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D4.1 Mapping of existing studies and metrics

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Executive Summary

This deliverable for WP4.1 identifies existing research on libraries of value to producing indicators on innovation and user involvement in developing library innovations. The goal is to use the results to produce relevant indicators, where feasible, for innovation, co-creation, digital participation, and transformative innovation.

A literature search identified studies on three topics of relevance to innovation: 1) user satisfaction with library services, as obtained through surveys of library users, 2) technology adoption, which occurs when libraries adopt and implement technologies such as digitalization or new services, and innovation and innovation activities within libraries, covering different types of innovations and activities to support the development and implementation of innovations, including user involvement (co-creation) in developing innovations. The literature on these three topics are summarized in tables that differentiate between public libraries (largely libraries at the municipal level that are accessible for all residents of the municipality) and research or academic libraries owned by tertiary institutions such as universities and colleges or government research institutes.

The literature review finds very little data that could be used to construct innovation indicators for libraries, which requires statistically representative data that are comparable across two or more jurisdictions (municipalities, regions, countries, etc.). This requires studies to collect data using similar questions and to present the results as frequencies, such as the percent of libraries that implemented an innovation or involved users in developing innovations. The only comparable data from user surveys is for user satisfaction with computer equipment in three Balkan countries compared to six African countries and for technology adoption for the use of makerspaces and social media in American academic libraries and a global selection of public libraries. There are no comparable indicators for innovation or innovation activities.

The best available data on innovation and user involvement in developing library innovations is from a survey of university libraries in Australia and the Danish public sector Innobarometer survey. The Australian survey includes four questions on different methods for involving users in developing library innovations. The Danish survey collects data on the percentage of libraries that introduced service innovations, the degree of novelty of library innovations, the initiators of innovation including citizens, collaboration partners including citizens, and promoting and hindering factors for library innovations.

Due to these limitations, the main value of the existing literature to research on measuring innovation in libraries is as a source of ideas for questions for inclusion in the planned WP4.2 survey. Relevant questions are summarized for leadership and the organizational culture for innovation, user involvement in innovation, the benefits of including users in innovation activities, and obstacles to the inclusion of users in developing innovation.

The lack of data on innovation in libraries, compared to extensive comparable innovation data for the business sector, is likely due to three causes: the lack of academic agreement on measuring innovation in libraries, the failure of national library surveys to include questions on innovation, and a failure of most National Statistical Offices to survey innovation in the public sector.

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List of Terms and Abbreviations

Abbreviation	Definition
AI	Artificial Intelligence
CIS	Community Innovation Survey
IFLA	International Federation of Library Associations
LIBER	Association of European Research Libraries
NACE	Nomenclature statistique des activités économiques dans la Communauté européenne (Statistical Classification of Economic Activities)
OECD	Organization for Economic Cooperation and Development
WP	Work Package

1 Introduction

Innovation is essential for productivity and can contribute to a range of other socio-economic benefits such as improved living standards and quality of life for citizens and residents. For these reasons, the governments of many countries monitor innovation activities in the business sector to identify the factors that contribute to business innovation and to monitor investments in innovation activities. The fourth edition of the Oslo Manual, published by OECD/Eurostat (2018), provides guidelines for measuring innovation in all economic sectors, but primarily focuses on the business sector. It defines innovation as:

> "a new or improved product [good or service] or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)" (p 19).

The reference to 'made available' or 'brought into use' is because a new idea must be implemented to be an innovation. Additional text states that the innovation need not have been developed by the responding organization. The fourth edition of the Oslo Manual (p 77, 111) also identifies the importance of measuring co-creation and design thinking activities, particularly for service innovations.

The unofficial Copenhagen Manual (Lykkebo et al, 2021) provides guidelines for measuring innovation in the public sector and has been used by several countries, including Czechia, Denmark, Finland, Greece, Iceland, the Netherlands, Norway, Slovenia Sweden, and New Zealand, to develop innovation surveys of government organizations. Other countries including Austria, Germany and South Africa are planning to run a public sector innovation survey in the near future. The generic questionnaire in the Copenhagen Manual defines an innovation as "a new or significantly changed way of improving workplace activities and results", which is similar to the Oslo Manual definition. Additional text in the questionnaire states that the innovation "must be new to your workplace, but can have been used before or developed by others" and that the "innovation must have been put into use". Both definitions are in agreement with the Oslo Manual. The main divergence with the Oslo Manual is the reference to an innovation 'improving' activities and results, in other words, an innovation must make something better, whereas the Oslo Manual definition does not require an innovation to be an improvement over previous practice.

NACE revision 2.0 (Eurostat, 2008) classifies all types of economically active organizations in Europe into three main sectors that differ by the ownership of the organization (private businesses, government, and non-governmental organisations serving households). All types of libraries that exist as separate entities with some decision making powers (municipal and other types of public libraries,

research and academic libraries, private libraries owned by businesses, and community libraries) are classified under division 91 (Libraries, archives, museums, and other cultural activities) with libraries in the separate class 91.01. Unfortunately, the Community Innovation Survey (CIS), implemented in all member states of the European Union and EFTA, does not include NACE 91.01 because the survey focuses on the business sector. Although business-owned libraries can have substantial collections, business libraries as separate entities are too infrequent to include NACE 91.01 in the CIS.

The task of WP4.1 is to "identify existing studies … on the measurement of value co-creation in library services, including survey research and analyses of publicly available data obtained from the internet and other sources". The indicators should be available separately for public libraries (largely libraries at the municipal level that are accessible for all residents of the municipality) and research or academic libraries owned by tertiary institutions such as universities and colleges of by government research institutes. The goal is to use the results to produce relevant indicators, where feasible, for innovation, co-creation, digital participation, and transformative innovation.

1.1 Data requirements for indicators

As will be obvious in the literature review described below, there is very little data that could be used to construct innovation indicators for libraries. The first problem is that the existing literature does not report results in a format that could be used to construct indicators. Comparability requires studies to collect data using similar questions and to publish the results as frequencies, such as the percent of libraries that implemented an innovation or involved users in developing innovations. The second problem is that data must be comparable for more than one jurisdiction (for instance a country, province or state, county, or municipality) and provide statistically representative results that accurately reflect the innovation activities of libraries within the jurisdiction. Ideally, data would also be available at two or more points in time, but only one study (Born et al, 2018) has been repeated, with data collected in 2012 and 2015. The minimum requirement for constructing indicators is that two or more studies of libraries in different jurisdictions use comparable definitions of key innovation activities or outcomes and that frequencies for these activities are published. In addition, it would be useful to have representative data for similar types of libraries, such as academic or public libraries.

Frequency data for innovation activities can be obtained in a number of ways, through questions that ask respondents to answer questions about a single service innovation, questions that elicit yes or no responses, questions requesting interval level or count data such as the number of users involved in a focus group, and Likert measures for the level of importance, satisfaction, or agreement/disagreement of a condition. Likert questions are very common in the literature, but they can only be used to construct indicators if four aspects are comparable across studies or across jurisdictions:

1) Using the same scale (very important, moderate importance, etc. or agreement statements),

2) Reporting the percent that cite a given level of importance (very important, for instance) instead of reporting means[1],
3) Listing similar sub-questions within a matrix question, since Likert scales are influenced by the type and number of questions in a matrix question, and
4) Cultural similarities in how "importance" or a similar construct is perceived. This can be a significant problem, particularly when comparing libraries in countries with very different levels of economic development.

Very few studies meet the data requirements for constructing indicators. Consequently, existing research is mostly of value as a source of ideas for questions in the WP4.2 survey and for ideas on the types of indicators that could be constructed if data requirements were met.

Of interest, national library associations collect a substantial amount of statistically representative data for specific member libraries and much of this data is comparable across countries. However, the type of data collected is rarely relevant to innovation and almost entirely administrative, covering the following types of variables: the number of part-time and full-time employees, expenditures on salaries and benefits, expenditures on physical materials, expenditures on electronic materials, total library card holders, new library card holders, in-person visits, days open per year, hours open per year, virtual visits, physical book loans, e-book loans, DVD loans, program sessions, attendees at programs, income from various levels of government, income from subscriptions, etc.[2] These data may also be publicly available for specific libraries, which creates opportunities for linking survey or other data to library administrative data, as in the example by De Witte and Geys (2013).

1.2 Types of data of relevance to innovation

The preliminary research for WP4.1 has identified several types of data of partial relevance to measuring innovation or co-creation in libraries. The studies fall into three categories:

- User satisfaction surveys, conducted by library associations, individual libraries, or academics. Their value is that they have been used by libraries to identify areas for future improvement, which can often require incremental or more substantive forms of innovation.

[1] Mean values for Likert scales are commonly reported in the literature. These are not useful for constructing indicators because the mean value suffers from two problems: a tendency for respondents to overreport the mid value of a Likert scale and because a mean close to the midpoint (3 in a five-point Likert scale) can be due to a "U" shaped distribution of responses with higher frequencies for both values of 1 or 2 and values of 4 or 5. To overcome these problems, Likert scale data should be reported as the percentage of respondents that give a 'high' or 'very high' response.

[22] For an example for the Netherlands, see https://www.bibliotheeknetwerk.nl/onderzoek/bibliotheekmonitor.

- Studies of the adoption by libraries of a list of one or more specific new technologies or services, with the data collected from library websites or through interviews or surveys.
- Studies of library innovations, for instance through interviews, surveys, website analysis, or evaluation of library innovation awards. Some of these studies have collected data on design thinking or the involvement of potential users in developing library innovations. A few studies examined inputs to innovation without collecting data on innovations.

Section 2 below describes the methodology to identify relevant research. The subsequent sections 3 to 5 examine the three types of research in greater depth and identifies studies of public and academic libraries. The tables that summarize the results of each study provide the author, the country of study location, study design, study size, if the questions used in a survey are available (of value for developing the WP4 survey questionnaire) and the main topics covered. Each section concludes with an evaluation of comparability across each type of study, necessary for constructing indicators. Section 6 covers other data sources and section 7 summarizes useful questions from the existing literature and other sources. Section 8 draws a few conclusions.

2 Methods

Relevant studies were identified through literature searches (two by WP2.1[3] and a third by WP4.1) and through requests sent to national experts. The goal was to identify publications that covered six or more libraries. This is a low minimum for inclusion, but research on six libraries was expected to require general questions, of relevance to different conditions, that could be useful for designing a questionnaire. Only studies published in English were included in the literature search.

The initial search under WP2 for public libraries was limited to identifying papers published between 2012 and 2022 in five academic journals (Library Quarterly, Library Management, Journal of Library Administration, IFLA Journal, and Libri). In addition to the keyword 'librar*, other search terms included innov*, transit* (for transition) and transform* (for transformation). The results were further sorted to include the additional keyword "co-creation". Several relevant papers were identified from this literature review, but the majority of papers are limited to case studies. These can provide useful ideas for survey questions for WP4.2, but are not useful for constructing indicators. A second search for public libraries covered journals listed by Scopus and identified articles of interest that were not included in the first search. A single search was conducted for academic libraries. Articles identified in the public and academic literature searches for the WP2.1 report were assessed to determine if they collected data on innovation for six or more libraries.

The WP4.1 search reported in this document covered 2010 to March 2023 and included all social science journals plus books[4]. The goal was to identify articles and reports that collected data of relevance to innovation for six or more libraries. In addition to a keyword for librar*, the search included:

1. Identifiers for **innovation** activities, including innov* or "change", "improvement", "novelty", and "development".

2. A secondary search limited the above by including identifiers for **co-creation** with users etc. Search terms included "co-creation", "design thinking", "innovation lab", and "living lab". As these terms are specialized and may not be used in all disciplines, other identifiers for user involvement in developing an innovation included "users", "citizens", "clients", and "stakeholders".

[3] WP2, Deliverable 2.1 "Conceptual framework of participatory management and sustainable growth".

[4] We thank Ad Notten from UNU-MERIT for conducting the literature search.

3. The search used exclusion criteria to limit the selection of articles from computer science (software/object libraries and user interaction), and some engineering, medical, and design/architecture articles.

The first two WP4.1 searches identified 572 items. If the title suggested that the paper covered innovation activities, the full abstract was read. Reading the abstract identified approximately 50 papers of possible interest because they used a survey, interviews, or website analysis to collect data on innovation or related activities. Combining the results from the two literature searches for WP2 and the WP4.1 search resulted in 43 relevant papers, which are summarized in Tables 1 to 7 (several other papers are discussed in the text only). Of note, the two literature searches by WP2.1 examined papers in much greater detail than the WP 4.1 search before determining if they were relevant to the LibraIN project or not.

In addition to the literature search, the heads of national library associations were contacted and asked if they were aware of data collections of relevance to innovations by libraries. This method identified the BiB survey of library users in Belgium and a similar survey in France, as discussed in the next section.

3 Library User Surveys

A common method identified by national experts are surveys of library users to determine the level of use for specific library services and user satisfaction with these services. A good example is the 2021/22 BiB survey in the Vlaamse region of Belgium, with responses obtained from 55,507 users of 153 libraries. The city of Genk analysed the data for their municipal libraries to identify possible areas for improvement[5], including:

- Demand for more recent and popular publications in English.
- Need to improve the ease of use of the online 'my library' accounts.
- High public interest (40% of respondents) in after hour library services, as in the "open library" program in Finland (van Kempen et al, 2021).
- Interest in more activities for children, youth, and adults.
- Moderate public interest (20% of respondents) in a film streaming service.

User interest in these improvements were interpreted in the Genk analysis as areas where the library could innovate to improve services. Similarly, a survey of 4,566 library users over fifteen years of age in Türkiye (Al et al, 2019, p 76) was partly motivated by the need to understand the personal characteristics and needs of library users to 'identify the innovative and creative services to be provided by libraries". The study found that the majority of library users were students who used the library to study, emphasizing the role of the library as a 'third place' after school (work) or home, and one of the most popular services were in- person or internet-based training courses. A 2011 survey of library users and non-users in six African countries, sponsored by EIFL (Electronic information for libraries) was conducted to understand satisfaction with libraries and barriers to library use (Elbert et al, 2012). The highest rates of dissatisfaction were with non-book collections (CD and DVD), computers and other equipment, and computer software, all areas that might be more resource intensive than book collections.

Similar library user surveys that included questions on user satisfaction have been conducted in France for the users and non-users of municipal libraries[6] and at the municipal level for the 18 public libraries of Lyon.[7] Other countries including Australia (states of NSW and Victoria) also conduct library user surveys that measure satisfaction.

[5] Publieksonderzoek 2021-2022, Wat leert Bibliotheek Genk uit de resultaten? www.vvbad.be.

[6] Ministère de la Culture et de la Communication, Les non-usagers des bibliothèques: Enquête quantitative, Direction générale des Médias et des Industries culturelles, Paris, November 2018.

[7] Satisfaction survey of public libraries in Lyon, March 2018, link to document.

Library user surveys are also conducted by academics. Bieraugel and Neill (2017) conducted a random survey of students in five locations in an academic library to determine how different spaces supported creativity and innovation. The results could be used to evaluate the effectiveness of different spaces and to alter the configuration of other spaces to improve student outcomes. Yuan and Yang (2023) asked university students and teachers in China about their use of library 'smart services' and how useful they found these services, such as 'sense of satisfaction', 'allow me to communicate with other users', 'allow me to stay engaged or connected with others', etc. They found that user satisfaction was more strongly correlated with the use of these services than supply factors such as service platform performance and quality. Stokic et al (2019) conducted a user (patron) survey of all types of libraries in Serbia, Montenegro and Bosnia and Herzegovina, with 224 responses. The questions asked about respondent level of satisfaction with specific services, such as the library website, online catalogue, access to digital materials, training, promotion/events, communication from the library, opening hours, accessibility, layout, computer equipment, etc. Cahill et al (2020) asked parents about their reasons for bringing their children to attend public library story times. The questions do not ask about satisfaction, but frequently cited reasons can be used to improve the service while reasons that are rarely cited, such as "learn early literacy and child development tips" may be best ignored as they could discourage some parents from attending.

Other surveys of library users have been conducted, but the results are not useful for developing indicators for several reasons: the study does not report frequency data that are necessary for constructing indicators (Chen and Shen, 2020; Noh, 2020; Rafique et al, 2018; Yu and Huang, 2020), the study only reports mean values for Likert questions (Ahmed, 2017; Oh, 2020), or the study only covers the users of a small number of libraries (Chow et al, 2012; Circle, 2018; Oh, 2020; Richter et al, 2019).

3.1 Comparability of user surveys

Indicators for user satisfaction require studies to collect and publish results for the frequency of the level of satisfaction of library users. Table 1 gives some of the results from user surveys where it is possible to construct metrics, illustrating the range of topics and methods used. Several of the user surveys can't be used to create indicators. The study by Bieraugel and Neill (2017) uses a seven-point agreement scale but it does not present the data in a format that can be compared to other research.

Table 1: Potential indicators from library user surveys

	Stokic et al, 2019	Al et al, 2019	Yuan & Yang, 2023	Elbert et al, 2012
Sample size	224	4566	577	3201
Country	Serbia, Montenegro, Bosnia/Herzegovina	Turkey	China	6 African countries

Date of survey	2016?	2017	2021	2011
Library type	Public	Public	Academic	Public
Highest importance services (% respondents)				
Library website	44%			
Online reservation of library materials	46%			
Participation in workshops org. by library	29%			
Access to digitized material (books etc)	46%			
Satisfaction with computer equipment	low			moderate
Positive user rating for (percent respondents):[1]				
Library opening hours				85%
Events				34%
Library facilities				77%
Find training courses beneficial **(percent averaged over 8 types of training courses)**		79%		
Types of training courses requested by users (percent respondents)[1]				
Internet based on topics of interest		75%		
Advanced computer use		70%		
Health education		60%		
Use of e-government services		48%		
Job search		43%		
Reasons not to use library smart services (percent respondents)[1]				
Unaware of them			73%	
Too busy with study and work			34%	
The smart services don't meet my needs			6%	
I don't know how to participate			41%	
Reasons for user dissatisfaction (percent respondents)[1]				
Range of books too limited				58%
Not enough computers				37%
You can't borrow books for long enough				22%
Motivations for non-users to use the library (percent respondents)[1]				
More of the books I want				45%
Open more hours				35%
More materials accessible online				29%
Easier to use				15%

1: selection of questions from the study

Stokic et al (2019) report some results for a question that asks respondents to "mark services that are of the highest importance to you", but otherwise the paper reports most results by giving means for Likert scale questions. The mean level of satisfaction for equipment (computers, printers, copiers, terminals) is less than that for accessibility and communication, indicating that this could be an area for technological improvement. Elbert et al (2012) use Likert scales in a question of user ratings of different aspects of their library, but correctly provide the percentage of respondents that reply to each

option (excellent, good, bad, very, bad, don't know). Yuan and Yang (2023) include multiple questions of relevance to user satisfaction for which no data are given, such as the answers to the questions "the platform is simple and intuitive", "the smart services platform is secure enough to protect my personal information", "the communication channels are are smooth and easy to use", "when I encounter difficulties, I can get help". However, the authors give the percentage of respondents that report different reasons for not participating in library smart services, as shown in Table 1. Al et al (2019) only collect data on user perceptions of training courses offered by libraries on a variety of topics. As shown in Table 1, only one indicator is available for more than one study (satisfaction with computer equipment).

4 Technology Adoption Studies

A common method of investigating innovation by libraries is to conduct a study of the adoption or use of defined technologies. For example, Jantz (2015) asked respondents if their library had introduced each of 32 defined technologies. Technology can also be interpreted broadly to include non-technical services and differences in how space is used. For example, Perry (2014) asks if libraries provide collections and physical facilities that are helpful for older adults, such as large print and audio books, assistive technology such as a computer equipped with large type hardware and software for individuals with poor sight, and adequate spacing between shelving to accommodate users of wheelchairs or walkers. Bartot et al (2016) ask about provision of different types of training courses for library patrons, such as how to access and use online services and databases and general internet use.

One advantage of technology adoption studies, as used in eight of the 17 studies listed in Table 2, is that it is possible to use website analysis, which is cheaper and faster than implementing a survey or conducting a series of interviews, although not all technologies may be reported on a website, resulting in under counting.

The disadvantage of technology adoption research is that they require expertise to identify new technologies or methods, which are expected to change over time as they are increasingly adopted. For some libraries, the list of technologies may include technologies that have been used by the library for a long time and which are consequently no longer an innovation, as defined by the Oslo Manual (OECD/Eurostat, 2018).

The relevance of technology adoption to indicators also becomes rapidly outdated, as new technologies diffuse. As an example, in the early 2010s there were multiple surveys of the use by libraries of web 2.0 technologies, such as forums, instant messaging, Facebook, YouTube, Twitter etc. Wojcik (2015) found that that the percentage of public libraries in one Polish province with one or more Web 2.0 elements rapidly increased over two years (2011 to 2013) from 41% to 59%. In the United States in 2013, 100% of the top one hundred colleges reported web 2.0 technologies on their websites, with 100% using social networking sites and 99% a blog (Boateng and Liu, 2013), while a survey found that for the same year only 1.5% of public libraries had a 3D printer (Woodson et al, 2020), a much more recent technology in 2013. The rapid diffusion of new technologies or services requires indicators to focus on emerging novelties such as 3D printers that have not yet reached saturation levels of diffusion.

Another disadvantage in some of the surveys conducted on technology adoption is the use of list serves (mailing lists) to distribute online questionnaires in three studies (Andrews et al, 2021; Hervieux

and Wheatley, 2021, Yoon et al, 2022), which means that the authors are unaware of the number of recipients and are therefore unable to calculate response rates.

Studies of technology adoption (excluding services such as training courses) are summarized in Table 2. Technology adoption studies are more commonly conducted for academic than for public libraries, with only seven of the 17 studies in Table 2 including public libraries versus 13 including academic libraries. This might be due to a belief that leading technologies are more likely to be first implemented in academic libraries, with public libraries being late adopters, for which there is some support. Out of three studies that included both academic and public libraries, three made a direct comparison in technology adoption rates between the two library types. Andrews et al (2021) found no difference between academic and public libraries in librarian support for adopting AI and related technologies, but Yoon et al (2022) found that the use and awareness of AI technologies was greater for academic than public librarians, and Rubin et al (2011) found that the websites of academic libraries reported a greater variety of technologies in use. These differences could be due to more resources available to academic libraries, due to their larger average size compared to public libraries.

Theoretically, technology adoption studies could collect information on user involvement or the use of design thinking to adjust a technology to each library's own conditions, but none of the studies listed in Table 2 have done this. Their main advantage for WP4.1 is if the types of identified technologies may be worthwhile including in the WP4.2 survey or if technology adoption can be used as a proxy indicator for innovation.

Table 2: Studies of technology adoption in libraries (organized by realized sample size)

Authors & date	Country	Study design	Returns/ Sample	Questions available	Topics covered
1. Woodson et al, 2020	US, **public** libraries	Survey	4,602	Yes	Survey conducted in 2013. Only one question on technology reported, which is if the library had a 3D printer.
2. Wojcik, 2015	Poland, **public** libraries	Website analysis	773	No	Number and prevalence of Web 2.0 technologies in use, number of library friends, messages and comments, types of information on website.
3. Catalano, 2018	US, academic libraries	Website analysis	316 (100 ARL libraries, 56 ARL branches), 160 randomly selected non-	No, but list of techs	Technologies / methods of interest include emerging staff positions, social media, research data services, digital scholarship, open educational resources (OER), makerspace, distance learning services, new reference services

Authors & date	Country	Study design	Returns/ Sample	Questions available	Topics covered
			ARL academic libraries		
4. Andrews et al, 2021	US, Canada, **public** and academic libraries	Online survey	236/?	Some questions given, others may only be an outline	Sample size unknown because the questionnaire sent to various list serves. Not about actual adoption but support for adopting "Artificial intelligence and related technologies" ("intention to adopt"). Respondents given 6 examples of technology: AI, Internet of things, cloud computing, big data, robots and mobile technologies. Not sure if these technologies were defined in the questionnaire.
5. Hamad et al, 2022	Jordan, academic libraries	Online survey	246/340	Yes for 16 smart technologies	Use of 16 defined smart technologies, including RFID, mobile applications, journal metrics, big data to pinpoint user needs, automated messages, etc. Plus questions on challenges to use of smart technologies.
6. Yoon et al, 2022	US, **public** & academic libraries	Online survey	242/?	-	Sample from subscribers to science-centred listservs. Covers six AI / 4th industrial revolution technologies
7. Hervieux & Wheatley, 2021	US & Canada, academic libraries	Survey	222/?	Yes	Perceptions and use of Artificial Intelligence, but AI undefined in the questions, though the Q gives the example of personal assistants (Siri, Alexa) as AI and asks if AI is used to do any of five activities (virtual reference, social media, collections management, cataloguing, scheduling).
8. Jantz, 2015	US, academic libraries	Survey	183 administrators in 50 ARL libraries	No, but useful information on types of innovations and how they are classified in a table	Asks if respondents had implemented a list of 32 innovation types. Distinguishes between admin and technical innovations and between radical, incremental and midrange types of innovations. Performance measured by 1) # of adopted innovations, 2) extent of implementation, 3) balance between radical and incremental innovation.
9. Rubin et al, 2011	US & Canada, **public** &	Website analysis	148/160	No	Use of eight types of website applications. Use of direct and indirect terms for

Authors & date	Country	Study design	Returns/ Sample	Questions available	Topics covered
	academic libraries				innovation in white papers listed in library websites. 35 (25%) of libraries mention innovation in 151 documents on their websites: 20 academic and 15 public libraries. 'Innovation' often combined with 'technology' or 'service'.
10. Baro, 2014	Africa, academic libraries		140/310 librarians in 16 university libraries	Yes	Use of web 2.0 technologies, plus purpose of use, how skills obtained, and barriers for librarians in their use.
11. Boateng & Liu, 2013	US, academic libraries	Website analysis	Top 100 universities	Yes	Use of specific web 2.0 technologies.
12. Mahmood & Richardson, 2011	US, academic libraries	Website analysis	100	No (but list of web 2.0 types)	Use of 15 different technologies included under web 2.0, such as instant messaging, social networking, photo sharing, etc.
13. Balaji et al, 2019	Asia, academic libraries	Website analysis	75	No (but list of web 2.0 types)	Use of web 2.0 technologies by 75 University libraries included in the Times Higher Education Asia University Rankings.
14. Coelho, 2011	Portugal, academic libraries	Website analysis	75	No (but list of web 2.0 types)	Use of 10 web 2.0 technologies in 75 libraries held by all 15 public universities in Portugal; tracked over 3 years. Construct use index with 6 levels.
15. Akwang, 2021	Nigeria, academic libraries	Survey	60	Yes	10 types of web 2.0 applications used and what are the constraints to their adoption (only frequencies given).
16. Born et al, 2018	multiple countries, **public** libraries	Website analysis & interviews	31	No	Central public libraries of 54 'world cities' in 22 countries. Use of 18 types of services: 11 digital, 4 for use of physical spaces, plus multi-location book returns, courses, and marketing measures.
17. Banfi, 2019	Switzerland, **public** libraries	Interviews	30	Yes, 6 main questions	Adoption of RDA and FBRization of bibliographic records.

4.1 Comparability of technology adoption research

Due to the gradual adoption of new technologies and services over time, the analysis of comparability is limited to seven studies published after 2015: Andrews et al (2021), Born et al (2018), Banfi, 2019), Catalano et al (2018), Hamad et al (2022), Hervieux & Wheatley (2021) and Jantz (2015). Three of these studies were eliminated because the authors did not publish frequency data (Jantz, 2015; Banfi, 2019) or only means were provided for Likert scale questions (Hamad et al, 2022). Results for the remaining four studies are given in Table 3.

Table 3: Comparable data for technology adoption, space use and services in libraries (percent respondents reporting each type of technology or space)

	Catalano, 2018	Born et al, 2018	Andrews et al, 2021	Hervieux & Wheatley, 2021
Sample size	304	29	236	163
Country	US	Global	US	US + Canada
Date of survey	2017?	2015	2020-2021	2019
Library type	Academic	Public	Both	Both
Social media (any)	72	94		
Research data services (RDS)	30			
Open Educational Resources (OER)	44			
Distance learning (DL) services for students	33			
Mobile website	84			
RFID		58		
AI use (any)			21	
Provides workshops on AI				7
Space use in the library				
Makerspace	22	41		
Working spaces		48		
Drinks / food in library		54		

As shown, there are only two types of technology that are reported by more than one study: the use of any social media and the provision of a makerspace. Data on AI are collected in two studies, but they measure different things, with Andrews et al (2021) only reporting on the use of any AI and Hervieux & Wheatley (2021) only reporting on the provision of workshops on AI. Hervieux & Wheatley (2021) did collect data on the use of AI for five library activities, but this did not meet the threshold of 6 libraries for inclusion in this review. Born et al (2018) provide additional data such as for different types of digitalized collections (newspapers, videos, e-books etc.) but these are excluded from Table 2 because of their high adoption rates in all libraries.

5 Innovation Surveys/Interviews with Multiple Library Managers

Ideally, studies on innovation by libraries would report data on the frequency of outputs (types of innovation) and the use of various inputs to develop innovations, including co-creation activities. These types of studies are infrequent. As a result, we have lowered the bar to include studies that collected any type of innovation data. The studies are divided into three groups: Table 4 lists 11 empirical studies with six or more respondents (either librarians or library innovations) that identify the presence of innovation. Table 5 lists four studies that collected data on expected inputs to innovation without measuring the absence or presence of innovation. Finally, Table 6 lists seven studies on user involvement or the use of design thinking to develop library innovations, although not all of these studies collect data on the occurrence of innovation. As with Table 2 on technology adoption, the majority of innovation-related studies across Tables 4 to 6 cover academic libraries (16) versus eight studies of public libraries.

5.1 Innovation Surveys

The realized sample size for innovation surveys is generally low, with the largest survey by Rafi et al (2022), with responses from 339 academic librarians in Pakistan. Rafi et al (2022) construct a Structural Equation Model (SEM) to evaluate the effect of several factors on "user service". The factors influencing user service include administration skills, resource integration, job skills, and explicit knowledge. Unfortunately, the outcome variable is problematic because it combines two measures of innovation (latest digitalization and subscribing to new databases) with two measures of obtaining input from users ('feedback from teachers, researchers and students' and seeking 'advice from faculty to improve services').

Data on innovation award winners or applicants have been used by academics to explore how innovations are developed for some time, such as the research by Borins (2000) on the sources of the idea for submitted innovations. Theoretically it is possible to use award application data, or interviews with award winners, to explore the involvement of users or co-creation in developing the innovation, but neither of the two studies using innovation award data (Potnis et al 2020a; 2020b) collected this type of data. One study by Potnis et al (2020a) surveyed 108 managers (administrators) responsible for 211 innovations that won an innovation award from 106 public libraries. The study identified the top three challenges for planning and implementing each award-winning innovation and the solutions used to address problems. The other study by Potnis et al (2020b) used website analysis for 80 innovation award winners and classified the innovations by type (Potnis et al, 2020b).

Other innovation studies examined activities that can lead to incremental and radical innovations (Janz, 2017), the effect of employee engagement on innovation (Gicholi, 2014), and policies and practices to support innovation (Jantz, 2012).

Table 4: Empirical studies of innovation in libraries (organized by realized sample size)

Authors & date	Country	Study design	Sample size	Questions available	Topics covered
Rafi et al, 2022	Pakistan, academic libraries	Survey	339	Yes	SEM model for factors influencing 'user service', which is based on four questions including 'latest digitalization', 'subscribing to new databases', feedback on problems, and 'sought advice from faculty to improve services'. User service variable combines both innovation and seeking input from users.
Potnis et al, 2020a	US, **public** libraries	Survey, library managers for 211 innovations in 106 public libraries	108/219 library managers	Yes (responses categorized)	Winners of Top-Innovators Award for 11 years (1998 to 2018). Open ended survey, Qs on 1) degree of importance of innovations, 2) top 3 challenges in planning and implementation, 3) solutions to address challenges. The categorization of the open responses useful for developing questions.
Potnis et al, 2020b	US, **public** libraries	Website analysis of innovation award winners	80 library innovations	No	Winners of "Top Innovators Award' managed by Urban Library Council. Asked about top 3 innovations by library, 80 in total reported, visited websites of 80 innovations to collect more information. Classifies innovations by type: programs, processes, partnerships, technology
Pacios, 2020	Spain, academic libraries	Website analysis	76 library websites	No	Website analysis to determine if library mission, vision, and value statements explicitly refer to 'knowledge' and 'innovation'. Innovation referred to by 6 of 56 libraries with a mission statement, 11 of 28 libraries with a vision statement, and 20 of 28 libraries with a value statement.
Jantz, 2017	US, academic libraries	Survey	50 libraries	No	Creates an innovation performance index for 1) each of 50 libraries based on the decision to adopt 32 types of "innovations" (see Jantz, 2015), 2) whether these were implemented, and 3) activities that can lead to incremental and radical innovations. Questions for 2 & 3 not given in this paper. Only correlates vision and organizational size with innovation index.
Gichohi, 2014	Kenya, academic libraries	Interviews using	31/34 librarians	Yes	Effect of employee engagement on innovation and creativity in the library. All employees from 3 universities.

Authors & date	Country	Study design	Sample size	Questions available	Topics covered
		structured Q			
Hoover, 2018	Canada, small academic libraries	Survey	18 librarians	Yes	Focus on IT use and structure of IT dept. Open questions on changes to IT, Educ. Tech.
Sucha et al, 2021	Czech Republic, **public** libraries	Interviews	27	No	Interviewees selected to maximize variety (library type, number of users, regions). Focus on types of social innovation, factors that stimulate, and barriers to it. From 27 interviews identified 227 projects/services with a social impact, classified into five categories: educational, cultural, leisure, meeting and connecting, and help to specific groups of people. Barriers and stimulators were structural (legislative, presence or lack of funding), local (use centred, cooperation, organizational (hierarchical, unsuitable premises, staff autonomy, heterogenous teams) and personal (burnout, lack of competence, intrinsic motivation, grounded in community).
Freeburg, 2020	US, **public** libraries	Interviews	15/15	No	Interviewees randomly selected, all agreed to take part. Focus on leadership (8 types identified from the 15 respondents) and types of innovation developed (3 types identified – brand new, modifications of existing services or processes, new to library). Author surprised that interviewees saw the latter as an innovation.
Lembinen, 2021	Various, academic libraries	Interviews	9	Yes (only open questions)	Focus on how library leaders define innovation, with 22 examples. Open questions on innovation activities to spot opportunities for innovation (collaboration, identifying unmet needs of library stakeholders), encourage innovation, and form and manage innovation teams.
Jantz, 2012	US, academic libraries	Interviews	6	Yes	Importance of innovation, characteristics of innovation, policies/practices to support innovation

None of the studies listed in Table 4 provide frequency data on innovation or innovation activities that could be used to construct indicators, either because only means or coefficients are provided or

because the study was largely qualitative. A few of the studies provide questions that could be useful inputs into the design of the WP4 survey questionnaire.

Terms to refer to 'innovation'

The LibrarIN WP 2.1 literature search suggested that public librarians may be unfamiliar with the term 'innovation', instead using alternative terms. As a consequence, the WP4.1 literature search, in addition to 'innovat*, used keywords such as "change'. Nevertheless, most of the identified studies on innovation used the term "innovation", with a few exceptions such as the article by Rafi et al (2022) where innovation is proxied through the use of 'latest digitalization' and 'improve services' in the questionnaire.

The study by Pacios (2020) analysed the mission, vision, and values statements of Spanish academic libraries and found explicit references to innovation in 6 of 56 libraries with a mission statement (11%), 11 of 28 libraries with a vision statement (39%), and 20 of 28 libraries with a value statement (71%). The author does not report the number that reported 'innovation' in at least one of the three mission statements, but these results suggest that many Spanish academic libraries find the term 'innovation' to be relevant to their own activities. However, this familiarity with the term may not apply to public libraries, which might partly explain why most of the identified studies on innovation are of academic libraries.

Lembinen (2021) explored how 9 librarians, all members of LIBER (Association of European Research Libraries), interpreted the concept of innovation. All viewed innovation as "something new, challenging, or a change: a new service, new format, new ways of doing things, new for the library, or a change in the culture". The interviewees also identified two main types of innovations: new services and new ways of operating. These results fit well with the OECD/Eurostat's Oslo Manual (2018) definition of innovation. Freeburg (2020) identified three types of library innovations in interviews with 15 librarians from public librarys: brand new, modifications of existing services or processes, and new to library. Freeburg was surprised that the interviewees saw changes that were only new to their own library as an innovation, but these are innovations as defined by the OECD/Eurostat Oslo Manual.

5.2 Surveys on inputs to innovation

Four studies (see Table 5) obtained no data on innovation itself, but address factors that influence the organizational environment for innovation, particularly the leadership style. Transformative leadership is associated with more substantive change (Martin, 2016), manager behaviours in favour of innovation (Peng, 2020), support for knowledge sharing or practices that are correlated with knowledge creation (Koloniari et al, 2019), and awareness of knowledge management methods and the use of web 2.0 (Islam et al, 2014).

Table 5: Empirical studies of inputs to innovation (organized by realized sample size)

Authors & date	Country	Study design	Sample size	Questions available	Topics covered
Martin, 2016	US, academic libraries	Survey	465/?	No	Survey uses list servs so the number of librarians receiving the survey is unknown. The questionnaire asks about the leadership style in the library, which is used to identify transformational leadership associated with substantial, long-lasting change.
Peng, 2020	Taiwan, **public** libraries	Survey	444/554 librarians	Yes	SEM model of the effect of leadership support for the respondent and respondent's job on the respondent's innovative behaviour. Innovative behaviour based on Confirmatory Factor Analysis using 14 scalar items, including "look for opportunities for improvement", "generate ideas or solutions to solve problems", "push ideas forward", "implement changes that seem beneficial". No data on whether an innovation occurred – the focus is on the individual respondent.
Islam et al, 2014	Various, academic libraries	Survey	101/600	Yes	Awareness of knowledge management and its link with web 2.0.
Koloniari et al, 2019	Greece, academic libraries	Survey	91/120, all personnel of 10 libraries	Yes	SEM model for correlation between a knowledge-friendly organizational culture and a knowledge centered strategy on knowledge creation, with knowledge creation containing four constructs (socialization, externalization, combination, and internalization). Both socialization and externalization include sharing knowledge and ideas. Combination covers strategies and internalisation covers use of teams.

None of the studies in Table 5 provide data that could be used to construct indicators. All four studies do not provide frequencies, only giving means for Likert questions or statistical coefficients. The main value of these studies is to draw ideas for questions on leadership factors that could influence innovation activities.

5.3 User involvement in library innovations

Seven studies (see Table 6) collected data on user involvement in innovation or training in user involvement methods. These are the most relevant studies to LibraIN's interest in user involvement in innovation.

Three of these studies do not provide data on user involvement that could be used to construct indicators. These include two studies that focused on training in how to involve users (Cigarini et al,

2002; Clarke and Bell, 2021) and the short paper by Henkel et al (2018) that covers open innovation (which can also involve users). The studies find that training is useful as a pre-condition to user involvement, suggesting that a question on training could be included in a survey.

Table 6: Empirical studies of user involvement in innovation (listed by realized sample size)

Authors & date	Country	Study design	Sample size	Questions available	Topics covered
Cruz et al, 2020	Brazil, academic libraries	Survey	107 librarians	Basic outline	Front line employee and **user involvement** in service innovation, performance
Arundel et al, 2016	Australia, academic libraries	Survey	79 library managers	Yes	Use of **co-creation and design thinking** with users and other stakeholders of academic libraries. Data on the respondents' most important innovations.
MacDonald, 2017	UK, academic & **public** libraries	Interviews	16 library managers	No, but five stage model a useful guide for questions on user involvement	Factors supporting and hindering the role of managers responsible for **user experience**. Constructs a five-stage model for the integration of user experience into the organizations development of services.
Cigarini et al, 2022	Spain, **public** libraries	Survey, focus groups etc.	22/30 librarians, 7 for focus group	Some	Survey of 30 librarians in Catalunya who had participated in a library training course and **user perceptions of co-creating** a citizen science project.
Islam et al, 2015	12 countries, academic libraries	Online survey	21/67 librarians	Yes	**User involvement in service innovation,** how library works with users to create value.
Clarke & Bell, 2021	US & Canada, Academic libraries	Interviews	13/60	Yes	Teaching **Design Thinking** in library programs
Henkel et al, 2018	Various countries, 4 **public** and 2 academic libraries	Lit review to identify 6 cases, then Q sent to each case	6/6	Main questions, but closed sub-questions not included	Why used open innovation, **methods to cooperate with external partners, who involved**, how to motivate external partners, shared experience, success or failure of project, importance of community empowerment.

Two studies have the highest relevance to user involvement in innovation design, the 2016 LH Martin Institute survey of university managers at public universities in Australia and New Zealand (Arundel et al, 2016) and the Islam et al (2015) study of user involvement in service innovation in 21 academic libraries in multiple countries.

The LH Martin survey collected information on the function of each manager's department and data on user involvement in developing innovations. The 'function' variable permits identifying libraries. Out of 573 responses, 79 (13.8%) are for libraries. The survey collected data on both the types of stakeholders included in innovation activities (students, consulting businesses, etc.) and the methods for involving users (see Table 7). The results show that over half of the respondents involve users in some way in developing innovations. Although a small sample, the data could be used to explore the factors that are associated with low versus a high intensity of user involvement. There are also outcome questions in the survey, but these are limited to a single 'most important' innovation, while the question on user involvement refers to all innovations in the previous two years.

Table 7: User involvement in developing innovations in Australian/New Zealand libraries, 2016, percent of innovative libraries

	Percent yes
Conduct user of focus groups with potential users of an innovation	62.7%
Survey your stakeholders or potential users about an innovation	57.5%
Test the 'ease of use' of a planned innovation on a sample of potential users	56.0%
Post-implementation studies to identify or solve problems with an innovation	60.0%

Islam et al (2015) collect data from up to 21 respondents on several aspects of user involvement, including the methods used by the library to learn about user needs, how this information is used, and the benefits of user involvement. The most common method is the use of social media and other online sources, reported by 57%. All other methods combined are reported by 43%. Methods for directly engaging with users in a two-way dialogue include meetings or discussions (reported by 19%), collaboration or library events (19%) and online/email (14%). The knowledge obtained from users is applied to tailor services to user needs (44%) or to assist acquisitions (28%). The most reported benefit is to meet user needs (62%). Most of the methods of involving users are either one-way, such as a survey or a library bulletin to inform users. Two-way interactions are mostly informal, such 'service interactions' on a day-to-day basis, building a rapport with users, or library events such as films where staff can talk to faculty or student users. More structured methods such as focus groups were only reported by 4 of the respondents.

Cruz et al (2020) provide data from a survey of academic libraries in Brazil on the involvement of users in four stages of innovation development (ideation, development of ideas, testing phase, and implementation of an innovation), the involvement of front-line employees who are likely to be aware of user needs in the same four innovation stages, and six outcome (performance) measures: user satisfaction, library image/reputation, employee satisfaction, process improvement/efficiency, cost reduction, and increased level of services/space. All variables are measured on a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree), which reduces comparability with other studies. The mean results for user involvement are between 3.4 and 3.7, or slightly below the neutral point of 4, whereas the mean results for front line employees are between 4.9 and 5.1, or slightly above the neutral point. This indicates that the involvement of front-line employees is more common than the involvement of users. Unfortunately, only reporting the mean values for the agreement scale reduces comparability with other studies, such as by Arundel et al (2016), which measures different methods for involving users on a 'yes' or 'no' basis.

MacDonald (2017) reports results for 16 library employees responsible for user experience. The data for the benefits of user involvement include increasing empathy and responsiveness (25%), improved public relations (38%), and improvements to websites (19%). In addition, MacDonald provides data on challenges to user involvement, which including navigating the library's culture (75%), resource limitations (63%), difficulty in scale and scope (44%), trust of colleagues (38%) and a lack of training or expertise 25%). The paper also builds a five-stage model for the intensity with which user experience is taken into consideration when developing or modifying services.

Table 8 summarizes the indicators that can be constructed from these four papers. Although the indicators are of relevance to measuring user involvement in innovation, differences in question wording mean that there are no comparable results across two or more studies.

Table 8: Indicators for user involvement in innovation

	Arundel et al, 2016	Islam et al, 2018	Cruz et al, 2020	MacDonald, 2017
Sample size	79	21	236	16
Country	Australia	Global	Brazil	UK
Date of survey	2015	2015	2019	2017
Library type	Academic	Academic	Academic	Academic + public
Methods for obtaining user input for innovations				
Conduct user or focus groups with potential users of an innovation	63%			
Survey your stakeholders or potential users about an innovation	58%			

	Arundel et al, 2016	Islam et al, 2018	Cruz et al, 2020	MacDonald, 2017
Sample size	79	21	236	16
Test the 'ease of use' of a planned innovation on a sample of potential users	56%			
Post-implementation studies to identify or solve problems with an innovation	60%			
Two-way interactions with library users through meetings / discussions		19%		
Two-way interactions with library users through informal collaboration, events, rapport, day-to-day interactions		52%		
Benefits				
Addressing user needs		62%		
Tailoring services to user needs		38%		
Obtaining suggestions for design		31%		
Improved empathy and responsiveness			25%	
Improved public relations			38%	
Website improvements			19%	
Challenges to including user experience				
Risks from user participation (handling expectations, lack of interest, lower standards)		47%		
Library culture				75%
Resource limitations				63%
Trust of colleagues				38%
Lack of staff training / expertise				25%

6 Other Data Sources

In addition to academic research, several other recent or planned studies could provide relevant indicators. Options include public sector innovation surveys and other surveys that include questions of relevance to innovation in libraries.

6.1 User involvement in library innovations

Public or municipal libraries can be included in general innovations surveys of the public sector that follow the Copenhagen Manual (Lykkebo et al, 2021), which recommends including several questions that could be used to construct innovation indicators of relevance to LibraIN:

1) The types of innovations that were implemented in the previous two years (service, product, process/method, external communication methods).
2) The initiator of the organizations most recent innovation, including "citizens" and "voluntary societies/organizations".
3) The use of collaboration to develop the organization's most recent innovation, including "citizens" and "voluntary societies/organizations".
4) The factors that promoted / hindered innovation (to some or a great extent), including citizens.
5) The outcomes from innovations.
6) The evaluation of innovations.
7) An optional question that asks respondents that report collaboration "what work did the collaborator(s) take part in", with four response options: "understanding the problem", "developing or adapting a solution", "implementation", and "delivery of products, services or concepts already developed".

The Copenhagen Manual also recommends including a question on general strategy that asks for the level of agreement with the statement that their workplace "systematically incorporates citizens' or companies' perspectives into our work". This is of potential interest, but this strategy is likely to cover many activities that do not involve innovation.

The Copenhagen Manual questionnaire has been implemented in several Scandinavian countries (Denmark, Sweden, Finland) and in the Netherlands and New Zealand. To date, none of the published reports provide results specifically for public libraries and the Netherlands and Finland did not include libraries in their survey. Libraries are included in the public sector innovation survey in Sweden where a sample of establishments with 10 or more employees from the entire SNA sector "general government" are included, stratified by level of government, industry and size class. The questionnaire includes a few questions of relevance as it asks respondents to report on whether needs, demands or expectations from users was an objective of the most important innovation and whether they

developed ideas or initiatives from users or society for their most important innovation. Results are however not yet available.[8]

It was possible to download data on libraries for Denmark, with results given in Tables 9a to 9e. Along with the results on user involvement from the university survey in Australia (Arundel et al, 2016), the Danish results are the most relevant available data for the innovation activities of libraries as they cover the percentage of libraries that introduced service innovations, the degree of novelty of library innovations, the initiators of innovation including citizens, collaboration partners, and promoting and hindering factors to library innovations. In addition, the Danish Innobarometer is a joint venture between the National Center for Public Sector Innovation and Statistics Denmark. The participation of Statistics Denmark ensures a representative sample based on the national business register and a good response rate. The total number of responses for the public sector is 2,363 workplaces, but the number of responding libraries and the response rate for libraries are not available on the relevant websites.

Tables 9a to 9c give results for the 2016 and 2019 surveys, with the data referring to the previous two years. The data source for Tables 9c to 9e does not provide the survey date, but this is probably the 2019 survey.

Table 9a: Percent libraries and all government organizations in Denmark that reported different types of innovations provides the percent of libraries that introduced a product, service, process, or communication innovation, plus any type of innovation, in the 2016 and 2019 surveys. For comparison, results for all government organizations are also given. The percent of libraries that reported any innovation is 92% in 2016 and 89% in 2019, slightly higher than that for all government organizations. The most frequent types of innovations in both years are service and process innovations. The very high rate of innovation in libraries is in line with other surveys of innovation in the public sector (Arundel et al, 2015; Bugge and Bloch, 2013).

Table 9a: Percent libraries and all government organizations in Denmark that reported different types of innovations

	2016		2019	
Type of innovation	**Libraries**	**Government**	**Libraries**	**Government**
Product	59	34	47	30
Service	79	42	68	38

[8] For an overview of the Swedish study, see https://www.scb.se/lamna-uppgifter/undersokningar/innovation-i-offentlig-sektor/.

Processes / ways of organizing work	77	70	70	73
Communication methods	46	47	62	44
Any type of innovation	92	80	89	81

https://www.statbank.dk/OIN01DK

Table 10: The degree of novelty of the library's or government organization's most recent innovation, percent respondents, innovative workplaces only provides information on the degree of novelty of the most recent innovation reported for libraries and government organizations. Novelty is measured from the perspective of the reporting organization, with the most novel innovations developed by the organization itself. The second level consists of innovations that were largely inspired by other sources, with some development work by the reporting organization. The lowest level of novelty occurs when the reporting organization largely copies innovations developed by others. Table 9b shows the importance of imitation in libraries and government, with 68% of libraries in 2019 reporting that their most recent innovation was either inspired by or a copy of solutions developed elsewhere.

Table 10: The degree of novelty of the library's or government organization's most recent innovation, percent respondents, innovative workplaces only

	2016		2019	
Novelty	**Libraries**	**Government**	**Libraries**	**Government**
The workplace was the first to develop the innovation	16	18	25	18
The innovation was to a large extent inspired by solutions developed by others	59	59	56	59
The innovation was to a large extent a copy of solutions developed by others	19	15	12	13
Don't know	6	8	7	10

https://www.statbank.dk/OIN01DK

Table 11: Percent libraries and all government organizations in Denmark reporting different initiators1 for the most recent innovation, innovative workplaces only provides results on the percent of specific sources that acted as the initiator of the library's most recent innovation in 2016 and 2019. For comparison, results are also given for other government sources. The table shows that citizens are the third most frequently reported initiator, reported by 21% of libraries in 2016 and 23% of libraries in 2019. This is higher than the percentage of other government organizations that report citizens (15% and 12% respectively). Voluntary societies/organizations were the third most common type of initiator in 2016, reported by 11% of libraries. These organizations are relevant as they often represent the interests of individual citizens.

Table 11: Percent libraries and all government organizations in Denmark reporting different initiators1 for the most recent innovation, innovative workplaces only

	2016		2019	
	Libraries	Government	Libraries	Government
Leaders and managers	43	45	38	38
Employees	32	35	41	34
Citizens	21	15	23	12
Voluntary associations / organizations	11	3	7	2
The nearest political management	9	16	11	11
Foundations	4	2	4	2
Higher education/research institutes	4	7	0	6
Private enterprises	1	2	2	3

1: Selection of initiators limited to people or organisations as initiators, https://www.statbank.dk/OINo1DK

Table 12: Percent libraries and all government organizations in Denmark reporting collaboration partners for their most recent innovation, innovative workplaces only gives the percent of libraries and all government organizations reporting different collaboration partners to develop their most recent innovation. Libraries are considerably more likely to report collaboration with citizens (43%) than all government organizations (15%) and voluntary associations (17% versus 8%). There is also extensive collaboration, as the sum of collaboration partners exceeds 100% (respondents can report more than one partner).

Table 12: Percent libraries and all government organizations in Denmark reporting collaboration partners for their most recent innovation, innovative workplaces only

Partner	Libraries	Government
Public sector workplaces within our municipality	44	42
Citizens	43	15
Public sector workplaces – same sector	32	13
Private companies consultants, suppliers, etc.	23	18
Voluntary associations/organisations	17	8
Foundations	10	4
Higher education and research institutions	6	12
Public sector workplaces – different sector	4	7
Foreign partners	6	2
No external collaboration on innovation	22	31

https://innovationbarometer.org/innovation-test/

Finally, Table 13: Percent libraries and government organizations in Denmark reporting different factors that promoted or hindered innovation (to some or a great extent), innovative workplaces only gives the percent of libraries and government organizations that reported different factors as hindering or promoting innovation. A large majority of libraries view citizens as promoting innovation (57%) compared to only 7% that report citizens as hindering innovation. The most frequently cited factor to hinder innovation is "limited financial resources" (32%) followed by a "focus on reliability in operations".

The Danish surveys also included a question on the evaluation of the most recent innovation (49% reported yes) and a question on different outcomes. The outcome results for 2019 for libraries are improved quality (reported by 50% of libraries), improved efficiency (38%), improved employee satisfaction (42%) and met political objectives (30%).

Table 13: Percent libraries and government organizations in Denmark reporting different factors that promoted or hindered innovation (to some or a great extent), innovative workplaces only

	Libraries		Government	
Factor	**Promoted**	**Hindered**	**Promoted**	**Hindered**
Employees	83	10	84	10
Collab. across workplace	82	7	81	7
Citizens	57	7	53	6
Focus on reliability in operations	52	17	52	17
The way we deal with errors	47	8	47	8
Organisational changes	45	10	45	10
The political leadership	41	6	41	6
New technology	37	6	40	6
Laws / national mandates	35	11	35	12
Limited financial resources	20	32	20	34

https://innovationbarometer.org/innovation-test/

6.2 Other innovation surveys

The European Community Innovation Survey (CIS) focuses on the business sector and consequently does not require member states to include the NACE category for libraries, (91.01) as most are government owned. Nevertheless, two countries (Portugal and Spain) already cover some NACE classes in section R, which includes libraries. The inclusion of libraries in the CIS, as well as museums and archives, would not pose significant challenges because these organizations are easy to identify and have substantial decision-making powers, which is a requirement for inclusion in the CIS.

The GLAMMON project funded under Horizon 2020 surveyed libraries and other cultural organizations such as museums, archives, and galleries. There are two relevant questions[9] in the GLAMMON survey (items in parentheses are response options):

1) If you have participatory co-creation practices for your audience, in what areas do these exist? (decisions about collection, appraisal, interpretation, programming; decisions over spending; contribution of content/things/knowledge; co-organization of events and exhibitions; co-organization of educational programs; digitalization processes/developments).
2) How do you regularly develop your digital cultural products or digitalisation activities? (outsource to a specialized company, in-house enterprise, collaborate with other external digital communities, hackathons, crowdsourcing, crowdfunding, outreach events, exhibitions, archiving events, creative reuse events).

Both questions are problematic. Question one does not define 'co-creation' and question 2 only obliquely refers to develop with citizens in the references to hackathons and crowdsourcing, with no option provided for dialogue with patrons. Yet the most serious problem for using the data as a source of indicators is that the very low response rate, at 3.3% results in too few cases for libraries to develop indicators that are representative of their activities.

The 2019 Co-Val survey of public administrations did not collect data for libraries, but the questionnaire is of value to LibrarIN because it includes questions on the following topics:

1) The use of external sources of assistance, advice, technology or other inputs to develop the most important innovation. The response options include 'design firms, innovation labs or living labs'.
2) Design thinking methods for developing the most important innovation (research to identify the challenges to be addressed by the innovation, research to identify different types of users, brainstorming or idea generation to identify solutions, development of a prototype, and pilot testing of the innovation.
3) Methods to obtain input from users (analysis of data on user experiences, in-depth conversation with users, focus groups, brainstorming or idea generation workshops, studies of user experience with a prototype).
4) Inclusion of user experiences in an evaluation of the innovation.

[9] A separate question is "have you established regular collaborations with any of the following actors or institutions for 'we co-organise projects or events', 'we provide space for free for their meetings/events', 'they provide us with space for free for our meetings/events'". However, the question does not cover activities that would usually lead to new or improved services or processes.

5) Contribution of users to outcomes (reduced development costs or development time, reduced need to revise the innovation after implementation, improved fit with user needs, improved quality, reduced risk of innovation failure).

7 Summary of Useful Questions from the Existing Literature

Of the three types of surveys covered in this report (user satisfaction surveys, technology adoption surveys, and innovation surveys), we focus on identifying innovation survey questions of possible value for the WP4.2 survey, which will be sent to identified library managers. However, the specific types of managers to receive the questionnaire has not yet been decided. Possible candidates for public libraries include the senior manager of branch libraries, managers responsible for change or services in central libraries, front line staff that directly interact with library patrons, or a combination of the two manager types and front-line staff. The candidates for academic libraries are likely to be similar, though there may be a focus on managers responsible for change or services.

All potential questions must be answerable by selected managers. Consequently, questions used in the user satisfaction surveys are not relevant as the WP4.2 survey will not directly survey users, although it could include questions on the perceptions of library managers on the effects of an innovation on users. A few questions on technology may be included, but previous technology lists, for instance on AI, would need to be updated.

The following sections discuss questions of relevance to innovation in libraries, with a focus on user involvement. Useful questions can also be identified through the general research on public sector innovation[10], but this report focuses on research that is specific to libraries.

7.1 Leadership and organizational culture

Questions on leadership and organizational culture, two enabling conditions for innovation, can be sent to library managers or to library front line staff, with questions adapted to the type of recipient. Relevant questions on leadership and organizational culture are drawn from Peng ((2018), Koloniari et al (2016), Islam et al (2014) and Lembinen (2021). These questions are often given as statements, with respondents asked to agree or disagree with the statement or to assess each statement's level of importance.

Leadership qualities that support innovation include:

1. Look for opportunities to improve an existing process or service.
2. Recognize opportunities to make a positive difference in my work, department, or organization.

[10] For instance, several studies of public sector innovation cover obstacles to user involvement in innovation processes (Arundel et al, 2019; Torfing et al, 2019; Mureddu and Osimo, 2020).

3. Generate ideas or solutions to address problems.
4. Experiment with new ideas or solutions.
5. Try to persuade others of the importance of a new idea or solution.
6. Take risks to support new ideas.
7. The library top management is always open to new ideas.

Statements of relevance to the organizational culture include:

1. Our library encourages people to collaborate with each other.
2. Encourage library staff to try something new.
3. Search for best practices outside the library.
4. Employees who take initiative are highly valued.
5. Lessons learned from both successful and unsuccessful projects are valued.
6. Staff from different parts of our library frequently interact with each other.
7. Our library frequently uses teams of people with diverse skills and expertise to develop projects.
8. Our library has a culture of sharing knowledge between staff.
9. In our library it takes a long time to get any new initiative approved.

7.2 User involvement in innovation

Questions on user involvement and the methods of obtaining user knowledge are best answered by managers responsible for developing service innovations and front-line staff that may be involved in these projects.

7.2.1 User involvement by innovation phase

Design thinking and other innovation methods frequently divide the process of developing an innovation into different phases, such as 1) idea generation, 2) development, 3) testing, and 4) implementation (Cruz et al, 2020). Users can be involved with varying levels of intensity at each phase and the effects of user involvement will vary by phase. For example, user involvement in testing can be limited to the 'ease of use' of a digital app, while user involvement in idea generation can influence the characteristics and functions of the app. Due to these differences in effects, it would be worthwhile to collect data for libraries on how patrons are involved in innovation by phase.

Cruz et al (2020) identify four phases, but do not give the actual questions to identify user involvement at each phase. MacDonald (2017) takes a different approach that classifies the library's level of interest in learning and responding to user experience into five levels:

1. Awareness of user experience throughout the organization.

2. User experience knowledge, skills, and resources within the organization.
3. User experience methods and techniques employed across the organization.
4. User experience incorporated into organizational leadership and strategy.
5. User experience integrated with the organization's workflows and processes.

MacDonald's (2017) classification is derived from semi-structured interviews with user experience professionals within libraries. The interview questions are not provided, but the levels provide a guideline for the types of questions that would need to be asked to replicate his classification system.

7.2.2 Obtaining information on user knowledge

There are multiple methods of learning about user experiences and needs (Arundel et al, 2016). These can be divided into:

1. Participatory methods where there is a dialogue between users and service designers or librarians (focus groups, brainstorming sessions, informal discussions between librarians and patrons, etc), and
2. Non-participatory methods where the flow of information is primarily one-way from users to librarians (surveys, suggestion boxes, user assessment of prototypes, social media, complaints, etc.).

The types of users involved in innovation activities can also vary, from using student advisory groups or NGOs to represent user needs, randomized requests for volunteers, or requests for volunteers that are targeted to specific individuals, such as heavy or marginal users of specific library services.

7.3 Benefits of user involvement

Questions on the benefits (or outcomes) of user involvement can be asked of managers or front-line staff, but the responses will be perceptions that can be biased towards favourable outcomes. Nevertheless, manager-reported outcomes can be useful for analysis if any positive bias is randomly distributed among respondents and there is a diversity in the level of reported benefits.

Many of the benefits identified in the literature are directly linked to innovation outcomes (Arundel et al, 2016; Islam et al, 2015), while others are a result of the process of user participation in developing innovations, such as a sense of belonging and ownership, improved public relations, or greater democracy. These process benefits are unlikely be included in the WP4.2 questionnaire. Other benefits include:

1. Obtaining suggestions for the design of innovations
2. Better tailoring of innovations to users
3. Improved quality of services
4. Improved outcomes from service use

7.4 Obstacles to and risks of user involvement

Obstacles to user involvement in developing innovations in libraries are frequently similar to risks and have been identified by Islam et al (2015), Macdonald (2017) and Cigarini et al (2022). They include:

1. Unrealistic expectations from users
2. Lack of interest, commitment, or motivation by users
3. Lack of understanding of the innovation project
4. Unawareness or lack of motivation for users to participate
5. User involvement resulting in declining professionalization of librarians
6. Lack of institutional or managerial support

8 Conclusions

The two main requirements for producing indicators of innovation, collaboration, or user involvement in library innovations are 1) availability of frequency level data and 2) availability of comparable data for more than one jurisdiction, such as two or more municipalities, regions, or countries. The literature review does not identify any data sources for European countries that meet these two requirements. The best available data are for Denmark (see Tables 9a to 9e), where results for Danish libraries can be obtained from a national survey of innovation by public sector organizations and for Australia, using a survey of university departments (including libraries) with results available on different methods for involving users in developing an innovation (see Figure 1).

The lack of data, compared to extensive comparable innovation data for the business sector, is likely due to three causes:

1) A lack agreement in the academic community on how to measure innovation in the public sector (including libraries), which results in no consensus over what should be measured or the definition of innovation.
2) The failure of national library surveys to include questions on innovation, and
3) The fact that National Statistical Offices in most countries do not conduct surveys of public sector innovation (with a few recent exceptions).

These three causes are partly due to the lack of an official, widely accepted set of guidelines for measuring public sector innovation that is equivalent to the OECD/Eurostat Oslo Manual guidelines for business innovation. The 'Copenhagen Manual' (Lykebbo et al, 2021) is a start in this direction, but it lacks the official certification and acceptance of the Oslo Manual. Consequently, the WP4.2 survey will need to develop and test questions and a survey methodology that can produce comparable indicators.

All WP4.2 survey questions will need to be answerable by survey respondents, which may include library managers from both central and branch libraries and possibly front-line staff. The literature review discussed in this report identifies several types of relevant questions that could be answered by survey respondents, including questions on leadership, organizational culture, user involvement in developing innovations, methods to obtain user knowledge and experience, the benefits of user involvement, and obstacles. Question design will need to draw on both the limited experience of library surveys and the more extensive experience of public sector innovation surveys.

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