# Library Services:

# From Automation to Transformation

Stephen Pinfield

# Outline

1. Automating and transforming the information environment:

   the digital shift

2. Transforming the library

3. Transforming scholarly communication

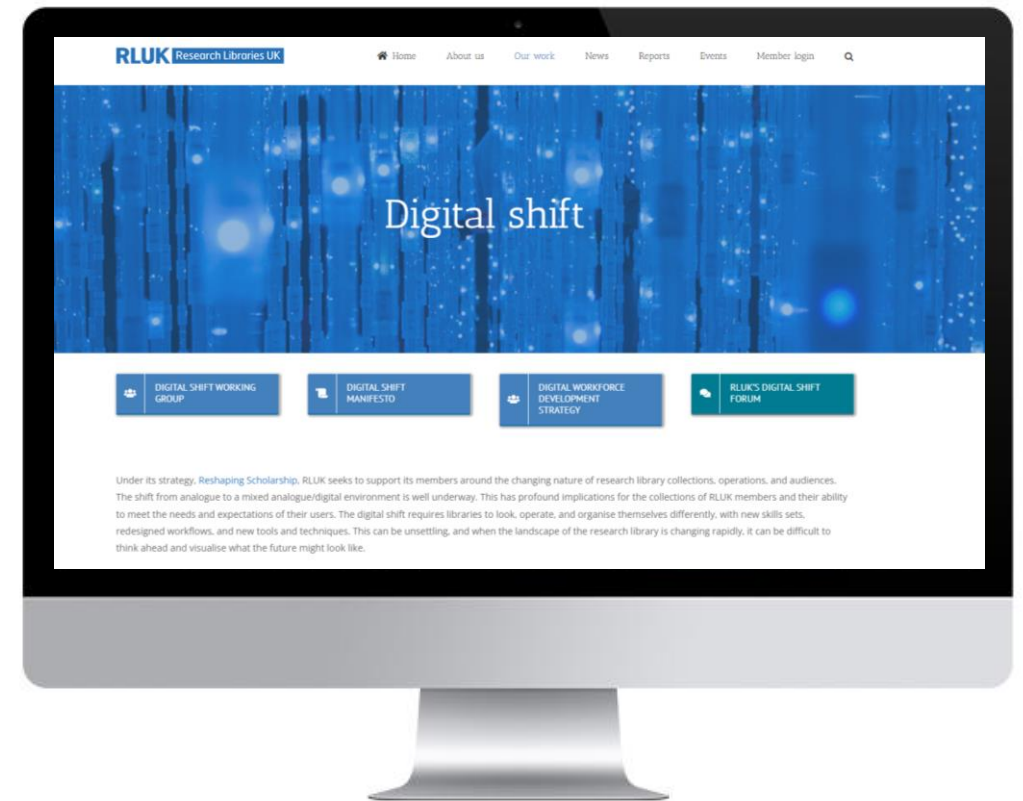# Outline

1. Automating and transforming the information environment: the digital shift

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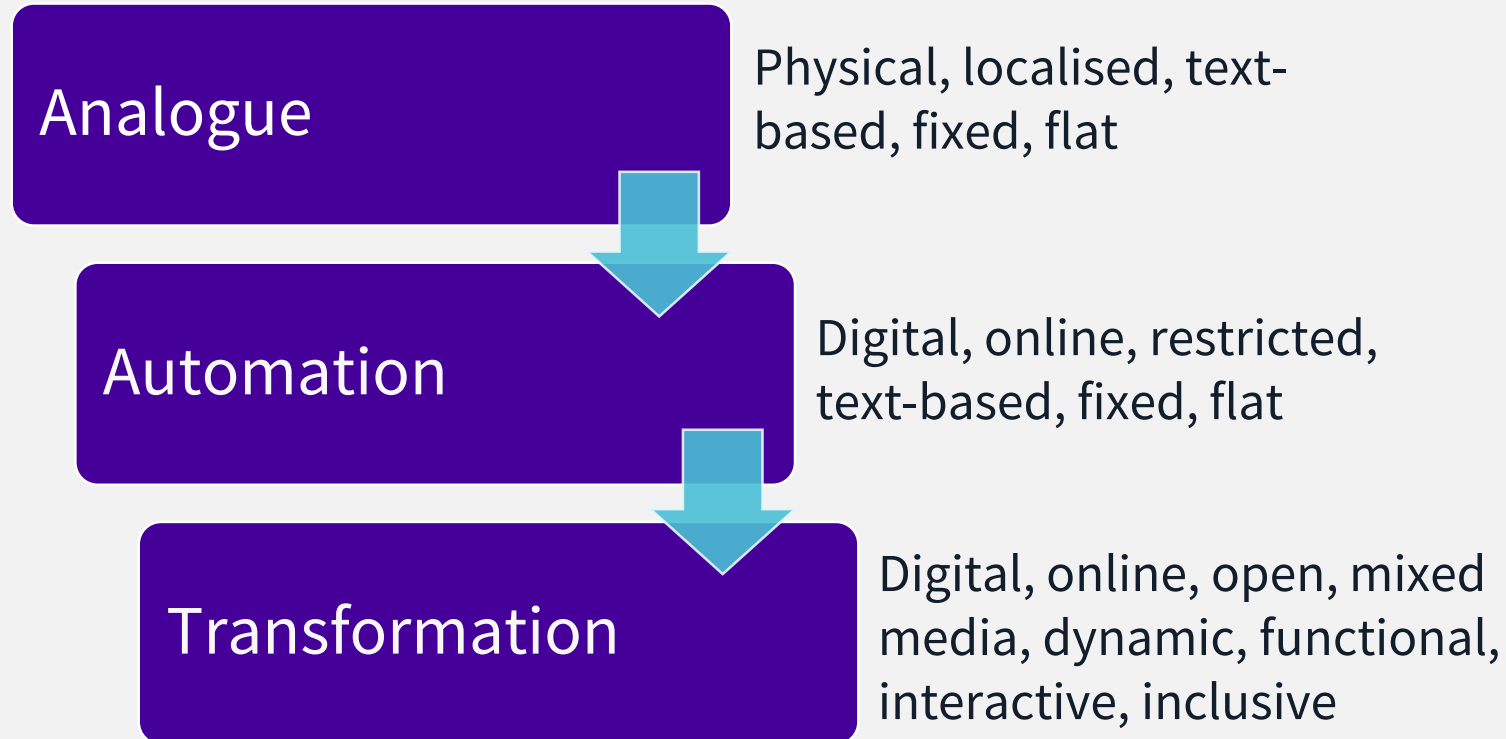
# 'Digital Shift'

"The 'digital shift' is used as an umbrella term for the analogue-digital transition of many library services, operations, collections, and audience interactions." (RLUK, 2020)

Part of wider changes: cultural, social, economic, technological etc

# The Transformation of the Information Environment

**Analogue** — Physical, localised, text-based, fixed, flat

**Automation** — Digital, online, restricted, text-based, fixed, flat

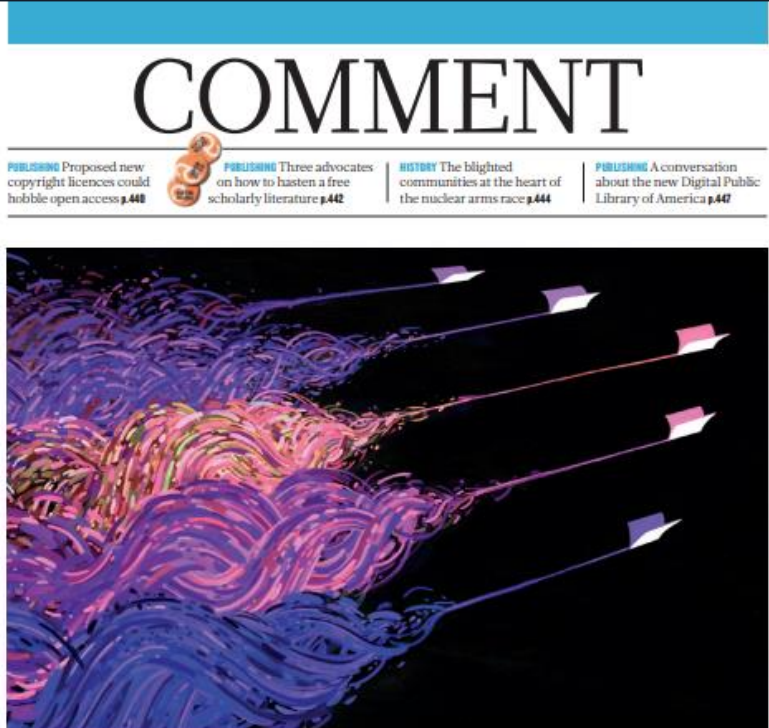**Transformation** — Digital, online, open, mixed media, dynamic, functional, interactive, inclusive

This is happening at different rates and in different ways across different institutions, disciplines and countries

What does the transformation of the information environment mean?

The example of scholarly communication

Priem (2013)

# 'Deconstructed' / 'Decoupled' / 'Recombinant' Journal'



RECONSTRUCTING PUBLISHING
In future, authors and funders will select services that are best for a given research product (for example, A and B). The product will be stored in and disseminated from an institutional repository, and given a unique identifier. Most traditional journal functions will be performed independently by an ecosystem of service providers. Some examples of services are labelled below.

FUNCTION

CERTIFICATION — Peer-review stamp, Aggregated comments

MARKETING — Author's Twitter feed, Mailing lists

PREPARATION — Typesetting, XML conversion

IDENTITY — Handle, Digital Object Identifier (DOI)

FOUNDATION

DISSEMINATION

STORAGE — Institutional repositories

▲ Product A, such as a data set          ▲ Product B, such as a video

"Today's publication silos will be replaced by a set of **decentralized, interoperable services** that are built on a core **infrastructure of open data and evolving standards** …This 'decoupled journal' publishes promiscuously, then subjects products to rigorous review through the **aggregated** judgements of expert communities, supporting both rapid, fine-grained filtering and consistent, meaningful evaluation."

(Priem, 2013, emphasis added)

# 'Datafied Scholarship'*

**Nexus, including:**

- Open Access/Open Science
- Text and Data Mining
- Artificial Intelligence
- Machine Learning
- Internet of Things and Intelligent materials
- Virtual/Augmented Reality
- Digital Humanities
- Academic Social Media
- Powerful networked infrastructures
- Plus: greater awareness and importance of values, sustainability, equity, diversity and inclusion
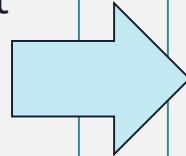
**Likely to lead to:**

- **Highly-collaborative** research
- Increasingly underpinned by larger and more complex **datasets and digital** artefacts
- Research outputs in a wide range of **forms**: text, data, visualisations, simulations, etc
- **Open** (gratis and libre) by default
- Available to be **automatically** crawled, mined, analysed, etc
- Surfaced/discovered in various personalised ways using continually adapting **algorithms** operating at a network level
- **End of 'journals' and 'articles'** as we currently think about them

(*Adapted from: Pinfield, Cox & Rutter, 2017)

# Challenges for Libraries

| Traditional library | Automated Library | Datafied open scholarship |
|---|---|---|
| Publications as distinct objects (physical) | Publications as distinct objects (digital) | 'Publication' as a digital 'flow' |
| Documents or document-like objects | Documents or document-like objects, plus data etc | Wide variety of outputs – documents, data, images, videos, simulations, etc |
| Purchased (owned) | Purchased (owned) or licensed (rented access) | Increasingly open |
| Indexed with hand-crafted metadata | Indexed with shared hand-crafted metadata | Automated metadata creation, TDM (text and data mining) |
| Discovered through specialized indexes and institutional library systems | Discovered through specialized indexes, network-level services, and institutional library systems | Discovered through network-level services and/or algorithmically-driven profiles |
| Pulled by user | Pulled by user, pushed to user | Pushed to user |
| Made available to local users | Local and open sources | Made available openly |

The digital shift is not just

automation but

transformation…

…for libraries this does not just mean

automation but

transformation

**Digital shifts** are not just automation but **transformations**…

…for libraries this does not just mean automation but **transformations**

# Outline

1. Automating and transforming the information environment:

   the digital shift

2. **Transforming the library**

3. Transforming scholarly communication

# Transforming the Library

- Inside-out library
- Intelligent library
- Service-driven library
- Platform library
- Meta library
- Boundaryless library
- Confident library

(Pinfield, Cox & Rutter, 2017 updated)

# Inside-Out Library



From 'outside in'
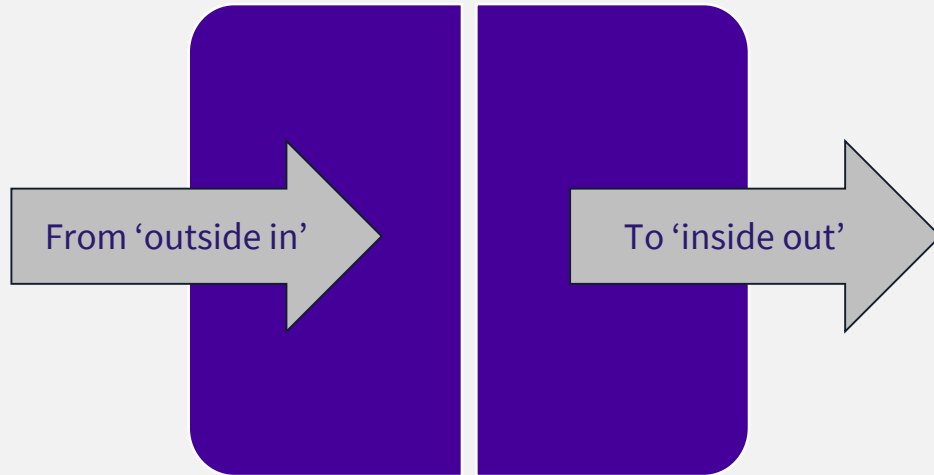
To 'inside out'

Examples:

- Open access systems / services
- Research data management / services
- Digital humanities support
- Digital special collections
- Bibliometrics support
- etc

"The inside-out Library. Creation happens in a digital environment, with an interest in the process, as well as the products, of research and learning. Libraries increasingly support the creation, curation and discoverability of institutional creations…. The university wishes to share these materials with the rest of the world."

(Dempsey, 2016, emphasis added)

# Challenges of the Inside-Out Library

- Achieving strategic re-positioning and re-prioritisation

- Re-directing existing resources (or identifying new ones) to inside-out activities

- Translating established practices into new applications

- Re-skilling staff (or making new hires) in new areas

- Ensuring the library has credibility to be involved in different areas, including up stream in research

- Ensuring local activities is sufficiently joined up with global systems and standards

From 'outside in'

To 'inside out'
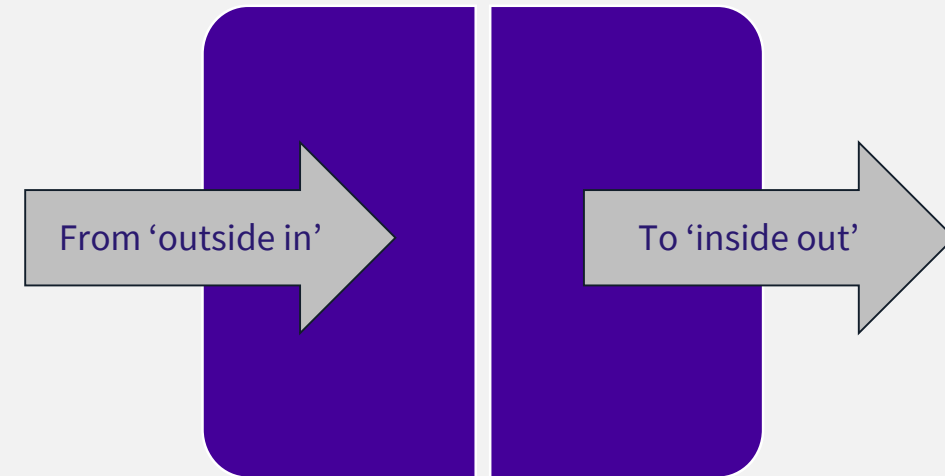
# Intelligent Library: Engaging with AI and Machine Learning

"A cluster of technologies and approaches to computing focussed on the ability of computers to make flexible rational decisions in response to unpredictable environmental conditions"

(Tredinnick, 2017)

**Includes:**
- Big data
- Analytics
- Machine learning
- Natural language processing (NLP)
- Text and data mining (TDM
- Data visualisation
- Decision logic
- Robotics
- Internet of things

**Current library activities:**
- Chatbots
- TDM services
- Discovery / discoverability – surfacing content in network-level services
- Supporting datafied scholarship
- Contributing to the intelligent / smart campus
- etc

**Challenges:**
- Accuracy and validity
- Transparency and intelligibility
- Privacy, dataveillance and self censorship
- Fairness and ethics
- Cost and its implications
- Employment and social equality

(Cox, Pinfield, & Rutter, 2019; Cox, 2022)

# AI, Libraries, Skills and Jurisdictions

| | AI applications | Skills needed | Jurisdiction/hybridity |
|---|---|---|---|
| 1 | Everyday web and mobile search | Understanding of how it works/training (of users) | Threat via smart technology simply replacing need to access library for information yet strengthens the need for information literacy and so educational jurisdiction |
| 2 | In existing library systems, for example, search interfaces | Training users | Strengthens the access jurisdiction |
| 3 | For knowledge discovery, such as licensing an AI product, offering collections as data, or supporting communities of AI users | […] [R]ange of skills required for 11 different options | […] [Varying] implications for jurisdiction |
| 4 | Conversational agents and voice assistants | Building knowledge base, skills for creating conversational agent (coding) | Limited impact to date in practice but could substitute for professional roles in the name of management efficiency |
| 5 | In user management—for example, learning analytics, library analytics, sentiment analysis | Data analysis, data science | Could strengthen an educational jurisdiction by giving more data on information need, but could also be seen as strengthening management logics |
| 6 | Robotic process automation—for example, applied to back end systems | Analysis of systems, coding | Makes some tasks more efficient, but unlikely to reduce professional work |
| 7 | Smart library | Sensor data analysis | Reinforces the access jurisdiction by improving understanding of use but could be seen as subordination to IT |

(Cox, 2022)

# Choices for the Library Around Information Discovery and AI

| Approach | What is involved | Skills needed | Resource cost | Risks | Likelihood | Jurisdiction/ hybridity |
|---|---|---|---|---|---|---|
| 1. Project | Building toward another type of involvement; skill development | Project management | Low | Temporary involvement | 1 Highly likely because low cost/risk | Noncommittal |
| 2. Do nothing | Nothing | None | None | Risk of being seen as not in tune with latest trends | 2 Likely | No claim |
| 3. License a proprietary AI product | Evaluation and support of third party products | Procurement, marketing, support through knowledge of users, bridge to IT services, understand potential of technology | Med | Vs open access ethos, limited by aggregator content, cost | 2 Likely | Full jurisdiction claimed—based on knowledge of users or managerialist |
| 4. Offer collections as data for AI | Collection management, metadata, data management, provenance—management of bias | Collection management, data management digitization, and so forth | Med | Have to have or acquire unique resources; Impact on traditional cataloguing roles | 2 Likely for research intensive/low for other | Full jurisdiction—based on access to collections or managerialist if driven by efficiency saving |
| 5. Support an institutional community led by data science academics | Library as service, for example, some help with things like copyright, training, choice of tools | Community participant, professional skills for example, in copyright, training | Low | More marginal involvement | 2 | Weak advisory |
| 6. Build institutional AI community | Neutral space, copyright expertise, support to software tools, training, acquire content; Ethical issues central | Depth of expertise in copyright, tools, training; Ethos of openness, sharing, and so forth, community building | Med | Hard to sustain, based on personal networks | 3 | Strong advisory or even a managerial role toward other professions |
| 7. Participate in extra-institutional support community | Contribute content, time, signpost the service to users | Collaboration skills | Med | Needs community to exist | 4 Unlikely because community does not exist | Weak advisory |
| 8. Customize AI products to local needs | Take AI products and customize them to local needs | AI skills | High | Risk of heavy investment for low return | 4 But require skills and resources | Split jurisdiction |
| 9. Resist | Ethics and human values opposing bias | Values and ethics | Low | Risk of being seen as not in tune | 4 Unlikely because tech love in profession | Full jurisdiction |
| 10. Create infrastructure which is tool agnostic | Create an infrastructure for data science across the institution | Infrastructure, workflows, storage, and so forth | Med | Skills lacking | 4 | Subordination |
| 11. Build own AI | Create own AI tools | Data science, AI | Very high | Skills lacking | 5 | Subordination |

(Cox, 2022)

# Key Issues Around Library Transformation and AI

1. **What a library is, what a collection is and how to search for material**. The library may increasingly be seen as data, accessed through AI, the scope of the collection as framed by the AI.

2. **How established services are delivered**, for example, by chatbots and other intelligent agents.

3. **What users expect of libraries**: through expectations learned in other areas.

4. **What information literacy is**: the ability to navigate a new space of AI tools and data, and data literacies, including critical awareness of how to protect one's own privacy.

5. **Who users are**: some users will be AI tools; human access to content will be remediated through content being summarised and partially analysed for them by machines.

6. **What libraries know about users and so how the library is managed**: because of management decisions based on use data, combined with other learning and research analytics.

7. **How the library works with other internal and external partners and competitors**, especially IT services and new third-party commercial services.

8. **How library services are evaluated**: again through wider and deeper data.

9. **What skills librarians need**: be that for licensing, evaluation of data analysis and visualisation tools or using such tools themselves.

10. **Whether the library community can operate effectively at different levels beyond the institution**: in order to design and deliver services which will serve international communities of scholars and students.

11. **Whether we need librarians** (because of chatbots, automated metadata creation tools, etc.) **or libraries** (because of alternative intermediaries) at all, at least as currently conceived.

(Cox, Pinfield, & Rutter, 2019)

# Service-Driven Library

- Move away from library based on collections to one based on services (including the collections as a service), including support and advice

- Central idea of the "facilitated collection" – "facilitates access to a coordinated mix of local, external and collaborative services assembled around user needs and available on the network" (Dempsey, 2016)

- Includes support to tools associated with open scholarship at network level





(Bosman & Kramer, 2015;
https://101innovations.wordpress.com/workflows/)

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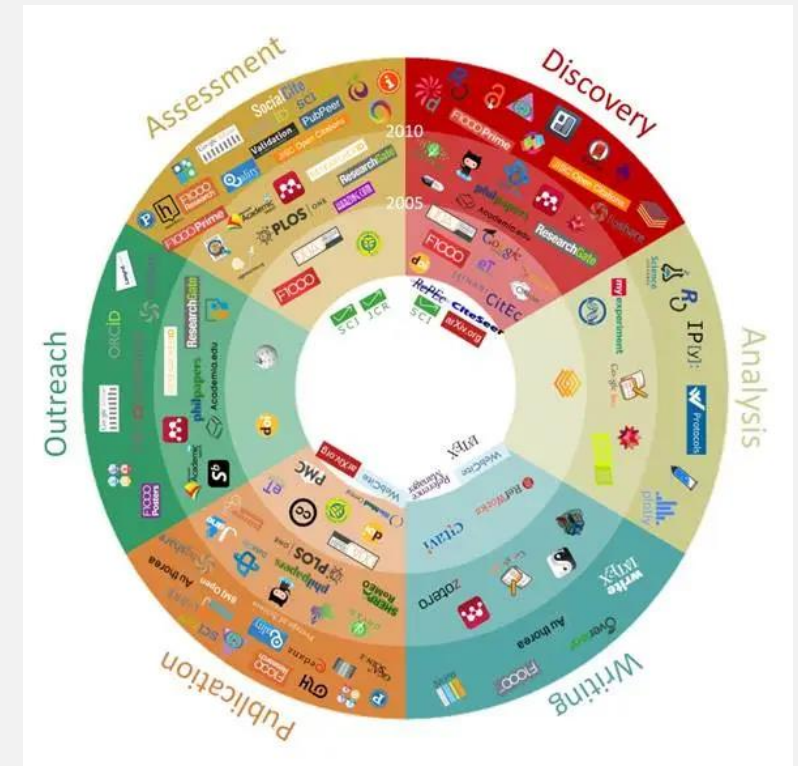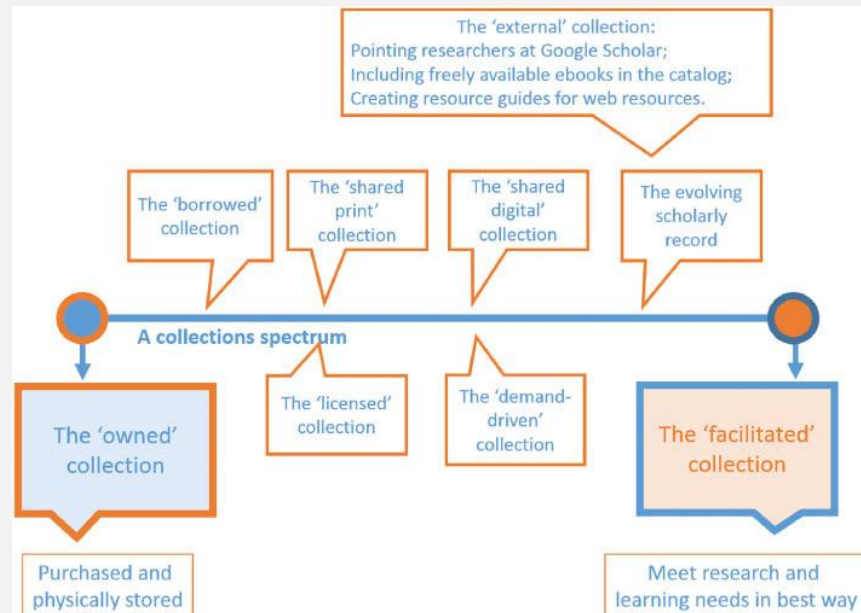
# Platform Library

"From 'library as space' to 'library as platform'" - projects that "have transformed physical and virtual spaces from preprogrammed areas and services designed to serve librarian-defined needs to an **open and flexible** architecture that better incorporates and **facilitates the projects, ideas, and interest-driven learning initiated by users**." (Andrews et al, 2016, emphasis added)

The library as platform, "focuses our attention away from the provisioning of resources to the foment those resources engender. A library as platform would give rise to **messy, rich networks of people and ideas, continuously sparked and maintained by the library's resources**." (Weinberger, 2012, emphasis added)

Seen most clearly in **Makerspaces** across different library sectors
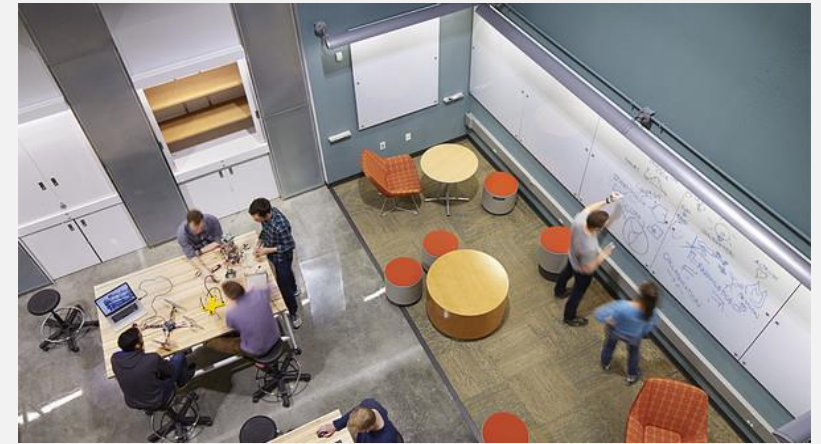


Raises question of the physical-virtual relationship in the library as platform
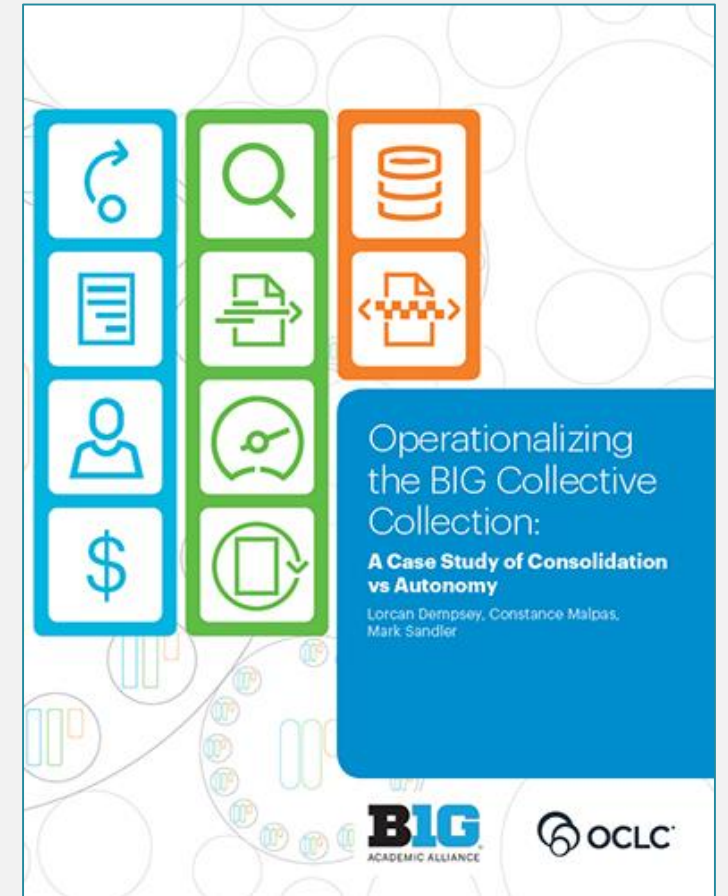
# Meta Library

- Increasing amount of activity needs to happen at the 'meta' (supra-institutional) level cf. local duplicative activity

- Action can happen at regional, national and international levels

- Applies to consortial work e.g. transformative agreements – 'inside-out-ing' of Big Deals

- Development of shared infrastructure and standards

- Coordinated action also applies in other areas e.g.
  - Collective collection management – print collections
  - Addressing major digital preservation challenges

"Libraries have to reshape themselves so that they are nodes on the global network that will make up the open scholarly commons"

(Lewis, 2019)



Operationalizing the BIG Collective Collection:

**A Case Study of Consolidation vs Autonomy**

Lorcan Dempsey, Constance Malpas, Mark Sandler

B1G ACADEMIC ALLIANCE    OCLC

# Boundaryless Library

- ## Physical spaces
  - Boundaries between library spaces and non-library spaces blurred
  - Creates challenge of what is distinct about library spaces
- ## Library organisation
  - In the library professional boundaries are breaking down
    - Acquisition of new skills
      - Development of existing staff
      - New hires
    - Organisational structures need reviewing
- ## Library relationships
  - Professional and organizational separation between the library and other departments is becoming blurred
    - Other Professional Services
    - Academic departments – 'Third Space' roles



The Diamond building, University of Sheffield – teaching, learning and library facility

# Boundaries and the "Third Space"



Academic — "Third Space" — Professional Service
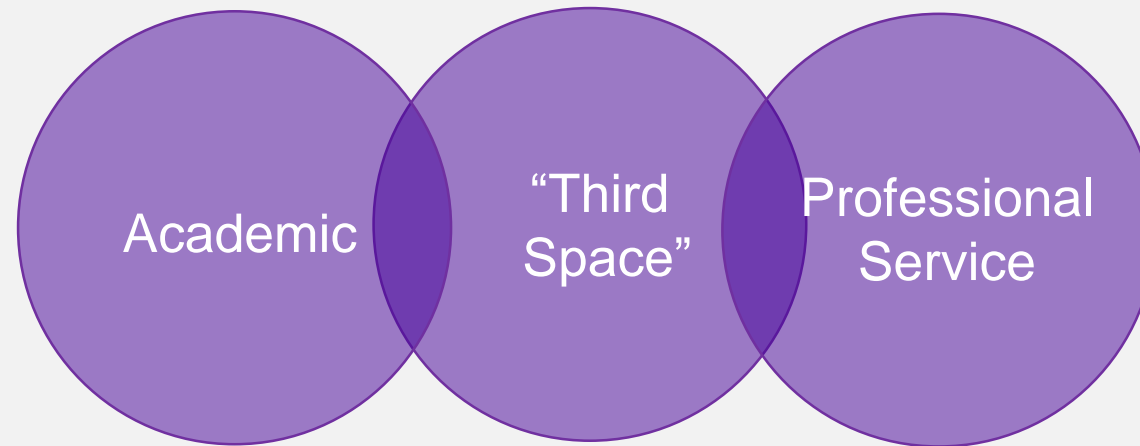
(Based on Whitchurch, 2013)

# "Dispositions" of Library Staff

| Identity "dispositions" | Characteristics |
|---|---|
| "Bounded professionals" (voluntary or involuntary) | Work within clear structural boundaries (e.g. specialist function, job description) |
| "Cross-boundary professionals" | Actively use boundaries and cross-boundary knowledge for strategic advantage and institutional capacity building |
| "Unbounded professionals" | Lack of consciousness of boundaries; focus on broadly-based projects across the university, and contribute to institutional development |
| "Blended professionals" | Dedicated appointments spanning professional and academic domains |

(Whitchurch, 2013)

# The Need for 'Coopetition'

- Professional groups compete for "jurisdiction" (Abbott, 1988) in new areas *as well* as needing to collaborate e.g. RDM, bibliometrics support

- Libraries need to navigate this 'coopetition' – cooperation and competition combined

- Existing services may also become contested e.g. learning spaces

(SCONUL, 2019)

Examples: Managing open access article processing changes budgets and responsibility for research data management



Figure 2 Library holds a budget for APCs in 2017-18



Figure 3 Library responsibility for RDM
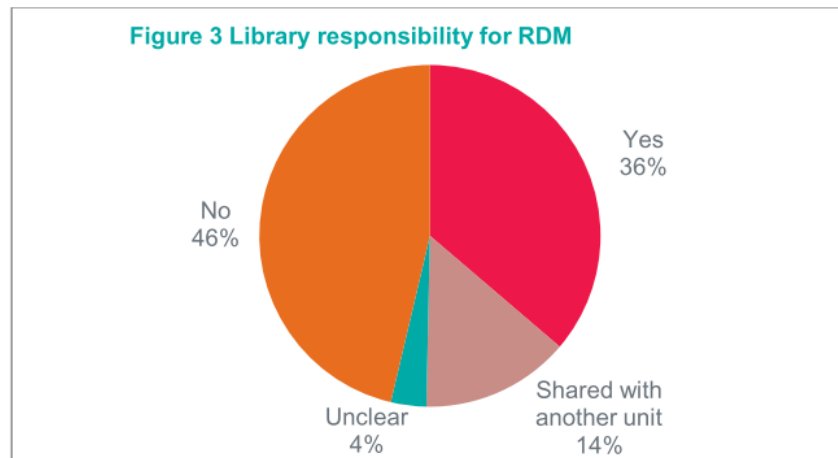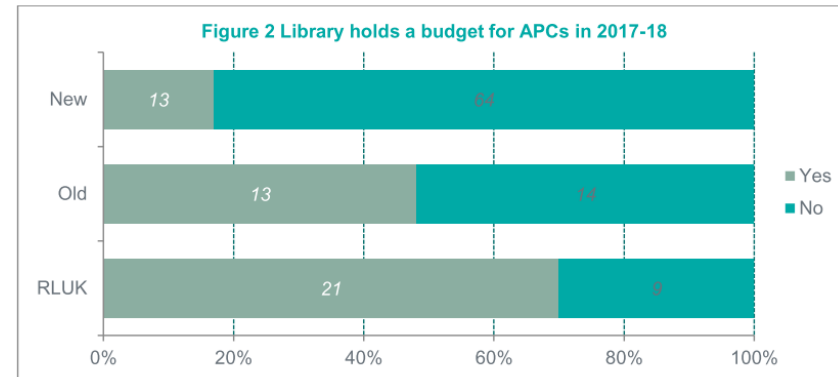
# Confident Library

- The role of the library is often not well understood in the rest of the institution
- 73% of participants in the Mapping the future of libraries project believed that "senior institutional decision makers need to be educated that the library is not all about books"
- The pandemic may have helped illustrate the ongoing potential of libraries in a digital environment
- Libraries need to have professional confidence to develop new roles
- **Libraries need to create and communicate a compelling vision of the future**

> "***People being wedded to that old model of the library is something that really holds libraries back***. *And I think we need to think about working with vice chancellors, working with PVCs [Pro-Voce Chancellors or Vice Presidents] for research, teaching learning and so on… we need to do a lot of work I think with those communities to get people to…be happy about moving away from old legacy models which give us huge unnecessary collection management building, storage problems…we could be faster, more flexible and more fleet-of-foot if we could move away from some of that. But **we need to take those people with us**. And I think that will be hard to do."*
> *(Library Manager)*
>
> (Pinfield, Cox, & Rutter, 2017)

# Confident Alignment

- **Service-provider:**
  - delivering key services and support activities required by users in line with institutional requirements, often at scale

- **Partner:**
  - working alongside users and other professional services organisations, often through projects or embedded working

- **Leader:**
  - innovating in new areas, persuading key stakeholders of the way forward and contributing to overall institutional strategy, creating and communicating a compelling vision

(Pinfield, Cox, & Rutter, 2017)

Applies at institutional and supra-institutional level

# Transforming the Library

- Inside-out library
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(Pinfield, Cox & Rutter, 2017 updated)

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# Scholarly Communication Systemic Problems

"Vicious circle":

- "Replication crisis":
  - lack of reliability and/or verifiability/reproducibility of scientific results – data often not share in reusable form – focus on newsworthy results

- "Affordability crisis":
  - oligopoly of publishers controlling content and quality brands – above inflation increases year-on-year, profit margins of 40%+

- "Functionality crisis"
  - unrealiable and non-integrated infrastructure, antiquated workflows

(Brembs, et al., 2023)

# Compounding the Problems

- "Surveillance capitalism"
  - companies tracking academic behaviour for targeting customers, product development and sometimes resale

- "Workflow monopoly"
  - workflow productivity tools being taken over by publishers or their holding companies

"There is now a very real threat of a single (or few) corporations effectively owning all scientific data, both research data and user data, on top of their share of the scholarly literature."
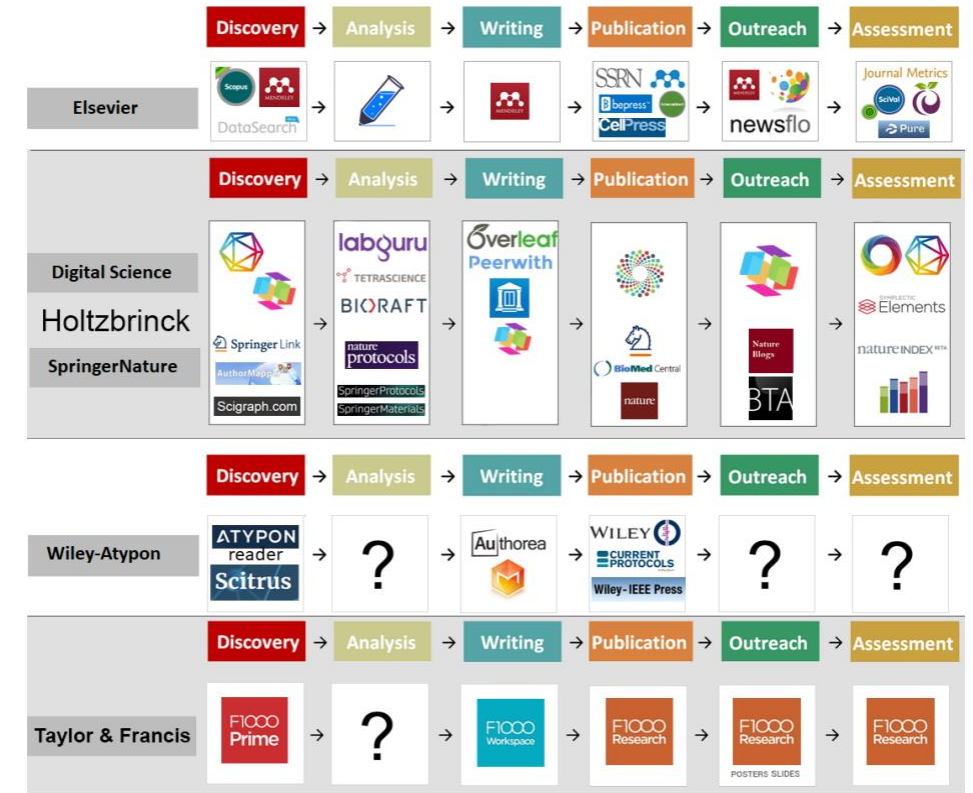


**Figure 1:** *Providers of digital tools for the scientific workflow.*
Logos stand for software tools designed for specific aspects of the workflow. Each tool may be used in more than one step of the workflow. Elsevier and Holtzbrink are leading in the race to cover the entire workflow, with Holtzbrink offering multiple tools for each step in the workflow. The preconditions for a functioning market exist, but a common standard is missing that provides for the substitutability of service providers or tools. (CC BY: Bianca Kramer, Jeroen Bosman, https://101innovations.wordpress.com/workflows)

(Brembs, et al., 2023)

# Transforming Scholarly Communication

## Problems:

- Replication crisis
- Affordability crisis
- Functionality crisis
- Surveillance capitalism
- Workflow monopoly

- Global scientific access and contribution inequities

## Library Activities:

- Change advocacy
- Policy development
- Negotiating and promoting new business models
- Systems development: tools and processes
  - Institutional repositories
  - Data repositories
  - Publishing platforms, incl. new approaches to peer review
- Standards development
- Training and support

## Transformed Library:

- Inside-out library
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# Confident Alignment with the Scholarly Communities Priorities

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- **Leader:**
  - innovating in new areas, persuading key stakeholders of the way forward and contributing to overall institutional strategy, creating and communicating a compelling vision

(Pinfield, Cox, & Rutter, 2017)

Applies at institutional and supra-institutional level

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