alignment with university goals, are considered essential. The interview also mentions that the VU has received funding from the Netherlands Research Council to set up RDM support services. In particular, these funds have enabled the library (and also the faculties) to hire staff.

VU notes that while no fixed formula ensures stable funding, early involvement in institutional planning processes and evidence-based demonstration of service value significantly increase the likelihood of success. However, the Dutch higher education sector is currently under financial pressure, and academic salaries often fail to retain qualified IT staff. These limitations,

coupled with the prioritisation of commercial over open-source platforms by university IT departments, pose constraints to innovation and sustainability.

4.1.3 Collaboration Initiatives

The VU Amsterdam Library pursues a collaboration strategy that includes both internal and external partnerships. Internally, the library works closely with several key roles and units. Among these is the IT-for-research team, a group of 8 to 10 consultants with strong communication skills who support researchers in meeting their computational infrastructure needs. Faculty-based data stewards and privacy champions serve as essential intermediaries, linking researchers with library support and the university's legal services. Furthermore, a community manager for RDM and Open Science works in the library and connects researchers and faculties to central services (including the library) and each other. These roles form a crucial part of the library's operational model, enabling long-term relationships with stakeholders and ensuring that digital services are responsive to user needs.

Externally, the library is actively involved in national research data management (RDM) working groups and regularly participates and presents its work in events such as the Dutch Open Science Festival[82]. It maintains ongoing dialogue with DANS[83], the Dutch national centre of expertise and repository for research data, particularly around training and repository use. It also collaborates with the National Library of the Netherlands. VU Library also contributes to discussions within the European Open Science Cloud (EOSC), LIBER and OpenAIRE, though its engagement remains more focused at the national level, where collaboration is more practically embedded. Together, these internal and external partnerships allow the VU Library to draw on shared expertise and coordinate its efforts within larger infrastructure frameworks.

4.1.4 Infrastructure and Technology

VU operates its own institutional repository and CRIS system, not only for publications and data, but also with information about researcher profiles, research units, etc. [84] The library sees value in open-source alternatives but acknowledges a strong dependency on commercial solutions due to internal university policies. There is growing recognition that open infrastructures would be optimal in the long run, especially in light of emerging EU discussions on data sovereignty and public infrastructure investment. However, achieving this requires early buy-in and sustained commitment - resources not always available in the current funding climate.

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[82] https://opensciencefestival.nl

[83] https://dans.knaw.nl

[84] VU repository system: https://publication.yoda.vu.nl/ and
https://dataverse.nl/dataverse/vuamsterdam, VU CRIS system: https://research.vu.nl

AI is considered a strategic opportunity but remains in the early stages of adoption. The library plans to join the university-wide AI competence network (Vrije Universiteit Amsterdam, 2025), recognising potential uses in cataloguing, internal analytics, and metadata enrichment.

4.1.5 Staff Skills and Organisational Culture

The absence of formal LIS education in the Netherlands for over 15 years has created a knowledge vacuum. As professionally trained librarians retire, the library relies increasingly on ad hoc upskilling. Soft skills - especially communication, one-on-one support, and project management - are now regarded as more critical than technical depth. Librarians must also learn to manage project scope, avoid perfectionism, and understand their role in collaborative environments. Efforts to foster a digital-first mindset are ongoing, but uptake varies. Cultural change is gradual, and progress depends on leadership support, peer learning, and sustained exposure to digital challenges.

4.1.6 Strategic Challenges and Outlook

The VU Library has identified several significant barriers to advancing digital transformation. The most important challenge is that, despite sustained training and outreach, many researchers still have limited awareness of RDM principles or the role of the library in supporting digital scholarship. Another challenge is managing the tension between innovation and reliability, particularly when using open platforms that lack the backing of robust institutional IT support. Funding and staffing constraints further complicate efforts, exacerbated by structural limitations within the Dutch higher education sector. Another key issue is the library's dependency on central university IT services, which sometimes make platform decisions that do not fully align with library needs or preferences.

In response to these challenges, the library emphasises the value of collaborative service models, strong internal networks, and active engagement with university leadership. Looking ahead, future priorities include expanding the use of digital analytics to better understand how services are used, integrating AI into backend operations, and continuing to develop faculty-based Open Science expertise hubs.

4.1.7 Conclusion

VU Amsterdam Library provides a pragmatic, service-centred model of digital transformation. Swiss research libraries may find the following aspects of VU's model particularly pertinent:

Reframing the library–researcher relationship: A persistent challenge lies in how researchers perceive librarians - not as collaborators, but as background service providers. This perception makes it difficult to build the trust and visibility needed for meaningful partnerships. The library's technical competence is not in question; rather, what is often missing is a strategy for relationship-building grounded in familiarity and face-to-face interaction. VU addresses this challenge by embedding data stewards and privacy champions within faculties - trusted figures who serve as

bridges between researchers, the library, and institutional services. Important to note here, is that those positions are funded by the faculties, not the library. Additionally, there are also data stewards and RDM experts working in the library, collaborating with the data stewards at the faculties. The introduction of a community manager has also proven effective in acting as a bridge between researchers and the library. These roles are essential for shifting the perception of the library from a remote service desk to an integrated partner in research workflows.

Building adaptability through soft skills: While technical expertise is well-established in most libraries, perfectionism and limited soft skills among staff can hinder adaptability. Many librarians are trained to prioritise precision and structure, but in dynamic digital environments, flexibility and interpersonal communication are equally important. Upskilling staff in areas such as one-to-one communication, project management, and business thinking is crucial - not only to support researchers more effectively, but also to help librarians work with agility across internal teams and institutional boundaries. VU's emphasis on continuous professional development and cross-functional collaboration supports this shift.

Strengthening institutional integration: Libraries already function as data hubs in practice, yet this role is often not recognised or reflected in institutional policy. A key lesson from VU is the importance of strategic visibility - not only through marketing, but also through governance. Library leaders must be present in university leadership and policy committees, where digital strategy, data governance, and infrastructure decisions are shaped. Without a seat at the table, libraries risk being bypassed in favour of external providers or central IT units.

4.2   Sächsische Landesbibliothek – Staats- und Universitätsbibliothek (SLUB Dresden)

4.2.1   Research Data Management

SLUB Dresden plays a central role in supporting RDM for both TU Dresden and the broader Saxon research landscape. It co-operates with TU Dresden in running the "Service Center Research Data"[85], which offers a wide range of support services to researchers.

These services include:

- Regular training events on topics such as secure storage, data structuring, metadata creation, and FAIR data principles.
- Consultations on data management plans (DMPs), including support for grant proposals.
- Technical and conceptual assistance in implementing RDM practices within research projects.

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[85] https://tu-dresden.de/forschung-transfer/services-fuer-forschende/kontaktstelle-forschungsdaten?set_language=en

While awareness of the FAIR principles is relatively widespread across disciplines, their adoption is uneven. Notably, humanities disciplines such as linguistics and German studies demonstrate high uptake, driven by community norms and academic leadership. In contrast, STEM fields and medicine often perceive FAIR practices as burdensome rather than beneficial. To address this, SLUB aligns its support with disciplinary norms, recommending established discipline-specific or general-purpose repositories such as Zenodo rather than insisting on the use of its own local infrastructure. This researcher-centred approach enhances visibility and relevance, while also supporting interoperability and data reuse.

4.2.2 Collections as Data

SLUB Dresden maintains various digitisation programmes. It is responsible for key platforms such as:

- The SLUB Digital Collections Portal[86]
- The German Photography Archive (Deutsche Fotothek)[87]
- The Virtual Map Forum (georeferenced and enriched historical maps)[88]
- The Saxon Digitisation Programme[89]
- The SAVE project (digital preservation of Saxony's audiovisual heritage)[90]

Digitisation at the library is carried out both in-house and in collaboration with external service providers. The resulting digital content is further enriched through a range of methods, including crowdsourcing initiatives that support transcription and annotation, and the integration of OCR to enable full-text search functionality. To ensure long-term accessibility, the digitised materials are preserved using infrastructure built on open standards.

Legal compliance is ensured through active engagement with current developments with respect to copyright laws, policies, etc. However, uncertainties remain around AI training on copyrighted content, data scraping, and publisher-imposed restrictions. SLUB navigates these issues through library-led licensing models and by advocating for legal clarity at the national level.

Metadata for digitised collections is encoded using MODS and METS, and efforts are made to ensure machine-readability via open APIs and participation in linked-open-data efforts like Wikidata. Rather than developing a knowledge graph internally, SLUB contributes to broader semantic web initiatives to enhance visibility and interoperability.

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[86] https://digital.slub-dresden.de/en/digital-collections
[87] https://www.deutschefotothek.de
[88] https://kartenforum.slub-dresden.de
[89] https://sachsen.digital
[90] https://www.slub-dresden.de/en/explore/media-library/save-sicherung-des-audiovisuellen-erbes-in-sachsen

4.2.3 Training for Researchers

SLUB Dresden provides a multifaceted training programme to support researchers in data management, scholarly communication, and open science. This includes both introductory and advanced sessions covering DMP creation, FAIR data principles, metadata and documentation standards, digital preservation, research data publication, and archiving. These offerings are further strengthened by consultation services that are embedded directly into institutional research workflows. A key component of this support is the Open Science Lab[91] - a hybrid physical and virtual space that offers tailored guidance for Open Access publishing and collaborative approaches to data management. The Open Science Lab also serves as the primary event space for meetings, workshops and conferences for the Open Science Community in Dresden.

In addition to its training portfolio, SLUB's physical infrastructure is designed to meet the needs of contemporary research. The library provides spaces for individual study, group work, and digital experimentation, as well as areas that foster researcher engagement. Amenities include high-speed WLAN, refreshment options, family-friendly workspaces, dedicated zones for commuting students, and meeting rooms for collaborative research planning.

Together, these facilities and services position SLUB as both a social and intellectual hub, effectively bridging analogue and digital modes of academic work.

4.2.4 Legal, Technical and Strategic Considerations

Legal and Policy Context

SLUB actively participates in national digitisation and Open Science policy frameworks. It contributes to the NFDI consortia (NFDI4Culture, NFDI4Memory, NFDI4Ing)[92] and provides strategic input to the Saxon Ministry for Science, Culture and Tourism.

Legal barriers, particularly around intellectual property rights, AI, and data scraping, are viewed as pressing challenges. SLUB calls for updated legislation to ensure that public-sector data and collections can be legally reused and enriched in the age of artificial intelligence.

Technology and Interoperability

SLUB balances in-house development and usage of open-source software with selective use of commercial tools. Current priorities include:

- Migration to FOLIO[93] as a library management system
- Participation in Kitodo[94] for digital workflows

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[91] https://www.slub-dresden.de/en/participate/slub-open-science-lab-1
[92] NFDI4Culture: https://nfdi4culture.de, NFDI4Memory: https://4memory.de, NFDI4Ing: https://nfdi4ing.de
[93] https://folio.org
[94] https://www.kitodo.org

- Experimentation with AI for metadata enhancement and cataloguing

However, inconsistent metadata practices across library networks remain a barrier to interoperability. AI is regarded as a potential solution for normalisation, and SLUB sees great potential in the OpenGPT-X[95] initiative to develop GDPR-compliant large language models for academic use and actively tests their releases on library-specific use cases.

Sustainability and Staffing

SLUB faces several ongoing challenges in adapting to the demands of digital transformation. These include the ratio between (permanent) internal IT capacity and reliance on short-term project funding, which can hinder long-term planning and service continuity. The library is also coping with an ageing workforce and a slow pace of cultural change, both of which underscore the need for succession planning and targeted efforts to build digital skills across staff.

Despite these challenges, SLUB benefits from Germany's strong and modern information science education system, which continues to produce graduates well-prepared for roles in digital librarianship. The library actively supports training and knowledge transfer initiatives aimed at bridging generational divides and ensuring a sustainable, future-ready workforce.

4.2.5 Conclusion

SLUB Dresden offers a compelling example of how a research library can embrace digital transformation while remaining grounded in its institutional mission and public service ethos. Its approach demonstrates how infrastructure, services, and strategy can be aligned to support open science, digital scholarship, and researcher engagement. At the same time, SLUB's experience reveals structural and cultural barriers that continue to challenge even well-established libraries. The following lessons, drawn from SLUB's strengths and limitations, offer practical guidance for Swiss research libraries navigating similar transitions.

Further development in cooperative structures: Wherever possible, SLUB Dresden seeks to connect with existing networks, special interest groups, and specialist groups, or to collaborate with other research infrastructure providers in order to ensure that the (further) development of services and infrastructure is efficient and sustainable in the long term.

Researcher-centred services build relevance and trust: SLUB's success is rooted in its pragmatic, researcher-focused approach to RDM. Rather than applying a one-size-fits-all model, the library has developed services that respond to specific disciplinary needs and are embedded in institutional research workflows. This model ensures uptake, fosters trust, and positions the library as an active partner in the research lifecycle. For Swiss libraries, this suggests that

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[95] https://opengpt-x.de

meaningful engagement with faculty requires more than technical tools - it requires co-developed solutions that respect the diversity of research cultures and career stages.

Digital services gain value through integration, not exclusivity: One of SLUB's notable strengths lies in the way it integrates its digitised collections into both national and international infrastructures. Rather than competing for visibility through standalone repositories, the library has prioritised discoverability, interoperability, and metadata quality. This approach supports a broader ecosystem of access and reuse, enabling collections to reach researchers across platforms and borders. For Swiss institutions, the lesson is clear: in a federated system, value lies not in controlling access, but in connecting collections to shared infrastructures. Repository exclusivity should be deprioritised in favour of visibility, standardisation, and long-term access.

Training must be open, inclusive, and discipline-aware: SLUB's training programmes stand out for their openness and inclusivity. By tailoring offerings to researchers' disciplinary contexts and career stages, and by delivering them through accessible platforms such as the Open Science Lab, SLUB ensures that training is relevant and scalable. Many similar initiatives already exist in the Swiss research library landscape, and this is a nice confirmation to continue with this model

Legal and strategic engagement is essential: SLUB engages proactively with emerging legal and ethical questions around AI, open data, and research infrastructure governance. Rather than waiting for regulatory frameworks to catch up, the library combines legal awareness with infrastructure development and policy dialogue. This strategic engagement allows it to anticipate change, advocate for researcher rights, and participate meaningfully in shaping national and European policy. For Swiss research libraries, the implication is that legal expertise and advocacy are no longer optional. Libraries must build internal capacity to interpret policy, negotiate rights, and participate in broader conversations around data sovereignty, reuse, and AI regulation.

Systemic challenges require systemic solutions: Despite its achievements, SLUB continues to face structural barriers that resonate with the Swiss context. Reliance on project-based funding and temporary staffing undermines long-term planning and institutional memory. Faculty perceptions of the library remain largely tied to literature provision, limiting its visibility as a digital infrastructure provider. Metadata inconsistencies across institutions hamper integration and collaboration. To address these issues, SLUB has invested in open-source infrastructure, aligned with national initiatives, and applied AI selectively to streamline cataloguing and normalise metadata. It has also taken care not to lose sight of the library's social function, resisting the temptation to digitise at the expense of physical spaces and human-centred services.

Balance innovation with sustainability: A final lesson from SLUB is the importance of balancing digital innovation with operational sustainability. Rapid expansion of services, especially under short-term funding, can place strain on staff and systems. SLUB's approach - to focus on modular, open, and collaborative infrastructures - offers a model for sustainable innovation. This

includes careful prioritisation, shared governance, and the retention of socially meaningful in-person services alongside digital expansion.

4.3   Universitätsbibliothek Wien (Vienna University Library)

4.3.1   Governance and Funding Models

The Vienna University Library is closely integrated into the university's institutional governance for digital transformation. It reports directly to the Vice Rectorate for Digitisation, which oversees the university's digital strategy and related projects. This structural alignment ensures that the library is directly involved in institutional decision-making concerning digital services, infrastructure, and RDM.

Within this framework, the library leads several key digital initiatives. It coordinates a growing network of data stewards, embedded at the faculty level to provide local, discipline-specific support for RDM. It also manages the university's institutional repository, PHAIDRA, and operates the Austrian Social Science Data Archive, positioning itself as a national actor in long-term data preservation. Despite these achievements, visibility remains a challenge. Many researchers are unaware that these services are delivered by the library. Enhancing institutional recognition and articulating the library's strategic value continue to be priority tasks.

Funding for digital services comes from a mix of institutional budgets, external research grants, and consortial or project-based schemes, such as the national "Shared RDM"[96] initiative. While there is consistent institutional support for core functions, a large portion of the library's digital innovation still depends on temporary, project-specific funding. This raises concerns about sustainability, particularly regarding the continuity of technical infrastructure and staffing. A key element in addressing this challenge is securing permanent contracts for IT and digital services staff, funded through the university's core budget. Nevertheless, legacy projects continue to be affected by staffing constraints and short-term financing.

Leadership renewal has been instrumental in driving change. The appointment of a new library director with a clear vision for research services has raised the internal profile of the library and helped redirect institutional funding toward more forward-looking digital initiatives.

4.3.2   Collaboration Initiatives

Collaboration is a cornerstone of the Vienna University Library's strategic approach. The library maintains a wide range of partnerships at the local, national, and international levels. Nationally, it collaborates in Shared RDM, an Austrian initiative aimed at developing shared research data tools and services, including electronic lab notebooks and repository platforms. Within the university, the library works closely with IT services, legal departments, and research offices to ensure that its data services are both comprehensive and compliant with legal and ethical

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[96] https://forschungsdaten.at/sharedrdm

standards. At the international level, the library aligns its efforts with the goals of the European Open Science Cloud (EOSC). While Austria's integration into EOSC is still evolving, the library sees cross-border collaboration as vital for building interoperable, sustainable digital research infrastructure. As mentioned in the interview, for the Vienna University Library, effective collaboration must go beyond formal agreements. It must be practical, researcher-oriented, and grounded in everyday workflows - supporting the adoption of tools and services that are aligned with the specific needs of individual disciplines.

4.3.3   Research Data Services, Open Science and Infrastructure

The Vienna University Library operates a comprehensive support framework for research data management (RDM). Central to this framework is a growing network of data stewards - currently numbering five, with plans to expand to twelve - who are embedded within faculties to provide tailored consultation and training. The library also maintains a centralised institutional repository, PHAIDRA, which is built on the Fedora platform and used for managing publications, theses and research data. Additional support is offered through consultations, workshops, and policy guidance, all coordinated via a dedicated RDM portal[97].

Despite this infrastructure, the uptake of the institutional repository remains limited. To better serve researchers and increase the discoverability of outputs, the library encourages the use of discipline-specific repositories, particularly those that are well-integrated into global research networks. This pragmatic approach respects disciplinary norms while still promoting compliance with FAIR data principles.

An important aspect of the library's communication strategy is the distinction it makes between FAIR and Open data. This is particularly relevant for researchers in the humanities, who may be hesitant about open publication but can still engage with FAIR-aligned practices that enhance internal organisation, interoperability, and data reuse.

In terms of infrastructure, the library prioritises in-house and open-source solutions wherever feasible. Key examples include the use of PHAIDRA[98] as the institutional repository, internal deployments of ChatGPT for staff use (configured to maintain data privacy) and plans to develop preservation strategies for dynamic web content.

However, integration with external infrastructures, such as the European Open Science Cloud (EOSC), continues to present challenges. Interoperability and metadata quality are inconsistent across systems, and while the library currently uses Dublin Core as its metadata standard, it recognises the need for further standardisation and alignment with broader frameworks.

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[97] https://rdm.univie.ac.at
[98] https://phaidra.univie.ac.at

One notable gap in Vienna University Library's current infrastructure is the absence of a linked data or knowledge graph strategy. Nonetheless, the library identifies artificial intelligence and semantic enrichment as strategic priorities for future development.

4.3.4 Digital Skills and Staffing Challenges

Vienna University Library, like many academic libraries, faces ongoing challenges in recruiting and retaining qualified staff, particularly in technical roles. Attracting IT personnel has proven difficult due to the significantly higher salaries offered in the private sector. By contrast, the recruitment of data stewards has been more successful; these roles are often filled by former researchers who seek professional stability while maintaining close ties to the academic environment.

The library benefits from a strong national ecosystem that includes recognised programmes in library and information science as well as in data stewardship. These programmes provide a solid foundation for developing a digitally skilled workforce.

To further address internal skill gaps, University of Vienna has introduced a number of measures, including an internationally accredited data stewardship certificate and regular staff training opportunities in RDM, Open Science, and digital tools. However, the absence of a comprehensive, formalised programme dedicated specifically to digital skills development remains a notable shortcoming. Strengthening internal training provision and creating institutional incentives to attract and retain IT professionals are therefore seen as strategic priorities for ensuring the library's long-term digital capacity.

4.3.5 Strategic Challenges and Outlook

The Vienna University Library faces a number of strategic challenges as it continues to evolve into a modern research infrastructure provider. One of the most pressing issues is the persistent undervaluation of library services, both by researchers and by institutional leadership. Although the library manages critical components such as the institutional repository and the data stewardship network, many users remain unaware of its contributions. Changing this perception requires continuous advocacy and the communication of success stories that clearly demonstrate the library's role in enabling research.

Another challenge lies in the reliance on project-based funding models, which undermines the sustainability of digital services. While the library has successfully obtained funding for national and institutional initiatives, the dependence on time-limited grants makes it difficult to retain staff and maintain continuity in infrastructure development. The appointment of a new library director has already improved internal visibility and opened the door to more stable funding streams, but ensuring long-term sustainability remains an ongoing concern.

Technical limitations also constrain innovation. Legacy systems are difficult to modernise, and the library must balance its preference for open-source solutions with institutional

dependencies on commercial platforms. This tension extends to IT staffing: while it is relatively easy to recruit data stewards - often from within the research community - it is significantly harder to attract qualified IT professionals, who are in high demand and command higher salaries outside the academic sector.

Despite these barriers, the outlook remains optimistic. The library is actively pursuing a shift in institutional culture through targeted communication strategies and increased participation in university governance. Its evolving role - from service provider to co-creator of research infrastructure - demands not only technical innovation but also effective change management. Future priorities include integrating AI into discovery services, enhancing legal and metadata interoperability, and embedding the library more deeply into the university's research processes.

The Vienna University Library recognises that success in this environment depends not just on the deployment of new tools, but on building trust, fostering institutional partnerships, and maintaining a clear, user-centred vision. Its ability to adapt, influence, and innovate will determine its long-term role within both the university and the broader research infrastructure ecosystem.

4.3.6 Conclusion

The Vienna University Library illustrates how a university library can navigate digital transformation through strategic governance, collaborative infrastructure development, and faculty-embedded service delivery. It balances technical innovation with pragmatic service design and acknowledges the importance of institutional culture in enabling sustainable change.

One of the most important lessons for Swiss research libraries is the need to embed library leadership within the university's digital governance structures. By participating directly in institutional decision-making, the library ensures that its services and expertise are aligned with broader strategic priorities. This visibility allows the library to advocate for its role not just as a support unit, but as a central actor in the university's research and data infrastructure.

Another key insight is the value of investing in cross-functional collaboration. University of Vienna's use of faculty-based data stewards and privacy champions demonstrates how trust can be built through proximity and responsiveness. These roles help bridge gaps between researchers, IT services, and the library, making data services more visible, tailored, and effective.

The library also places strong emphasis on communication. Enhancing researchers' understanding of what the library offers, and why it matters, is essential for increasing uptake and institutional support. Communication is not simply about visibility but about establishing the library's relevance in the daily workflows of researchers.

Finally, the library's efforts underscore the importance of sustainability. Future-ready digital services depend on stable staffing, long-term funding models, and infrastructure that is modular

and adaptable. The Vienna University Library avoids the trap of overextension by focusing on flexible, scalable systems that can evolve alongside the university's needs.

4.4 University of Leeds Library

4.4.1 Governance

The University of Leeds Library is deeply integrated into institutional governance and research infrastructure planning. It formally manages the RDM policy[99] and is embedded in the university's broader digital transformation strategy, particularly through the "Digital Futures"[100] programme.

Digital initiatives are governed via university-wide boards and digital programme steering groups, in which the library plays a leading role. This involvement enables the library to act as a convener between professional services, academic departments and digital education units. It also ensures strategic alignment with institution-wide priorities, including AI adoption and infrastructure development.

The long-term aim of digital transformation at Leeds is to embed digital capabilities so seamlessly across the university that a dedicated digital strategy becomes redundant. In this context, the library is not merely a service provider, but a strategic partner in innovation.

4.4.2 Funding Models

The University of Leeds Library operates under a layered funding model that reflects the range and scope of its services. Core library functions are financed through the university's institutional budget, providing a stable foundation for day-to-day operations. Strategic projects - such as initiatives involving artificial intelligence, infrastructure upgrades, and the redevelopment of repository platforms - are supported through competitive, project-based grants.

While the library does contribute to research grants indirectly, there is a growing recognition that it should be more explicitly included in the budgeting of externally funded projects. This includes being properly costed and credited for the infrastructure and services it provides to support research. Philanthropic funding and support from external consortia are also seen as potential sources of income, although they have not yet been systematically integrated into the library's financial planning.

To ensure long-term sustainability, the library recognises the need for its infrastructure to be incorporated into institutional grant applications and cost recovery frameworks. This requires ongoing advocacy, clear evidence of the library's impact, and alignment with funder

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[99] https://library.leeds.ac.uk/info/14062/research-data-management/68/research-data-management-policy

[100] University of Leeds Library. Forward plan 2022-2025. Digital Futures. https://library.leeds.ac.uk/info/1605/strategy-and-policies/217/forward-plan-2022-2025/2

expectations. Without such strategic positioning, there is a risk that essential digital services may be underfunded or overlooked in long-term planning.

4.4.3   Collaboration Initiatives

The University of Leeds Library collaborates closely with both internal and external partners to deliver and develop its services. Internally, the library has strong partnerships with the university's IT services and digital education teams to ensure technical and pedagogical alignment. The library also benefits from a distributed network of faculty-based support staff, including data stewards and community managers, who help to integrate library services within disciplinary contexts. Collaboration with the university's research offices further ensures that RDM, repository usage, and training activities comply with requirements and support broader institutional goals.

Externally, the library participates in a variety of national and international initiatives. At the national level, it contributes to policy discussions through its engagement with UK Research and Innovation (UKRI)[101], supports the development of Open Access frameworks, and takes part in ongoing reviews of UK data policy. Internationally, Leeds participates in collaborative projects with institutions such as Yale and Northwestern University, particularly in the area of AI-enhanced discovery systems.

In addition to these partnerships, the library co-manages three major repository services as part of the White Rose Consortium, White Rose Research Online, White Rose eTheses Online, and the Leeds Research Data Repository[102]. These platforms are currently undergoing infrastructure upgrades and are regarded as essential components of the university's commitment to open science.

4.4.4   Infrastructure and Technology Strategy

Acknowledging the limitations posed by technical debt and legacy systems, the University of Leeds library is currently upgrading its repositories to enable better integration with external, discipline-specific services. As part of this process, considerations around access, long-term preservation, and data reusability are being incorporated into the redesign of the infrastructure from the outset.

Leeds employs a tiered infrastructure model to support its diverse needs. Standardised applications are supported by corporate platforms, such as Microsoft services; controlled environments are maintained for innovation and secure activities, such as AI training; and open-source tools are adopted to provide flexible, community-driven services. Throughout this work,

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[101] https://www.ukri.org

[102] White Rose Consortium: https://whiterose.ac.uk, White Rose Research Online: https://eprints.whiterose.ac.uk, Whote Rose eTheses Online: https://etheses.whiterose.ac.uk, Leeds Research Data Repository: https://researchdata.leeds.ac.uk

decisions are guided by a commitment to GDPR compliance, institutional autonomy and long-term sustainability. Where feasible, the library favours open-source solutions, provided they are financially and technically viable.

4.4.5   AI, Legal, Policy, and Ethical Engagement

Artificial intelligence is viewed as a transformative force for the future of research library services. The library is already piloting several AI applications, including the integration of large language models (LLMs) for metadata enrichment and content discovery, the use of generative tools, such as ChatGPT[103] and CoPilot[104], to support both researchers and staff. In parallel with these technical developments, Leeds is playing an active role in shaping institutional AI policy. The library recognises the importance of taking the lead in addressing the ethical, legal, and governance implications of AI, particularly regarding issues such as algorithmic bias and digital sovereignty.

The university complies with UKRI's mandates on Open Access and research data management. However, library stakeholders continue to advocate for several key improvements to the broader policy environment. These include clearer and more permissive provisions for text and data mining (TDM), particularly for non-commercial research, as well as the development of researcher-friendly intellectual property and reuse policies, and legal reform to enable the responsible and transparent use of training datasets for AI.

In this context, the library acts as a policy translator, interpreting national and international frameworks and embedding them in institutional strategies and service models. Through this role, the library ensures that technological innovation is accompanied by informed governance and research-aligned practice.

4.4.6   Workforce and Skills

Like many of its counterparts across the UK, the library is facing several challenges related to staffing. One of the core issues is that library and information science (LIS) education in the country feels outdated and often fails to equip graduates with the skills needed for modern digital roles. Additionally, the library struggles to recruit and retain specialists in areas such as IT and metadata management, largely due to salary constraints that make it difficult to compete with other sectors. Funding pressures have also led to roles becoming increasingly generalised, which poses a risk to maintaining deep, domain-specific expertise, particularly in areas such as preservation and digital cataloguing.

To address these challenges, the library has adopted several strategies. It invests in in-house training and fosters communities of practice to support continuous learning and skills

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[103] https://chatgpt.com
[104] https://copilot.microsoft.com

development. Where possible, it recruits subject-matter experts to fill key roles, and it places strong emphasis on succession planning to ensure that institutional knowledge is retained over time.

4.4.7 Conclusion

The ability of libraries to act as full partners in digital scholarship is constrained by ageing infrastructure, limited visibility in funding structures and persistent gaps in technical staffing. However, examples such as the University of Leeds Library show that these challenges can be overcome. By aligning leadership, infrastructure and institutional strategy, libraries can evolve from service providers to strategic enablers of research. The following lessons offer practical guidance to Swiss libraries seeking to fulfil this role.

Redesign infrastructure for scalability and future-readiness: Many research libraries still rely on outdated systems that cannot support scalable access, AI applications, or modern digital scholarship. Repository and metadata platforms must now facilitate machine-actionable data, semantic enrichment, and interoperability. The University of Leeds offers a useful model in this regard, combining standardised corporate tools, secure innovation environments, and flexible open-source solutions in a tiered approach. Swiss libraries could adopt a similarly modular, standards-based infrastructure to ensure adaptability and long-term relevance.

Close the skills gap through internal investment and targeted hiring: The shortage of specialised technical staff is a recurring problem not only in Leeds but also in Switzerland, exacerbated by outdated LIS curricula and limited budgets for professional development. To offset these issues, libraries should invest in in-house training and cultivate communities of practice. Where feasible, they should also hire domain experts to build critical capabilities. Upskilling must be treated as a long-term organisational investment, not a one-off intervention. Without internal expertise, even the best infrastructure cannot be sustained.

Position the library as a strategic connector: In many Swiss institutions, the library remains on the margins of strategic discussions (Zentralbibliothek Zürich et al., 2018). Researchers often view RDM and FAIR practices as compliance tasks rather than enablers of reproducible and open science. Meanwhile, the library's contributions to research infrastructure and data stewardship are often overlooked in funding structures. The Leeds example suggests that libraries must act as conveners, connecting academic staff, IT services, legal departments, and research offices. This requires both technical proficiency and diplomatic ability.

Advocate for funding structures that reflect the library's research role: Libraries are essential to research through data management, preservation, and reuse, yet they are often treated as unpaid contributors. This approach undermines their sustainability and visibility. Swiss research libraries should push for funding models that formally recognise their infrastructure and staffing in research proposals. Taking the lead on their own projects, especially in areas such as

knowledge infrastructure, AI ethics, and open metadata, would further establish their role as active research partners.

Take a leadership role in AI and open science governance: As AI becomes an integral part of digital scholarship, it is crucial that libraries not only adopt new tools but also help shape the frameworks that govern their use. Leeds has shown that libraries can influence how data is managed, shared and protected by engaging actively in institutional AI and open science governance. For Swiss research libraries, this means securing leadership roles in university-wide AI committees, open science boards, and data governance groups. This will ensure that library values, such as openness, equity, and long-term preservation, are embedded in the technological decisions that will shape research for years to come.

5 Comparative Analysis of Interviews and their relevance for Swiss Research Libraries

5.1 Comparison of international, national, and institutional approaches

The digital transformation of research libraries is being shaped at multiple levels, through international networks, national infrastructure institutions, and individual libraries, each offering distinctive models of governance, service innovation, and policy engagement.

International Networks such as LIBER, OCLC, IFLA, GASCO, and CAUL play a key role in shaping the digital transformation of research libraries by offering strategic frameworks, coordination platforms, and sector-wide guidance. LIBER focuses on long-term planning and collaboration among European research libraries, with an emphasis on open science, digital services, and workforce development. OCLC advances metadata standards and collaborative infrastructure, while IFLA contributes ethical and normative frameworks to guide global library practice. GASCO exemplifies regional cooperation in licensing and digital content negotiation, and CAUL illustrates the impact of coordinated national efforts in training, open access, and infrastructure sharing. The interviews also showed that different policy levels are shaping the digital strategy of research libraries, with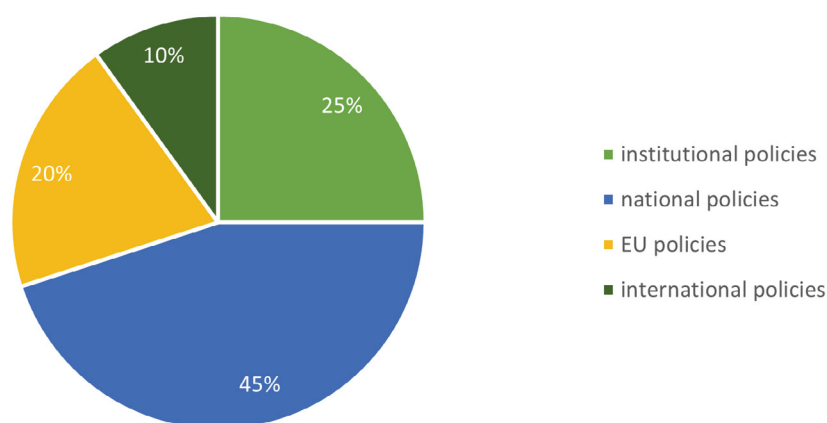 national policies being the most relevant (see Figure 3 - Policies and frameworks influencing digital strategy of research libraries. Percentages denote the occurrence of mentions in the interviews.).

Figure 3 - Policies and frameworks influencing digital strategy of research libraries. Percentages denote the occurrence of mentions in the interviews.

National-Level Institutions acting as innovation incubators, including the KB (Netherlands), NL Finland, TIB (Germany), and ZBW (Germany), demonstrate the value of national mandates and dedicated funding streams for digital innovation. The KB exemplifies a "digital-first" national library model, embedding agile governance and environmental sustainability. The National Library of Finland shows the success of national collaboration between memory institutions in services like Finna, the federated discovery portal offering metadata from hundreds of Finnish

organisations, thus elevating NL Finland to a de-facto data hub. TIB focuses on semantic infrastructure, AI-supported services, and open platforms, while ZBW integrates advanced metadata frameworks with a strong open science advocacy.

Institutional Leaders such as the University of Leeds, Vienna University Library, SLUB Dresden, and VU Amsterdam show how individual research libraries, even within decentralised systems, can influence institutional research strategy. Leeds is notable for embedding library governance into institutional transformation boards, while Vienna University Library leverages faculty-embedded data stewards. SLUB Dresden excels in integrated RDM services and legal policy engagement, and VU Amsterdam prioritises researcher-centred design and soft skill development.

These three levels are interconnected: institutional innovation often depends on national infrastructure and international standards, while practical insights from libraries feed back into broader policy frameworks.

5.2 Identification of strengths, weaknesses, and transferability of best practices to Switzerland

The analysis reveals a number of practices that are potentially transferable to the Swiss research landscape. The following Table 1 summarises key strengths, challenges and their transferability:

Table 1 - Comparative strengths and weaknesses, as mentioned by the interviewed institutions, with their transferability to the Swiss research library landscape

Area	Strengths (Best Practices	Weaknesses / Cautions	Transferability to Swiss Context
Governance	Integrated steering committees (Leeds, Vienna University Library, NL Finland); agile structures (KB, ZBW)	Libraries marginalised in digital policy planning (OCLC, IFLA)	Could be adopted via swissuniversities and local governance reforms
Funding	Dedicated digital transformation funds (ZBW, TIB); project-grant diversity (CAUL)	Project dependency and staff precarity (Vienna University Library, SLUB)	Swiss libraries could advocate for continuity in ORD-linked funding

RDM Services	Federated, discipline-aware models (SLUB, VU); consortial scaling (OCLC, TIB, NL Finland)	Fragmentation and redundancy in infrastructure (SLUB, Vienna University Library)	Alignment with national ORD strategy
Training & Skills	Digital Dexterity programmes (CAUL); Data Steward networks (Vienna University Library), interdisciplinary staff development (TIB)	Skills gaps and burnout; lack of formal LIS training (IFLA, KB, VU), difficulty recruiting technical profiles (VU, Leeds)	Calls for national training strategy and LIS revitalisation
AI and Innovation	Responsible AI pilots (Leeds, OCLC, SLUB, TIB, NL Finland); integration with metadata systems (ZBW, NL Finland)	Lack of legal clarity; licensing concerns (GASCO, KB, NL Finland), ethical oversight still emerging (IFLA)	Requires legal reform and strategic procurement policies
Legal & Ethical Framing	Policy advocacy on IP, TDM, and data rights (LIBER, IFLA, GASCO), proactive engagement with AI regulation (TIB, KB, NL Finland)	Fragmented legislation: libraries not included in AI regulation debates	Opportunity for Swiss libraries to influence national frameworks
Metadata & Standards	Linked Open Data, knowledge graphs (TIB, ZBW, NL Finland); persistent identifiers (OCLC, NL Finland)	Quality inconsistencies; interoperability issues (SLUB, OCLC)	Supports Swiss aims under ORD and EOSC-linked efforts

The federated approaches to RDM and Open Science, the use of soft skills to build library influence, and proactive alignment with national policy agendas stand out in particular as possible levers for Swiss research libraries. However, caution must be exercised when transferring resource-intensive models into smaller or more decentralised Swiss institutions.

5.3 Legal, financial, and governance implications

The successful transfer of international best practices to the Swiss context depends heavily on structural, legal, and financial frameworks. Without addressing these foundational issues, even the most promising models risk falling short in implementation.

5.3.1 Legal Implications

Swiss research libraries operate within a shifting regulatory landscape that presents both opportunities and challenges, particularly in areas such as artificial intelligence, copyright, and research data reuse. As observed in the cases of e.g. the KB, the NL Finland and GASCO, insufficient legal protections against data scraping, unclear provisions for text and data mining (TDM), and the absence of robust frameworks for AI training on library collections pose significant risks. To navigate these challenges, Swiss stakeholders should advocate for clearer and more research-friendly legislation. This includes reforming copyright law to enable TDM for scholarly purposes, clarifying reuse rights for Open Access and Open Data, and ensuring that libraries are actively involved in shaping national strategies for AI and digital sovereignty.

5.3.2 Financial Implications:

One of the recurring themes across the case studies, among others mentioned in the interviews by SLUB Dresden and Vienna University Library, is the risk posed by short-term, project-based funding. While such models can stimulate innovation, they often fall short of supporting sustained development. An issue that Swiss libraries are struggling with, as well. A more durable approach to digital transformation in Swiss libraries will thus require stable, long-term funding mechanisms. This, together with advocacy and value demonstration of library services, was mentioned as key strategies to ensure long-term financial sustainability (Figure 4). In practice, this would include establishing permanent budget lines for key digital infrastructure roles and ensuring that libraries are explicitly included in the financial planning of research projects. Institutions such as Leeds and CAUL illustrate the benefits of embedding libraries into research grant structures and advocating for their recognition as active research partners. In parallel, Switzerland could benefit from supporting shared funding models, through national consortia or initiatives similar to Shared RDM Austria, that spread costs while strengthening collaboration.
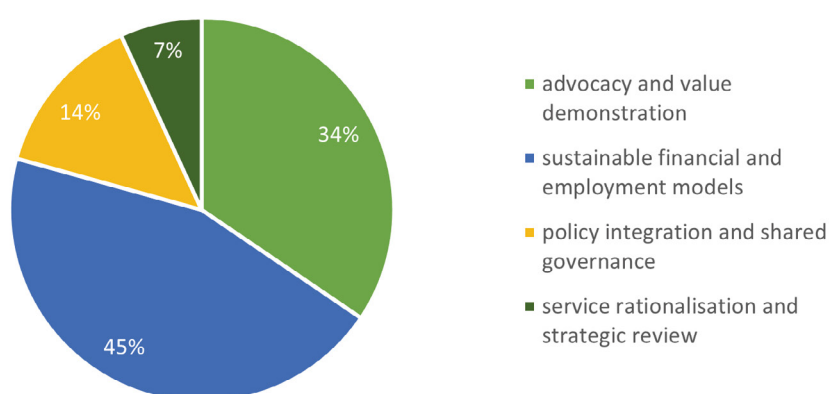

Figure 4 - Strategies to ensure long-term funding and sustainability of research library services. Percentages denote the occurrence of mentions in the interviews.

5.3.3 Governance Implications:

Swiss research libraries can draw important lessons from international examples that demonstrate the value of integrated and collaborative governance. One key recommendation

mentioned again and again, is for library leaders to be actively involved in institutional digital governance structures and national strategic bodies. Their presence ensures that library perspectives are embedded in broader policy and infrastructure decisions, rather than treated as peripheral support functions. Key stakeholders to demonstrate the library value to and ensure collaboration with are the university governance leadership on one hand, and the administrative services and research support units on the other, as shown in Figure 5.
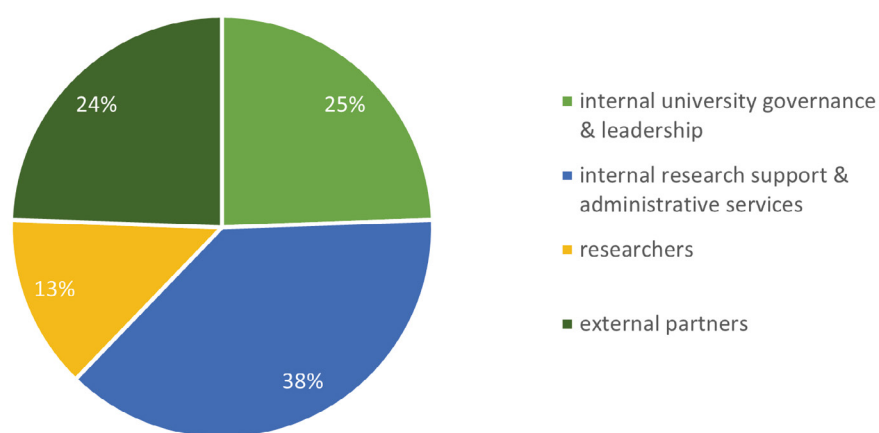

Figure 5 - Key stakeholders as perceived by interviewed research libraries. Percentages denote the occurrence of mentions in the interviews.

Equally important is an active involvement in governance, is the shift toward more agile, cross-functional team structures, an approach used effectively by institutions like the KB and ZBW. These models help break down silos, enabling faster innovation and better coordination across departments. As the experiences of OCLC and IFLA highlight, building "social interoperability" (the ability of teams and departments to communicate, collaborate, and align their goals) is as vital as technical integration.

5.4 Future trends and key themes for the evolution of research libraries

The transformation of research libraries is accelerating in response to shifts in technology, research practices, and policy frameworks. The interviews identified several overarching trends that are likely to shape the sector over the next decade. These trends are not isolated but mutually reinforcing, pointing toward a model of the library as a proactive, policy-engaged, and digitally sophisticated infrastructure provider.

AI integration as a strategic driver: AI is widely viewed as a transformative force in research libraries. Many institutions are already experimenting with AI-enhanced metadata enrichment, discovery interfaces, and workflow automation. Crucially, libraries are also beginning to influence AI governance. Several institutions are advocating for libraries to have a seat at the table in policy discussions, particularly around text-and-data mining, ethical AI use, and rights to public data. Thus the AI, ethics and data governance topic complex, together with open infrastructures,

as discussed in the following section, have been clearly defined in the interviews as leading trends, expected to be relevant for research libraries in the next five to ten years (see Figure 6).
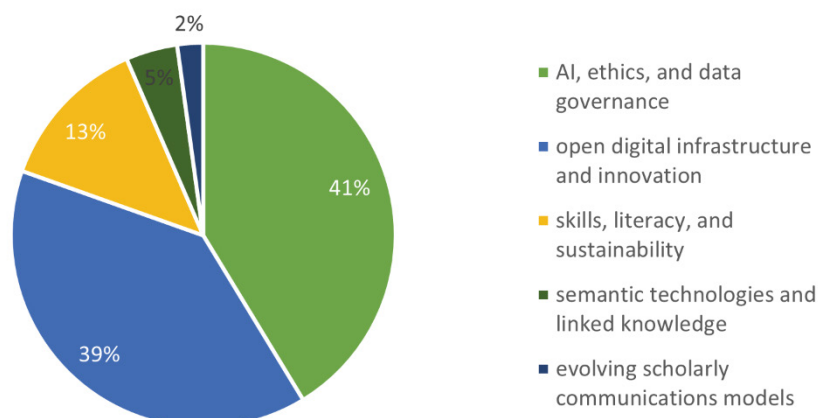

Figure 6 - Key trends relevant for research libraries, according to the interviews. Percentages denote the occurrence of mentions in the interviews.

Libraries as infrastructure providers and data hubs: Several interviewed institutions mentioned the need for research libraries to redefine themselves as infrastructure providers. They should be responsible not just for content access, but for managing research data, sustaining repositories, and enabling interoperability with national and international platforms. This evolution is visible in the shift toward "library-led" digital strategies. The role of libraries as trusted data hubs is also gaining traction. Many interviewees suggested that libraries should formally adopt this label to better reflect their growing involvement in managing digital corpora and metadata infrastructure. As the boundaries between research infrastructure, data services, and scholarly communication continue to blur, the library's capacity to act as a connector, enabler, and advocate will be essential to its long-term role.

Research policy and ethical engagement: There is increasing recognition that libraries must take an active role in shaping research policy. Rather than simply implementing standards, libraries are positioning themselves as stakeholders in discussions about open access, data reuse, and digital sovereignty. Institutions such as IFLA and LIBER argue that advocacy must become a professional responsibility of libraries, not an extracurricular task. Generally, the strategic integration of libraries within universities and their policy leadership has been defined as the most important theme for the future evolution of research libraries , together with a corresponding shift in organisational culture, data-centric mission and infrastructure, as well as topics of user experience and sustainability (see Figure 7).
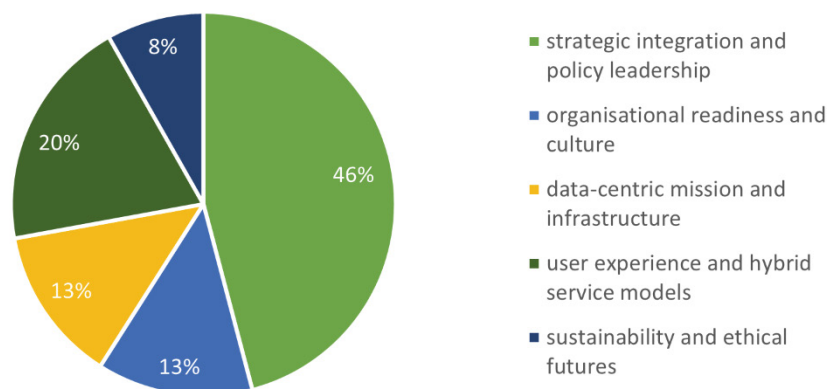
- strategic integration and policy leadership
- organisational readiness and culture
- data-centric mission and infrastructure
- user experience and hybrid service models
- sustainability and ethical futures

Figure 7 - Key themes for the evolution of research libraries. Percentages denote the occurrence of mentions in the interviews.

Balancing digital services with physical relevance: While digital transformation dominates the strategic agenda, many libraries emphasise the continuing importance of physical spaces. High in-person usage, especially among students, indicates that the library as a social and learning space remains critical. SLUB Dresden and KB, for example, both caution against "digitising libraries to death," noting the importance of balancing innovation with user-centred service design.

Green IT and sustainable infrastructures: Sustainability is becoming a strategic concern, particularly in the context of energy use and the environmental footprint of digital infrastructure. Green libraries may become an important dimension of institutional strategy in the years ahead, with some like NL Finland leading the way with the goal to become carbon neutral by 2030.

Workforce evolution and skills development: Future-proofing research libraries will also depend on the evolution of the workforce, with a strong LIS education system as foundation. Institutions report a growing need for interdisciplinary skills, combining digital literacy, AI competence, project management, and communication. New roles, such as data stewards, AI trainers, and infrastructure strategists, are likely to become standard across libraries. Upskilling, succession planning, and cross-institutional training programmes are increasingly seen as necessary investments. While relatively lower salaries remain a recruitment challenge, an open working culture and public mission remain effective retention factors.

6   Long-Term Perspectives of Digital Collections in Research Libraries

The emergence of digital collections has fundamentally transformed the role of libraries as custodians of knowledge, extending their responsibilities into complex terrains of technological stewardship. While the digitisation of cultural heritage and scholarly resources has enabled unprecedented access and reuse, it has also introduced new vulnerabilities, particularly concerning long-term preservation and the fragility of digital media. This chapter explores the historical evolution of digital collections in libraries, assesses their long-term value, and addresses persistent challenges such as bit-rot[105] (Hayes, 1998), technological obsolescence (Hedstrom, 1997), and the socio-technical dimensions of digital preservation (Pereda et al., 2025).

The late 20th century saw libraries begin to digitise selected parts of their collections, primarily rare and fragile items, driven by goals of preservation and increased accessibility. Initiatives such as the American Memory project started 1990 at the Library of Congress (Stieglitz, 2014) or Gallica at the Bibliothèque nationale de France in 1997 (Duchesneau, 2014) set early standards for digital library programmes. By the early 2000s, large-scale mass digitisation efforts (most notably Google Books[106]) ushered in a paradigm shift that repositioned digital collections not as adjuncts but as central to the mission of research libraries.

However, this digitisation wave was not merely a technological development; it marked a transition in the epistemological and archival functions of libraries. As Paul Conway notes, digitisation can be both a surrogate and a transformation, reflecting the dual role of digital collections as both preservation tools and new cultural artefacts (Conway, 2010). The scholarly value of these collections has grown alongside developments in digital humanities, text and data mining, and artificial intelligence, positioning libraries as data hubs and laboratories for computational scholarship (Posner, 2016).

Despite the many benefits of digital collections, their long-term preservation is fraught with uncertainty. Unlike traditional print media, which can survive for centuries when properly stored, digital media are inherently unstable. The phenomenon of bit-rot, or the gradual decay of digital information over time due to media degradation, format obsolescence, or software incompatibility, poses a profound risk to the longevity of digital collections (Cerf, 2011).

Research by (Rosenthal et al., 2005) has demonstrated that digital preservation requires active, ongoing intervention, including format migration, emulation strategies, and robust

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[105] *Bit rot* refers to the gradual degradation of data stored on digital media. It can occur due to various factors, including the dispersal of electric charge of a bit or the flipping of bits, physical deterioration of storage devices, changes in software or hardware environment, and the obsolescence of file formats. Over time, the integrity of data can thus be compromised leading ultimately to a complete loss of information.

[106] https://books.google.com

metadata management. The LOCKSS[107] (Lots of Copies Keep Stuff Safe) initiative exemplifies a distributed approach to preservation, but even such systems are not immune to the broader challenges of maintaining fixity, provenance, and access continuity across generations of hardware and software (Maniatis et al., 2005).

As (Hedstrom, 1997) observed early in the digital preservation discourse, we may be the first society who will leave quite little of our information age behind to future generations, likening digital preservation to a ticking time bomb for digital libraries. This warning is increasingly salient, as libraries struggle with shrinking budgets, complex licensing arrangements for digital content, and the increasing centrality of proprietary platforms that limit long-term custodianship.

The long-term value of digital collections lies not only in their capacity to preserve analogue materials but also in their generativity for future research. As (Borgman, 2015) argues, data - when curated, contextualised, and made interoperable - becomes part of a larger scholarly infrastructure. Digital collections, in this sense, are more than repositories; they are nodes in a knowledge ecosystem, where preservation must be understood as an ongoing negotiation between technical, institutional, and intellectual commitments.

Frameworks such as the Open Archival Information System (OAIS) model (CCSDS, 2012) and principles like FAIR (Findable, Accessible, Interoperable, Reusable) (Wilkinson et al., 2016) are essential in guiding the sustainable development of digital collections. Yet their implementation requires long-term strategic vision, including investment in digital preservation skills, cross-sector collaboration, and alignment with broader research data management policies.

The evolution of digital collections remains a cornerstone of the research library's mission in the digital age. As digitisation continues to expand across analogue and born-digital materials, institutions are increasingly focused not only on access and enrichment, but on legal, technical, and strategic conditions for long-term preservation and reuse. The interviews reviewed in this report reveal several key themes and challenges shaping the long-term future of digital collections.

Scalable, open, and enriched collections: Several institutions, including SLUB Dresden, the NL Finland and the KB, have established extensive digitisation programmes designed for both public and scholarly use. These efforts are not limited to image capture. They increasingly rely on enrichment strategies such as optical character recognition (OCR), georeferencing, crowdsourced transcription, and semantic tagging to make materials searchable, linkable, and machine-readable. SLUB Dresden, for instance, integrates OCR to enable full-text search, uses open standards for preservation, and contributes to linked data platforms like Wikidata instead of building proprietary knowledge graphs. Its collections, such as the German Photography

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[107] https://www.lockss.org

Archive and the Virtual Map Forum, are positioned as open cultural data with enduring scholarly value.

Preservation as a core legal and infrastructural responsibility: Across the interviews, preservation was repeatedly identified as a legal obligation and a core infrastructural task. Long-term accessibility is typically managed through national strategies (e.g. Germany's SAVE project) and open-source preservation tools. Yet institutions acknowledge that preserving digital content is often more complex than analogue materials, requiring format migration, metadata maintenance, and legal oversight, in additional to a substantial funding.

Interoperability over exclusivity: Rather than maintaining standalone repositories, several leading libraries stress the importance of interoperability. Collections must be discoverable through shared infrastructures, e.g. national discovery layers and cross-institutional metadata aggregators like NL Finland's Finna. Some efforts already exist in Switzerland with e.g. swisscollections[108], or the recently created DAGI[109], but are still limited to only a select few institutions. SLUB Dresden and TIB both prioritise integration, demonstrating that value lies in visibility and reuse across networks, not in siloed ownership. Still, metadata quality and harmonisation remain key concerns for a functioning interoperability. Libraries such as NL Finland, ZBW and TIB are increasingly using AI to normalise and enrich metadata, often following a "human-in-the-loop" approach that preserves curatorial oversight while boosting efficiency.

Strategic legal engagement and risk management: Legal uncertainty around the use of digital collections for AI training, TDM, and reuse remains widespread. Libraries are increasingly taking proactive roles in policy advocacy. Institutions are also exploring library-led licensing models that enable non-commercial academic reuse while protecting against commercial exploitation.

Long-term challenges: complexity, capacity, and continuity: The most pressing risks identified include the growing volume of data, increasing format obsolescence, inconsistent metadata, and limited institutional capacity to manage digital preservation at scale. SLUB, TIB, NL Finland and KB all emphasise that while technical solutions exist, sustainable digital collections depend on clear governance, cross-institutional collaboration, and secure funding.

In conclusion, the long-term outlook for digital collections marks a clear shift from isolated digitisation efforts to the development of permanent, interoperable, and policy-aligned

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[108] https://swisscollections.ch
[109] DAGI is the data aggregator in which specimen data from the decentralized natural history collection institutions in Switzerland are aggregated mapped to Darwin Core for standardization and enriched with additional information retrieved from global catalogues. https://swisscollnet.scnat.ch/en/data_mobilisation/national_data_infrastructure

infrastructures. Research libraries must manage their collections not only to ensure access, but to enable legal reuse, semantic interoperability, and long-term scholarly value.

Looking ahead, this perspective calls for both optimism and vigilance. Libraries are uniquely positioned to lead in digital preservation, drawing on their long-standing public mission, technical capabilities, and expanding role within the digital knowledge economy. Yet this leadership must be supported by sustained funding, coherent legal frameworks, and greater public recognition of the risks posed by digital fragility.

Preserving digital memory is not merely a technical challenge; it is a cultural responsibility. The decisions made today, regarding metadata standards, licensing, infrastructure, and preservation workflows, will determine whether future generations can access the intellectual and cultural record of our time. Ensuring that born-digital and digitised content remains usable and trustworthy is essential to the integrity of research and the public good.

7 Future Scenarios for Swiss Research Libraries

This chapter explores three plausible future scenarios for the development of Swiss research libraries over the coming decade, based on the insights from interviews with experts from abroad, as discussed in chapters 2 through 5. Each scenario is evaluated in terms of its impact on research data management (RDM), digital collections, and training and capacity-building. Risk levels and estimated costs are discussed, with a concluding SWOT analysis comparing the three models.

7.1 Scenario 1: Minimal Change (Business as Usual)

In this baseline trajectory, Swiss research libraries maintain their current course, responding reactively to change while avoiding major structural shifts. Operations continue within existing institutional and financial frameworks, with no comprehensive national strategy for digital transformation of libraries. Innovation is incremental, unevenly distributed, and largely driven by temporary projects rather than long-term planning.

Under this scenario, research data management remains fragmented and largely decentralised. Libraries continue to provide general guidance on data management plans and access to repositories, but without the infrastructure or coordination necessary to act as centralised data hubs. Institutional repositories persist, but their discoverability and long-term sustainability are inconsistent across institutions.

Digitisation projects and digital collections under this model remain local and often dependent on temporary funding or heritage-related mandates. Metadata standards are not uniformly applied, which hinders national interoperability and international integration. Libraries' role in digital preservation continues to be reactive, rather than strategically planned.

In terms of training and capacity-building, services remain ad hoc and locally defined. There is limited investment in structured upskilling programmes, and the professional pipeline in information science continues to contract, leaving libraries with an ageing workforce and growing knowledge gaps in digital competencies.

Financially, this path involves relatively low risk for RLs internally, as most services are maintained using existing resources. It also preserves familiar workflows and institutional roles, avoiding the disruptions that come with more transformative change. However, the long-term risks are significant. Without visible innovation or stronger integration into the national research and academic ecosystem, libraries risk becoming increasingly irrelevant. They may struggle to attract and retain skilled digital professionals, lose influence in policy and funding discussions, and fall behind European counterparts in advancing Open Science and digital infrastructure. The situation is further exacerbated, as on 20 September 2024, the Federal Council announced to pursue several cost-cutting measures, which would include the discontinuation of project-related

contributions (PgB)[110]. These federal contributions have in the past decades been important innovation drivers in the Swiss RL system. With these changes, the financial resources for the 2025-2028 swissuniversities programmes can only be committed and allocated for the years 2025 and 2026. As of now, the process is still ongoing and the relevant committees of swissuniversities are regularly consolidating recent information on their website (c.f. footnote 110, currently only available in German and French).

7.2 Scenario 2: Partial Transformation (Adoption of Selected Best Practices)

This intermediate scenario envisions Swiss research libraries adopting selected best practices from international models, blending innovation with institutional stability. Rather than pursuing full structural reform, libraries strategically implement improvements in digital service delivery, research engagement, and infrastructure collaboration. This approach emphasises feasible, high-impact changes that align with ongoing initiatives such as the Swiss Open Research Data strategy.

Research data management becomes more consistent and better integrated into institutional research workflows. Libraries increasingly collaborate with IT departments, data protection officers, and research offices to support data sharing, metadata management, and compliance with FAIR principles. Federated RDM services are introduced, and disciplinary repositories receive greater institutional support. Repository design improves through harmonised metadata standards, persistent identifier (PID) systems, and metadata harvesting, enhancing both national and international discoverability.

In the area of digital collections, libraries adopt robust metadata standards and shared discovery systems. Collections begin to link with external platforms like Wikidata, knowledge graphs, and open-source tools are more widely used for digitisation and digital preservation. While these efforts remain grounded in individual institutional contexts, the emergence of shared practices enhances interoperability and national visibility.

Training and capacity-building are significantly strengthened under this model. A national training framework is developed, offering certified programmes in data management, Open Science, and digital scholarship. Libraries embed data stewards or research-facing staff within key faculties, supporting direct researcher engagement and tailored services. These training and support services are more systematically coordinated and, although the uptake and reach vary by institution, the national baseline improves.

Selective experimentation with emerging technologies, such as artificial intelligence and automation, begins in defined internal processes, particularly in areas like cataloguing and

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[110] https://www.swissuniversities.ch/en/topics/open-science/open-science-programme

metadata enrichment. These efforts are cautiously implemented, reflecting a balance between innovation and the preservation of institutional workflows.

The financial cost of this scenario is moderate. Investments are required for upgrading platforms, developing training programmes, and expanding staff capacity. However, costs are often shared through collaborative consortia and national initiatives. The benefits are substantial: libraries gain greater visibility, improve researcher engagement, and strengthen their role within the research ecosystem, without requiring a full structural overhaul.

Nonetheless, risks remain. Implementation may be uneven across institutions, and reliance on short-term project funding or a small number of champions could limit long-term impact. Fragmented adoption may also reinforce disparities between disciplines or institutions. Despite these challenges, this scenario offers a practical, feasible and forward-looking path that positions Swiss research libraries for greater national relevance and international alignment.

7.3 Scenario 3: Advanced Transformation (Research Libraries as National Research Infrastructure and Research Support Leaders)

In this transformative scenario, Swiss research libraries fully reposition themselves as critical actors in the national and international research infrastructure landscape. Drawing inspiration from leading institutions such as TIB, ZBW, SLUB, NL Finland and the University of Leeds, libraries adopt a coordinated, integrated approach that redefines their role from service providers to strategic partners and innovation incubators in Open Science, data policy, and digital innovation in general. They serve as fully operational data hubs, in close partnership with research funders, IT services, and disciplinary communities. Seamless infrastructure supports data publication, compliance with FAIR principles, and integration with the European Open Science Cloud.

Digital collections also undergo a strategic overhaul. Enhanced with rich semantic metadata, persistent identifiers, and AI-powered discovery tools, these collections become more accessible, useful, and interconnected, with centralised national discovery portals aggregating metadata from all Swiss memory institutions. Nationally coordinated digitisation efforts prioritise scholarly and public relevance, while AI tools assist in metadata generation, entity recognition, and multilingual access, broadening the reach and usability of digital assets for both researchers and the broader public.

Training and capacity-building become deeply embedded in institutional and national strategies. The LIS curriculum is updated and certification programmes in data stewardship, digital literacy, and AI fluency are standardised, ensuring a skilled workforce across all career stages. Libraries become central actors in researcher development, offering robust, ongoing education for staff and play a central role in equipping early-career researchers with the competencies needed for digital scholarship. Looking at internal management, libraries evolve into agile, multidisciplinary organisations. Staff roles are reimagined: data stewards, research software

engineers, and AI specialists are embedded directly within research units, enabling close alignment with academic needs. Team structures adopt agile models instead of traditional hierarchies, thus fostering innovation, responsiveness, and cross-functional collaboration.

This scenario demands bold investment – both from the government and the universities hosting research libraries – across multiple dimensions: infrastructure modernisation, staff expansion and upskilling, AI integration, and governance reform. It also requires sustained leadership commitment and strong coordination among universities, national stakeholders, and policymakers. While the transformation carries strategic and political risks, such as resistance to change, legal and policy lag, or reform fatigue, it offers substantial long-term benefits.

By embracing this model, Swiss research libraries could not only ensure their own resilience and relevance but also attract new funding, partnerships, and skilled professionals. They would gain a powerful voice in shaping policy on issues like copyright, AI regulation, and FAIR mandates, and they build the capacity to measure and communicate their impact, trustworthiness, and societal value. Ultimately, this scenario offers the greatest long-term return on investment and positions Swiss research libraries as indispensable partners in the digital research ecosystem, nationally and globally.

7.4   SWOT Analysis

This chapter assesses each of the above scenarios for their strengths, weaknesses, opportunities, and threats, with Table 2 providing an overview.

Table 2 - SWOT Analysis

Scenario	Strengths	Weaknesses
1 Minimal	Low internal additional financial load and organisational risk. Preserves established workflows and institutional roles.	Limited innovation and digital capability due to funding cuts. Fragmented RDM and inconsistent metadata standards. Ageing workforce, declining digital skills.
2 Partial	Balance between innovation and institutional continuity. Improved RDM integration and metadata harmonisation. Shared services and training frameworks enhance efficiency.	Risk of uneven adoption and fragmentation. Dependence on short-term funding and individual champions.
3 Advanced	High strategic visibility and influence. Fully integrated RDM, digital collections, and training. Strong alignment with Open Science and FAIR principles.	Requires major investment and organisational change. High complexity and coordination burden. Potential resistance to reform.
Scenario	Opportunities	Threats

1 Minimal	Opportunity to maintain status-quo during uncertain times.	Risk of irrelevance in national and international research infrastructure.
	Time to observe other models.	Difficulty attracting and retaining staff.
		Limited influence in policy and funding decisions.
2 Partial	Alignment with Swiss Open Research Data strategy.	Inconsistent progress across institutions.
	Enhanced researcher engagement and visibility.	Reinforces inequalities between disciplines or regions.
	Scope to scale successful initiatives nationally.	Lack of central governance could lead to duplication.
3 Advanced	Leadership in national and global research ecosystems.	Strategic and political risk if commitment falters.
	Shaping future policy and infrastructure standards.	Legal/policy frameworks may lag behind innovation.
	Long-term return on investment.	Risk of reform fatigue among staff & community.

The first scenario represents a continuation of existing practices. Its strength lies in its low additional financial load and organisational risk. It preserves familiar workflows and institutional autonomy and may be an appealing pathway in times of economic uncertainty or institutional conservatism. However, the strategic risks are considerable. Libraries under this model risk marginalisation within the research ecosystem, particularly in relation to digital scholarship and Open Science. The inability to attract and retain skilled professionals, coupled with limited policy influence, may lead to long-term erosion of relevance, especially in view of current funding cuts.

The second scenario, where Swiss research libraries adopt selected best practices, implements targeted improvements. It requires moderate investment, particularly in terms of platform upgrades, staff development, and collaborative governance. However, these costs could be shared across institutions or consortia. The principal risk lies in uneven adoption and implementation. Without stronger coordination mechanisms, disparities may persist between institutions and disciplines, reinforcing existing inequalities and limiting the overall impact of reform. Nevertheless, Scenario 2 offers a realistic and forward-looking approach, aligning well with existing efforts under the Swiss Open Research Data strategy. It provides a scalable foundation for further development and institutional alignment without demanding immediate systemic transformation.

The third scenario represents a fundamental reimagining of the role of Swiss research libraries. This endeavour demands significant investment in infrastructure, staffing, and governance reform. It also requires strong political will and sustained institutional leadership. While the financial and strategic risks are high, particularly in a decentralised system, the long-term benefits

are substantial. Libraries become critical infrastructure providers and policy influencers. They are well-positioned to attract funding, foster innovation, and shape future frameworks for digital scholarship and Open Science.

The three scenarios thus differ not only in the scope of their ambition but also in the depth of organisational change and the level of coordination and financing required. The *Minimal Change* pathway (1st scenario) prioritises continuity but risks obsolescence. *Partial Transformation* (2nd scenario) offers a balanced, feasible progression that leverages existing momentum while mitigating institutional disruption. In contrast, *Advanced Transformation* (3rd scenario) is the most demanding but offers the greatest potential for long-term resilience, visibility, and leadership. Institutional contexts will inevitably shape the attractiveness of each scenario. Smaller or risk-averse institutions may find the first model appealing, whereas those with strong strategic vision and capacity may gravitate towards the third. The second scenario may serve as a transitional model: providing a coherent, actionable roadmap that can later scale into more integrated national strategies and a transition towards the third scenario. Ultimately, the future relevance and impact of Swiss research libraries will depend on their willingness to invest, collaborate, and lead. These scenarios offer not prescriptive pathways, but a strategic framework to guide decision-making in an increasingly complex and digitally-driven research environment.

8 Conclusions and Potential Strategic Directions

Drawing on information gained from the interviews and supported by literature, this study posits that research libraries should position themselves not as ancillary service units, but as core institutional actors in digital scholarship, research infrastructure and knowledge stewardship. The key findings being as follows:

Reframing the Role

Research libraries must move beyond their traditional identity as content curators and support units. They are increasingly strategic partners in research production, dissemination, and assessment. This broader role is aligned with LIBER's vision of libraries as "engaged and trusted hubs" (LIBER, 2022). Libraries are now central to enabling open and data-driven science. Their involvement spans the entire research lifecycle, from data management planning to long-term preservation, from open publishing to impact evaluation. To realise this role fully, libraries must be structurally embedded in governance and visibly engaged across institutional policy.

Strategy and Value

Research libraries must participate in decision-making at the highest institutional levels, particularly in committees overseeing digital strategy, infrastructure, AI, and research data governance. Strengthening library leadership within governance frameworks allows for better alignment with university priorities and greater influence over emerging research norms. Establishing high-level steering groups and appointing senior staff with remit for digital services are concrete steps toward this aim.

Furthermore, it is important that research libraries communicate their value for long-term viability. Impact can be communicated through success stories, internal metrics, and proactive engagement with early-career researchers. To secure financial sustainability, libraries must also be costed directly into research funding applications rather than treated as "in-kind" contributors As Kiviniemi et al., (2009) argue, the ability to demonstrate contribution to research performance and compliance is critical for success.

Service Innovation along the Information Lifecycle

Service development in research data management (RDM) remains central to a research library's evolving mission. Libraries that provide end-to-end RDM support along the information lifecycle are better positioned to support reproducible, high-quality research (Tenopir et al., 2017; van der Graaf, 2023). A tiered model of support has proven particularly effective. This combines generic, centralised services (e.g. DMP tools, repository guidance) with embedded, discipline-specific expertise (e.g. data stewards within faculties). The study by van der Graaf (2023) highlights this layered approach as a key enabling structure for scalable, responsive services. Another important task of research libraries is their role in safeguarding research integrity. Their contributions to

data curation, version control, and open methodologies are vital in ensuring reproducibility and transparent scholarship (Schmidt et al., 2024).

Investing in Staff and their Skills

Skills development is a persistent challenge. The interviews repeatedly highlight a need to enhance both technical and interpersonal capacities among library professionals. FAIR data principles, AI literacy, communication and project management are all core skill areas that need to be tackled. Successful institutions also invest in interdisciplinary collaboration and role innovation, supporting hybrid positions like open science coordinators and embedded data experts.

However, a long-term sustainable solution requires a reform of LIS education. Current curricula often lag behind the realities of digital scholarship. Internal training pipelines can address immediate gaps, while collaboration with LIS programmes can help ensure that new graduates are research-ready (Revez, 2018; Semeler et al., 2019). Critical positions must be especially protected from the volatility of short-term project funding. Libraries thus need both institutional and national support to fund core data and infrastructure roles on a permanent basis.

Repositories as Core Infrastructure

Institutional repositories[111] remain one of the most under-recognised pillars of scholarly infrastructure. When properly maintained, they provide secure, FAIR-aligned access to a wide array of research outputs, from preprints and data to grey literature and teaching materials. Modernisation is essential. Repositories should be machine-readable, integrated with research workflows, and technically prepared for AI-driven services. This includes persistent identifiers, high-quality metadata, and API-based interoperability (LIBER, 2025). Such infrastructure not only supports open science but enables national and pan-European services for discovery, reuse, and evaluation.

Repositories are also crucial for preservation. Libraries must take responsibility for long-term digital curation, including both born-digital research data and digitised cultural materials. These efforts must address lifecycle planning, preservation formats, and cross-institutional access strategies. In general, repositories need to keep on evolving with evolving research demands, if a reframing of RLs as a strategic and research partner is to be pursued. National OA and ORD strategies are important supporting documents in this context (swissuniversities, 2021; swissuniversities & Swiss National Science Foundation, 2024).

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[111] Repositories here means explicitly only institutional repositories – regardless of their storage of only OA publications, research data, or both – and not (multi-)disciplinary repositories such as Zenodo, or data and service centres such as FORS (https://forscenter.ch) or DaSCH (https://www.dasch.swiss).

Responsible and Ethical Approaches to AI and Data

AI is transforming scholarly communication and information retrieval with yet to be seen consequences. Research libraries must help shape its use ethically and effectively. Internally, libraries should actively explore AI applications in cataloguing, metadata enhancement, and discover, all while ensuring transparency and "human in the loop" safeguards. Internal strategies of research libraries should include ethical guidelines and accountability mechanisms. Externally, libraries must advocate for equitable terms in licensing agreements. Rights to text and data mining and safeguards against unregulated data extraction from open content must be defended through collective negotiation.

Federated Collaboration and Networked Infrastructure

Meeting current scholarly demands alone is virtually impossible for any single institution. Research libraries should therefore collaborate at both national and international levels to build and maintain scalable, resilient infrastructure, especially when it comes to nation-wide discovery layers, supported by every memory institution. When labour is divided, duplication of efforts can be avoided and innovation capacity increased. In that context, it is important to complement top-down strategies by practitioner-led innovation. Data stewards, repository managers, and librarians embedded in research environments are often best positioned to respond quickly and appropriately to user needs.

Balancing Innovation with Stewardship and Sustainability

Even in digitally advanced institutions, libraries still also serve as physical and social spaces, offering inclusive environments for collaboration, informal learning, and intellectual refuge. Investment in digital capacity must not come at the expense of the physical infrastructure that anchors the library's public mission. And crucially, while digital collections must continue to be developed, their analogue counterparts must not be lost or forgotten.

The environmental impact of digital infrastructure should also be addressed. Research libraries can lead in adopting green IT practices, optimising server performance, and integrating sustainability into procurement and planning. These efforts align with broader institutional and societal commitments to climate responsibility and the Sustainable Development Goals (UN. General Assembly (70th sess.: 2015-2016), 2015).

9 References

ACRL Research Planning and Review Committee. (2024). 2024 Top Trends in Academic Libraries: A Review of the Trends and Issues. *College & Research Libraries News*, *85*(6). https://doi.org/10.5860/crln.85.6.231

Borgman, C. L. (2015). *Big Data, Little Data, No Data: Scholarship in the Networked World*. THE MIT Press.

Bryant, R., Dortmund, A., & Lavoie, B. (2020). *Social Interoperability in Research Support: Cross-Campus Partnerships and the University Research Enterprise*. https://doi.org/10.25333/WYRD-N586

Bryant, R., Lavoie, B., & Rinehart, A. K. (2023). *Building Research Data Management Capacity: Case Studies in Strategic Library Collaboration*. OCLC Research. https://doi.org/10.25333/knxc-xy74

CAUL. (2019, February 8). *Council of Australian University Librarians (CAUL) Digital Dexterity Framework*. https://www.caul.edu.au/sites/default/files/documents/digital-dexterity/digdex2019framework.pdf

CAUL. (2025, March 14). *Strategy 2023-2025*. https://www.caul.edu.au/sites/default/files/documents/strategy/caul_strategy_2023-2025.pdf

CAUL. (n.d.). *CAUL Engagement Strategy and Stakeholder Engagement Framework*. https://www.caul.edu.au/sites/default/files/documents/caul-doc/caul_engagement_strategy_2022.pdf

CCSDS. (2012). *Reference Model for an Open Archival Information System (OAIS)* (No. CCSDS 650.0-M-2; p. 135). Management Council of the Consultative Committee for Space Data Systems. http://public.ccsds.org/publications/archive/650x0m2.pdf

Cerf, V. G. (2011). Avoiding 'bit rot': Long-term preservation of digital information. *Proceedings of the IEEE*, *99*(6), 915–916. https://doi.org/10/fp9rbm

Conway, P. (2010). Preservation in the Age of Google: Digitization, Digital Preservation, and Dilemmas. *The Library Quarterly*, *80*(1), 61–79.

Duchesneau, M. (2014). Gallica: The Online Digital Library of the Bibliothèque nationale de France. *Nineteenth-Century Music Review*, *11*(2), 337–347. https://doi.org/10.1017/S1479409814000287

European Union. (2024, July 13). *Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence and amending Regulations (EC) No 300/2008, (EU) No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828*

(Artificial Intelligence Act) (Text with EEA relevance). http://data.eu-ropa.eu/eli/reg/2024/1689/oj

Hayes, B. (1998). Computing Science: Bit Rot. *American Scientist*, *86*(5), 410–415.

Hedstrom, M. (1997). Digital Preservation: A Time Bomb for Digital Libraries. *Computers and the Humanities*, *31*(3), 189–202. https://doi.org/10.1023/A:1000676723815

IFLA. (2011). *IFLA/UNESCO Manifesto for Digital Libraries*. https://repository.ifla.org/handle/20.500.14598/3583

IFLA. (2024a). *IFLA Strategy 2024-2029* (IFLA Publications). https://repository.ifla.org/handle/20.500.14598/3497

IFLA. (2024b). *IFLA Trend Report 2024: Facing the future of information with confidence*. https://repository.ifla.org/handle/20.500.14598/3496

IFLA. (2025, May 1). *IFLA Members including Institution and Association Affiliates*. https://www.ifla.org/wp-content/uploads/ifla-members-and-association-affiliates_2025-05-01.pdf

KB national library of the Netherlands. (2023). *Words connect people. KB Policy plan 2023-2026*. https://www.kb.nl/sites/default/files/documents/tg_-_kb_beleidsplan2326_en_v3_11072023.pdf

Kiviniemi, V., Laitinen, M., & Saarti, J. (2009). Are libraries worth investing in?: Finnish university libraries and their effect on the national economy. *LIBER Quarterly*, *19*(1), 54–61. https://doi.org/10/gp5kpc

Kniberg, H., & Ivarsson, A. (2012). *Scaling Agile @ Spotify with Tribes, Squads, Chapters & Guilds*. https://www.agileleanhouse.com/lib/lib/People/HenrikKniberg/SpotifyScaling.pdf

LIBER. (2017). *LIBER definition of research library: Background paper*. https://libereurope.eu/wp-content/uploads/2020/12/Mar2017Mail_DefinitionofResearchLibrariesBackgroundPaper.pdf

LIBER. (2022). *Strategy 2023-2027*. https://libereurope.eu/wp-content/uploads/2022/01/LIBER_STRAT_A5_digital-final-1.pdf

LIBER. (2025). *LIBER Policy Plan*. https://libereurope.eu/wp-content/uploads/2025-LIBER-Policy-Plan.pdf

Maniatis, P., Roussopoulos, M., Giuli, T. J., Rosenthal, D. S. H., & Baker, M. (2005). The LOCKSS peer-to-peer digital preservation system. *ACM Transactions on Computer Systems*, *23*(1), 2–50. https://doi.org/10.1145/1047915.1047917

Ministry of Education and Culture, Finland. (2007, December 31). *Act on Collecting and Preserving Cultural Materials 1433/2007*. https://finlex.fi/eli?uri=http://data.finlex.fi/eli/sd/2007/1433/ajantasa/2015-08-07/fin

Ministry of Education and Culture, Finland. (2009, July 24). *Universities Act. 558/2009*. https://finlex.fi/en/legislation/translations/2009/eng/558

National Library of Finland. (2020). *Strategic plan of the National Library of Finland 2021–2030*. National Library of Finland. https://urn.fi/URN:NBN:fi-fe2020042822711

Pereda, J., Willcox, P., Candela, G., Sanchez, A., & Murrieta-Flores, P. A. (2025). Online cultural heritage as a social machine: A socio-technical approach to digital infrastructure and ecosystems. *International Journal of Digital Humanities*. https://doi.org/10.1007/s42803-025-00097-6

Posner, M. (2016). What's Next: The Radical, Unrealized Potential of Digital Humanities. In M. K. Gold & L. F. Klein (Eds.), *Debates in the Digital Humanities 2016* (pp. 32–41). University of Minnesota Press. https://www.jstor.org/stable/10.5749/j.ctt1cn6thb.6

Rajapatirana, B. (2025, June 4). Scaling de-duplication in WorldCat: Balancing AI innovation with cataloging care. *Hanging Together. The OCLC Research Blog*. https://hangingtogether.org/scaling-de-duplication-in-worldcat-balancing-ai-innovation-with-cataloging-care/

Revez, J. (2018). Opening the Heart of Science: A Review of the Changing Roles of Research Libraries. *Publications*, *6*(1), 9. https://doi.org/10.3390/publications6010009

Rosenthal, D. S. H., Robertson, T. S., Lipkis, T., Reich, V., & Morabito, S. (2005). *Requirements for Digital Preservation Systems: A Bottom-Up Approach* (Version 2). arXiv. https://doi.org/10.48550/ARXIV.CS/0509018

Schmidt, B., Chiarelli, A., Loffreda, L., & Sondervan, J. (2024). Emerging roles and responsibilities of libraries in support of reproducible research. *LIBER Quarterly: The Journal of the Association of European Research Libraries*, *33*(1), 1–21. https://doi.org/10.53377/lq.14947

Semeler, A. R., Pinto, A. L., & Rozados, H. B. F. (2019). Data science in data librarianship: Core competencies of a data librarian. *Journal of Librarianship and Information Science*, *51*(3), 771–780. https://doi.org/10.1177/0961000617742465

Stieglitz, S. (2014). The American Memory Project The American Memory Project. In J. Krueger (Ed.), *Cases on Electronic Records and Resource Management Implementation in Diverse Environments:* IGI Global. https://doi.org/10.4018/978-1-4666-4466-3

swissuniversities. (2021). *Swiss National Open Research Data Strategy*. swissuniversities. https://www.swissuniversities.ch/fileadmin/swissuniversities/Dokumente/Hochschulpolitik/ORD/Swiss_National_ORD_Strategy_en.pdf

swissuniversities & Swiss National Science Foundation. (2024). *Swiss National Open Access Strategy*. https://www.swissuniversities.ch/fileadmin/swissuniversities/Dokumente/Hochschulpolitik/Open_Access/Swiss-National-Open-Access-Strategy-2024-en.pdf

Tenopir, C., Talja, S., Horstmann, W., Late, E., Hughes, D., Pollock, D., Schmidt, B., Baird, L., Sandusky, R. J., & Allard, S. (2017). Research Data Services in European Academic Research Libraries. *LIBER QUARTERLY*, *27*(1), 23–44. https://doi.org/10/ghvwwk

Ukkonen, A.-E., & Lilja, J. (Eds.). (2025). *National Library of Finland Digitisation Programme 2025-2028*. National Library of Finland. https://urn.fi/URN:ISBN:978-952-84-0748-5

UN. General Assembly (70th sess.: 2015-2016). (2015). *Transforming our world: The 2030 Agenda for Sustainable Development: Resolution / adopted by the General Assembly* (No. A/RES/70/1; p. 35). https://digitallibrary.un.org/record/3923923

UNESCO. (2021). *UNESCO Recommendation on Open Science*. UNESCO. https://doi.org/10.54677/MNMH8546

UNSW Sydney. (2021). *Open Access Policy*. https://www.unsw.edu.au/content/dam/pdfs/governance/policy/2022-01-policies/openaccesspolicy.pdf

van der Graaf, M. (2023). *Open Science Services by Research Libraries: Organisational Perspectives - A LIBER and ADBU Report*. Zenodo. https://doi.org/10.5281/ZENODO.8060242

Van Wessel, J. W. (2020). *AI en de Bibliotheek: Zeven Principes*. Zenodo. https://doi.org/10.5281/ZENODO.3865326

Vrije Universiteit Amsterdam. (2024, December 17). *Research Data and Software Management Policy*. https://rdm.vu.nl/public/policies-regulations/RDSM-policy-VU-EN-v3.0.pdf

Vrije Universiteit Amsterdam. (2025, April). *Kader voor generatieve AI in het onderwijs*. https://assets-us-01.kc-usercontent.com/d8b6f1f5-816c-005b-1dc1-e363dd7ce9a5/db60d995-ef49-46c7-ba04-719377d978bc/Kader%20genAI%20in%20onderwijs%20april%202025.pdf

Wilkinson, M. D., Dumontier, M., Aalbersberg, Ij. J., Appleton, G., Axton, M., Baak, A., Blomberg, N., Boiten, J.-W., da Silva Santos, L. B., Bourne, P. E., Bouwman, J., Brookes, A. J., Clark, T., Crosas, M., Dillo, I., Dumon, O., Edmunds, S., Evelo, C. T., Finkers, R., … Mons, B. (2016). The FAIR Guiding Principles for scientific data management and stewardship. *Scientific Data*, *3*(1), 160018. https://doi.org/10.1038/sdata.2016.18

ZBW - Leibniz-Informationszentrum Wirtschaft. (2021). *Strategie der ZBW 2022-2026*. https://www.zbw.eu/fileadmin/pdf/ueber-uns/2022/2022-strategie.pdf

Zentralbibliothek Zürich, Keller, A., & Uhl, S. (Eds.). (2018). *Bibliotheken der Schweiz: Innovation durch Kooperation: Festschrift für Susanna Bliggenstorfer anlässlich ihres Rücktrittes als Direktorin der Zentralbibliothek Zürich*. De Gruyter. https://doi.org/10.1515/9783110553796

A List of Interviewees and Assessed Organisations

The following is a list of assessed organisations and, where applicable, the experts contacted for interviewees. The list of organisations to be assessed was decided in consultation with the Swiss Science Council.

International Networks and Organisations

Organisation	Region	Interviewees	URL
LIBER (Association of European Research Libraries)	Europe	Julien Roche Martine Pronk	https://libereurope.eu
GASCO (German, Austrian and Swiss Consortia Organisation)	DACH (Germany, Austria, Switzerland)	Hildegard Schäffler	https://www.hbz-nrw.de/produkte/digitale-inhalte/gasco
OCLC (Online Computer Library Center)	Global	Rebecca Bryant	https://www.oclc.org
IFLA (International Federation of Library Associations and Institutions)	Global	Fiona Bradley	https://www.ifla.org

International Networks and Organisations

Organisation	Region	Interviewees	URL
Kansalliskirjasto (National Library of Finland)	Finland	Johanna Lilja Nina Hyvönen Katja Hilska-Keinänen	https://www.kansalliskirjasto.fi
KB (Koninklijke Bibliotheek, National Library of the Netherlands)	The Netherlands	Martijn Kleppe	https://www.kb.nl
TIB (Leibniz Information Centre for Science and Technology University Library)	Germany	Sören Auer	https://www.tib.eu

ZBW (Leibniz Information Centre for Economics)	Germany	Klaus Tochtermann	https://www.zbw.eu
CAUL (Council of Australasian University Librarians)	Australia and Aotearoa / New Zealand	Martin Borchert	https://www.caul.edu.au

Regional Research Libraries

Organisation	Region	Interviewees	URL
University Library of the Vrije Universiteit (VU) Amsterdam	The Netherlands	Elisa Rodenburg	https://vu.nl/en/about-vu/divisions/university-library
SLUB Dresden (Saxon State and University Library)	Germany	Kay-Michael Würzner	https://www.slub-dresden.de
Vienna University Library (Universitätsbibliothek Wien)	Austria	Michael Feichtinger	https://bibliothek.univie.ac.at
University of Leeds Library	UK	Masud Khokar	https://library.leeds.ac.uk

B Interview Questionnaire

1. Introduction (5 min)

Welcome & Context: Thank you for participating in this interview. We are conducting research on best practices in digital transformation for research libraries, with a particular focus on governance models, service innovations, and collaboration.

Confidentiality & Consent: This interview is being conducted for research purposes. Your insights will be anonymized unless you consent to attribution. Do you agree to participate and for us to record this session for note-taking purposes?

2. Governance & Collaboration (15 min)

Institutional Priorities: How does your institution (library/network/organization) define its digital transformation strategy?

Leadership & Governance: What governance structures (committees, steering groups) oversee digital initiatives at your institution? Who are the key stakeholders involved?

Collaboration & Partnerships: How do you collaborate with other libraries, research institutions, or international organizations on digital transformation projects? Can you share a successful collaboration case and its impact?

Policy & Funding: How are digital projects funded at your institution? (e.g., institutional budget, external grants, consortial funding). What policies or national/international frameworks influence your digital strategy?

3. Digital Transformation Strategies (15 min)

Service Innovations: What are the most significant digital services your library/organization has developed in recent years? Which services have had the most impact on researchers and students?

Research Data Management (RDM): How does your institution support research data management? What challenges have you encountered in implementing FAIR principles?

Digitisation & Collections as Data: What strategies do you use for large-scale digitisation and data enrichment? How do you ensure long-term accessibility and legal compliance for digital collections?

Open Science & Researcher Support: What training or support does your institution provide for researchers on open access, data management, or digital literacy? What are the main gaps in researcher training that libraries could address? What training is necessary for the support staff?

4. Technology & Standardisation (10 min)

Emerging Technologies: Is your institution using AI, automation, or data analytics to enhance digital services? If yes, how? Do you see AI as a future driver of research library transformation?

Metadata & Interoperability: What metadata standards and interoperability frameworks does your institution use? What challenges do you face in integrating library systems with broader research infrastructures (e.g., European Open Science Cloud, national data repositories)?

Infrastructure & Scalability: Does your institution prefer in-house technology development, open-source solutions, or commercial platforms? How do you balance innovation with sustainability in technical infrastructure?

5. Challenges & Future Trends (10 min)

Barriers to Digital Transformation: What are the biggest obstacles you face in implementing digital strategies? (e.g., funding, institutional resistance, technical challenges) How do you address digital skills gaps among staff and researchers?

Sustainability & Long-term Vision: How do you ensure long-term funding and sustainability for digital initiatives? What strategies have worked best to future-proof digital services?

Future of Research Libraries: What do you see as the most critical digital transformation trends for research libraries in the next 5–10 years? How should research libraries evolve to remain relevant and impactful in the digital age?

6. Closing (5 min)

Final Reflections: Is there anything we haven't covered that you believe is important in discussing digital transformation for research libraries? Would you be open to follow-up discussions or sharing reports/documents that might enrich our study?

Impressum