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Cocreating service innovations in European public libraries

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ABSTRACT

This study uses survey data for 543 European libraries to investigate the effect of co-creation and other factors on the usefulness of knowledge for innovation obtained from four groups: library users, non-management staff, non-profits and businesses. The study finds that 24.3% of libraries develop a 'high priority' innovation through co-creation with library users. Co-creation has a substantial positive effect on the usefulness of knowledge obtained from all four groups. The knowledge of non-managerial library staff on user needs can partly substitute for user engagement. The results support the importance of drawing on multiple knowledge sources within a library innovation ecosystem.

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1. Introduction

There is extensive theoretical and empirical research on the co-delivery and co-production of public services (Osborne and Strokosch 2013; Torfing, Sørensen, and Røiseland 2019). These focus on the consumption phase of the service cycle where the value of the final service proposition is determined between service providers and service users. The latter play a central role in creating 'value-in-use', which is always uniquely and phenomenologically determined by the user during the consumption of the service (Osborne 2018, 2021; Vargo and Lusch 2016).

Research on the role of service users in co-delivery and co-production has led to interest in their role in the earlier phase of co-creating innovations (new or improved processes or services), with co-creation defined as the

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interactive participation of users or other stakeholders in identifying the problems to be addressed or the development of innovative solutions (Osborne et al. 2022).

We adopt the theoretical lens of open innovation (Chesbrough 2017; Laursen and Salter 2006) to explore the effects of users and other external stakeholders on the acquisition of useful knowledge (the practical understanding and application of information), which is the primary purpose of open innovation (Qi and Liang, 2024; Xiao, Makhija, and Karim 2021). Open innovation consists of processes to obtain relevant knowledge for innovation that is distributed among different actors external to the innovating organization (Chesbrough 2017). Co-creation is part of open innovation, providing an interactive forum where distributed sources of knowledge and expertise can be assessed and combined with the knowledge held within the innovating organization (Chesbrough 2017; Strokosch and Osborne 2020). Other methods can also provide access to distributed knowledge, such as consulting or reading technical literature, but co-creation supports interactions that can increase creativity, expertise and understanding of how to solve problems (Torfing, Sørensen, and Røiseland 2019).

Empirical research on the co-creation of innovative services within the public sector is almost entirely based on case studies and focused on the role of service users (Centeno, 2025; Figenschou et al. 2024; Knox, Marin-Cadavid, and Oziri 2025), with little empirical research on the role of external stakeholders such as non-profits and businesses and how they interact with users in developing public sector innovations, even though the relevance of multiple stakeholders in public service ecosystems is recognized in the literature (Osborne et al. 2022; Trischler and Charles 2019). The public service logic literature (Osborne 2018; Osborne et al. 2022; Skålén et al. 2018) and the broader public management literature (Bryson et al. 2017) identify a need to better understand how knowledge from users and other stakeholders can be obtained and integrated in the development of service innovations.

Our main research question responds to this need by asking:

How do different methods of obtaining knowledge influence the usefulness of knowledge from different groups, including internal and external sources?

Our empirical contributions address three aspects of this question. First, using survey results from public libraries across 9 EU countries, we respond to calls for representative data on the prevalence of co-creation to develop innovative public services (Torfing, Sørensen, and Røiseland 2019).

Second, we evaluate the acquisition of useful knowledge from distributed knowledge sources in the public sector, of relevance to open innovation theory. A key internal knowledge source is non-management library staff who regularly interact with users. External sources include non-profit

organizations (community groups, schools, health providers, etc.), and businesses, as well as service users (Figenschou et al. 2024). We estimate the relative usefulness of knowledge obtained from these different sources and the interactions between them. Different knowledge sources can complement each other, create redundancies where one source substitutes for another (Chesbrough 2017; Svetina and Prodan 2008) or synergistically create new knowledge (Mahr, 2014; Torfing, 2023).

Third, we evaluate the effects of constraint and support factors on the usefulness of knowledge obtained from different sources.

Addressing these research questions requires sufficient data to support statistical methods to estimate prevalence rates and to simultaneously evaluate the effects of open innovation on the usefulness of knowledge from different sources. To obtain appropriate data, we conducted a survey in 2024–2025 of the innovation activities of European public libraries, with usable responses from 543 public libraries in nine European countries. The survey questions cover the use of co-creation with library users (hereafter referred to simply as ‘users’) and other external sources for a single focus innovation for each library.

Libraries are a relevant public sector for studying open innovation and co-creation because of a shift over the last two decades from ‘collections to connection’ (Rasmussen, 2016), with connection created through user participation in developing library service innovations for cultural activities and health, wellbeing and entertainment services (Windrum et al. 2025). The shift towards connection is supported by policies in many countries to enhance community engagement, social interaction, and user participation in a range of library activities, including innovation (Council of Europe 2023; Hider et al. 2024; van Kempen et al. 2021). A commitment to co-creation is included in the mission statements of prestigious libraries such as the Dokk1 library in Aarhus (Bech-Petersen 2016), the Oodi Library in Helsinki (Nicholson 2019), and the De Krook library in Ghent (Brabandere de 2020). Case studies have also identified other libraries using co-creation to develop library service innovations (Dogunke 2020; Huvila 2020; Islam, Agarwal, and Ikeda 2015; Lee et al. 2025; Loh et al. 2021; Luca and Ulyannikova 2020; Nicholson 2019; Pellack 2022).

Although restricted to libraries, this study is relevant to open innovation in the public sector because it eliminates confounding from combining multiple public sector functions that can obscure the relationships between co-creation and the usefulness of knowledge from different sources. Therefore, our findings should be relevant to discourse on the acquisition of useful knowledge in other public sectors.

The next section reviews the literature on open innovation strategies in public libraries and factors that could influence the use of co-creation. The following section on data and methods describes the survey, statistical

methods, and the variables for analysis. This is followed by the results, a discussion of the implications for theory and practice, and a conclusion.

2. Open innovation and the co-creation of library service innovations

Innovation is the implementation of new or improved processes or services by an organization (OECD/Eurostat, 2018). In the public sector, it increases productivity and service performance through better ways of working and delivering value (Cinar et al. 2024). Knowledge, defined as the practical understanding and application of information, is a critical input to innovation (OECD/Eurostat, 2018: 46) and is created from learning, expertise and experience (Centeno, 2025). The acquisition of external knowledge and its combination with internal knowledge is the primary purpose of open innovation activities (Centeno 2025; Qi and Liang 2024; da Silva Meireles, Azevedo, and Boaventura 2022). As well as drawing upon knowledge held by the employees of an organization, knowledge from disparate sources is searched, circulated and adapted (Centeno 2025; Figenschou et al. 2024; Torfing, Sørensen, and Dečman 2023).

Co-creation is a practical, interactive method for acquiring and integrating knowledge from one or more members of the innovating organization and one or more sources of external knowledge that are not part of the innovating organization (Torfing, Sørensen, and Røiseland 2019). Interactive methods can include one or more design thinking exercises, brainstorming sessions, workshops or focus groups. Co-creation can encourage deep involvement of external parties, especially to obtain tacit, experience-based insights (Messiha et al. 2025), to ensure that public concerns and aspirations are consistently understood and considered at different stages of the innovation process. Co-creation activities that include internal library staff or service designers working on behalf of the library and external users or stakeholders can define the problem or tasks to be addressed by the innovation and how the innovation will solve the problem or tasks (Hapel 2020).

There is an ongoing debate on the extent of user involvement in co-creation by public sector organizations. Several case studies (Delica and Elbeshausen 2013; Hider et al. 2024; Scupola and Westh Nicolajsen 2010; Wakeling et al. 2022) found minimal user involvement in developing public sector innovations. Conversely, scholars such as Torfing, Sørensen, and Røiseland (2019, 2021) argue that public organizations have shifted from minimal user involvement to the 'systematic involvement of relevant and affected actors in the co-creation of new public services . . . to solve a shared problem, challenge, or task through a constructive exchange of different kinds of knowledge, resources, competences, and ideas' (Torfing, Sørensen, and Røiseland 2019, 802).

Knowledge from many external sources can also be obtained through non-interactive methods such as surveys or reading publications. The International Association for Public Participation (IAP², 2018) defines these methods for obtaining knowledge from users as ‘consulting’ (Johansson-Sköldberg, Woodilla, and Çetinkaya 2013).

Interactive methods such as co-creation are expected to access more useful knowledge from users than non-interactive methods (Bentzen 2022). Nonverbal communication and ad hoc discussions during co-creation activities (Mahr, Lievens, and Blazevic 2014, 605) support the transfer of tacit knowledge only available in the minds of people who possess it (Breschi and Lissoni 2001). This is particularly relevant for obtaining experiential knowledge from current or potential service users. The ‘lived experience’ of service users (Jaspers and Tuurnas 2023; Meijer 2011) can broaden the range of new ideas and perspectives on entirely novel solutions or new methods of achieving similar tasks (Ansell and Torfing 2021; Jalonen et al. 2021; Park 2020; Sørensen and Torfing 2015).

Public sector innovation occurs within an innovation ecosystem that includes the public organization, service users, and a variety of external organizations that plan, design and deliver the innovation (Strokosch and Osborne 2020; Windrum and García-Goñi 2008). The innovation ecosystem for library services frequently includes non-managerial library staff and users (Henkel et al. 2018). Depending on the goals or type of innovation, other stakeholders in the library innovation ecosystem include non-profit organizations (community groups, schools, etc.), municipal governments, businesses, and library associations (Cruz et al. 2020; Gesierich, Nordli, and Arundel 2024). Some of these stakeholders could provide sources of expertise that are not available from library staff or users, such as technical knowledge.

User knowledge on service innovations can be obtained without directly involving users. Non-managerial library staff and employees of non-profit community organizations that regularly engage with service users are likely to have developed an understanding of user interests and needs. Collins and Evans (2002; 2005) define this as ‘interactional expertise’ or the ability to converse about a practical skill or expertise without direct experience. Dogunke’s (2020) study of digital innovation gives an example where front-line library staff provided information on user behaviour and preferences. These alternative sources of knowledge on user needs can be particularly valuable when users are unwilling or unable to participate in co-creation activities (Centeno 2025; Eseonu 2022).

Drawing on multiple sources through co-creation or other methods, as promoted by open innovation theories, is expected to provide complementary knowledge, as the purpose for searching distributed knowledge sources is to provide access to different knowledge types (Laursen and Salter 2006; Torugsa and Arundel 2016). The co-creation environment also supports

immediate feedback between different participants, creating opportunities for deep interactive exploration of complex issues that could lead to novel insights (Mahr, Lievens, and Blazevic 2014) and the production of new knowledge for innovation (Centeno 2025; Cluley and Radnor 2020; Tuurnas 2015). Under these conditions, the co-creation environment can synergistically 'produce innovative solutions that none of the actors would be able to produce singlehandedly' (Torfing, Sørensen, and Dečman 2023, 4). Alternatively, knowledge from different sources can overlap (Mahr, Lievens, and Blazevic 2014), leading to possible redundancy where one knowledge source provides a substitute for another. This could be an inefficient outcome, given the high cost of co-creation activities (Hurley, Trischler, and Dietrich 2018; Torfing, Sørensen, and Røiseland 2019).

2.1. Support and constraint factors for co-creation

The usefulness of knowledge obtained through co-creation can be influenced by support and constraint factors for innovation (Burgers, Arundel, and Casali 2024) and the characteristics of the innovation.

General support factors include library leadership that supports a pro-innovation culture and staff that are motivated to think of ideas for innovation. Furthermore, innovation develops under uncertainty. Managers may not know which sources of knowledge are the most useful or how to best obtain relevant knowledge (Laursen and Salter 2006). Previous experience with a diversity of innovation activities can reduce uncertainty. Both experience and the presence of personnel with skills in how to innovate and incorporate user needs (Torfing, Sørensen, and Røiseland 2019; Wiewiora, Keast, and Brown 2016) could create absorptive capacity for identifying and applying knowledge obtained through co-creation activities.

Other support factors specific to co-creation activities include experience with design thinking (Moring and Schreiber 2022), staff acceptance of ideas provided by library users, alternative sources of information on users (Torfing, Sørensen, and Røiseland 2019), sufficient staff experienced in innovation, and dedicated funding for the innovation to cover the costs of using co-creation methods.

Co-creation is costly and time consuming, with innovating organizations facing constraints in terms of the money, time, and psychological resources necessary for discovering, creating, and maintaining relationships with external knowledge sources (Arikan 2009; Burgers, Arundel, and Casali 2024; Cruz et al. 2020; Figenschou et al. 2024). Insufficient resources could be an obstacle if funding is inadequate to cover the cost of finding users willing to participate (Dietrich et al. 2017; Hurley, Trischler, and Dietrich 2018; Mahr, Lievens, and Blazevic 2014). High costs or difficulties in finding users could encourage managers to obtain knowledge on user needs from consulting

instead of through co-creation or by relying on non-profits or front-line staff to provide knowledge on user perspectives. Public sector employees could also resist obtaining knowledge from users, with a preference for input from public sector professionals (Brandsen 2021; Chauhan, Croft, and Spyridonidis 2023; Fuglsang and Hansen 2022; Jenhaug 2020; Nordberg and Aflaki 2024).

The degree of connection is a strategic choice on the part of the library. Libraries with a focus on connection activities may be more likely to co-create innovations with users or with other groups because of experience with working with library users and stakeholders and an acceptance of their importance. This experience should reduce employee resistance to incorporating user knowledge (Engström and Dahlquist 2020; Huvila 2020), thereby increasing the assessed usefulness of inputs from users or user alternatives.

The extent of user and stakeholder engagement in co-creation may depend on the characteristics of the innovation itself. Users might be less likely to provide useful knowledge if the innovation is based on unfamiliar technologies, whereas non-profits could be familiar with new technology and have interactional expertise to understand the needs of users (Windrum 2013, 2014).

In summary, open innovation theory suggests that useful knowledge is distributed across multiple actors. Co-creation provides an interactive mechanism to access and integrate this knowledge, which should increase the perceived usefulness of knowledge from external sources. Similarly, non-managerial staff hold substantial operational and user-facing tacit knowledge that could partially substitute for external knowledge.

3. Data and methods

The public library survey was conducted between September 2024 and January 2025 in nine European Union countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, the Netherlands and Spain. The limitation to these nine countries is due to the languages spoken by the research consortium and familiarity with national conditions, essential to constructing a sample of national libraries to survey.

The survey is a census, with the questionnaire sent to all main libraries in cities with more than approximately 10,000 inhabitants. The survey does not include branch libraries.

Survey questions were translated from English into the seven national languages of the nine countries. The questions underwent 17 cognitive testing interviews with library managers in the national language in four countries (Denmark, France, the Netherlands and Spain) to ensure that respondents could understand the questions and provide reasonably accurate answers (Arundel 2023, Chapter 4). Questions were revised as needed.

Public library managers often do not use the term ‘innovation’, referring to ‘change’ (Axonidi, Colombati, and Gamboni 2020) or new ‘programs’ or ‘projects’ (Windrum et al. 2025). Consequently, the survey questionnaire uses the words ‘new or improved services or processes’ when referring to innovations. The questionnaire defines services as ‘for your library’s users’ and processes as ‘administrative and other types of processes’. Library users are defined in the questionnaire as ‘anyone who may access your library (either online or in person), including previous, current or potential (future) library users’.

Section A of the questionnaire asks about library goals, management and employee support for innovation, staff skills, types of innovations within the previous three years, and drivers and obstacles to innovation. Section B (only asked of respondents who report one or more innovations in section A) asks respondents to select a single focal innovation ‘of high priority to your library or of high expected value for your library users’ and to provide a short, written description. All other section B questions refer to this focal innovation and ask how it was developed, including consulting and co-creation and the importance of knowledge obtained from different groups. The full questionnaire is available here (<https://librarin.eu/resources/public-deliverables/>, file D4.2 ‘Questionnaire design and cognitive testing’, pp 45–53).

With few exceptions, email and postal correspondence were addressed to a named senior manager at each library. The survey used a combined online/postal survey method to increase response rates and followed good practice recommendations for organizational surveys (Arundel 2023). The cover letter stated that returning the questionnaire would constitute informed consent and described how respondents could revoke consent at any time. Questionnaires were sent to 1,110 main public libraries, with responses from 761, giving an initial response rate of 68.6%. However, response rates declined over the questionnaire. The relevant response rate for this study is 54.9% (588 libraries) for respondents that answered all of sections A and B after excluding ineligible libraries that reported that they did not innovate in Section A. The analyses exclude 17 respondents with process only innovations and 28 cases with missing values for one or more variables used in the regressions. For comparability, the descriptive and regression results use the same set of 543 responding libraries, with one focal innovation per library. There are no substantive differences in the descriptive results when based on 571 (excluding process only) or 543 respondents.

3.1. Statistics

Descriptive results identify the prevalence of co-creation with users and the usefulness of knowledge obtained from users and stakeholders through co-creation.

Separate ordered logit models identify factors that are correlated with the usefulness of inputs obtained from four potential knowledge sources for which data on co-creation was collected: non-managerial library staff, potential users of the innovation, non-profits and businesses.

3.2. Variables

3.2.1. Variables for consult, co-creation and knowledge usefulness

A variable for consulting methods to obtain knowledge can only be constructed for library users. Consult equals 1 if the respondent reports ‘informal conversations between library staff and library users’ or ‘surveys on the experiences of library users with previous or similar services or processes’ and zero otherwise. A second version of consult (consult only) is constructed for the descriptive results for library users and equals 1 when consult is present but co-creation is absent.

For each of the four groups for which data on co-creation was collected, co-creation equals 1 if the respondent reports that individuals from the group were involved in ‘focus groups, design thinking exercises, brainstorming sessions or workshops’ to “identify challenges or unmet needs to be addressed’ or ‘generate solutions to these challenges or unmet needs’.

The variables for knowledge usefulness are available for the four groups with data on co-creation and for four other groups: library managers; managers or staff from other libraries; regional, national or international library associations; and municipal government or politicians. Variables for usefulness are derived from the question ‘Overall, how useful was input obtained, through any means, from the following groups to the development of this new or improved service?’ ‘Any means’ covers unspecified methods such as collaboration, informal conversations with librarians at professional conferences, etc. The four response options were ‘not used (no input from this group)’, ‘slightly useful’, ‘moderately useful’, and ‘very useful’. ‘Input’ includes tacit, codified, or embodied knowledge, with the latter possibly provided by businesses or municipal governments. For the ordered logit analyses the dependent variable for usefulness varies from zero (not used) to 3 (very useful).

3.2.2. Variables for general innovation activities

Six types of variables are constructed using Section A questions applicable to all innovation activities: 1) the importance of functions or activities that involve ‘connection’, 2) the support of management and non-management staff for innovation, 3) experience in the past three years with a diversity of innovation types, 4) the presence of staff with competences in ‘design thinking or other methods for involving library users in developing library services’, 5) drivers of innovation, and 6) obstacles to innovation.

Connection is an interval level variable that equals the sum of the importance of three library functions or activities of relevance to connection: 1) 'community or cultural activities', 2) 'A place where people can use library facilities (Makerspaces, Fablabs, etc.) for their own creative projects', and 3) 'A place where people can collaborate to develop or provide activities to address their own needs, such as cross-cultural activities, writing groups, social entrepreneurship, etc'. The importance of each question ranges from 1 (not at all) to slightly (2), moderately (3) and high (4). The value of the variable 'connection' can vary from 3 to 12.

Library strategies to support innovation are measured by the frequency of agreement (always = 3, often = 2 and rarely = 1) to the statements 'management strongly supported developing new or improved services or processes' and 'non-managerial staff were highly motivated to think of ideas for new or improved services or processes'. As 'always' captures the strongest level of management support or staff motivation, the variables were recoded as 1 = 'always' and zero otherwise.

Prior experience with developing a diversity of different types of innovation can improve innovation capabilities and possibly increase awareness of the benefits of co-creation. Respondents were asked 'did your library introduce any new services or processes for' 1) collections, 2) educational programs, 3) cultural or community programs, 4) methods for delivering or communicating services to library users, 5) changes to the building design or use of library space, and 6) administrative or other work processes. The number of 'yes' responses are summed, with the variable 'innovation experience' ranging in value from 1 to 6.

The presence of 'design thinking or other methods for involving library users in developing library services' is asked on a yes or no basis, with the variable 'design skills' equal to 1 if these skills are present and zero otherwise.

Two drivers are included: 'new media and technologies (digitalization, AI etc.)' and 'suggestions from library users'. The two drivers are measured on an ordinal scale ranging from 1 (not at all) to 4 (high) importance.

Three innovation obstacles that could reduce the resources available for co-creation activities are 1) 'insufficient staff to take on new work', 2) 'insufficient financial resources' and 3) 'library staff uninterested or resistant to change'. Each obstacle is measured on an importance scale ranging from 1 (not at all) to 4 (high) importance.

3.2.3. Other variables for the focal innovation

In addition to variables for consulting and co-creation, three variables are limited to the focal innovation: 1) the sum of highly useful other knowledge sources, 2) whether it was a service-only innovation (as opposed to a combined process-service innovation), and 3) if it had digital characteristics.

The usefulness of knowledge for the development of service innovations could be affected by the presence of highly useful knowledge from other sources, either because they are substitutes that reduce the usefulness of the source in question, or they create positive synergies that increase its usefulness. The variable ‘Other highly useful sources’ equals the sum of ‘very useful’ responses for six sources excluding the source of interest. This includes three sources for which involvement in co-creation activities is not known: other libraries, library associations, and municipal government or politicians. Managers are excluded to avoid respondents’ self-assessment of their own usefulness and to focus on external knowledge sources.

Other research has identified an optimum number of knowledge sources that can be included in innovation projects before diminishing returns are reached, resulting in an inverse ‘U’ shaped relationship between the number of sources and innovation activities or outcomes (Burgers, Arundel, and Casali 2024; Ghisetti, Marzucchi, and Montresor 2015). To check for this effect, a squared term for the number of ‘highly useful’ knowledge sources was included in the regressions, but no evidence of an inverse ‘U’ relationship was identified. Consequently, the regression models do not include squared terms.

The variable ‘service only’ equals 1 when the innovation does not include process characteristics and 0 for combined process-services. The variable ‘digital’ equals 1 if the innovation involves ‘digital technologies, automated systems, apps, or artificial intelligence’ and zero otherwise. Users could be more likely to be involved in service only innovations compared to a combined service-process innovation, which could require more technical expertise. For the same reason, users could be less likely to be involved in digital innovations.

3.2.4. Size and country

Two control variables are the size of the library, measured by the number of employees (50 and over = 1, less than 50 = 0), and country dummies. Large libraries could have more resources and consequently expertise and funding for co-creation.

The sample covers a diversity of approaches to providing public library services that occur both within each country and across the nine countries. Within countries, there are likely to be differences in strategies and resources between libraries, for instance between those serving small municipalities (Van Melik and Merry 2023) and large libraries in cities, such as the Dokk1, Oodi, and De Krook libraries mentioned above. Huvila (2020) found differences by country in the priorities and public role of libraries in five European countries, but also similarities in managerial attitudes to user participation in library activities. In this article we do not examine differences by country, instead focusing on the use of different methods to obtain knowledge for

innovation at the level of individual libraries. This requires controlling for national differences in the resources available to libraries or the library innovation ecosystem. Many of these within-country and across-country differences are captured by independent variables for strategies such as the variable ‘connection’, and variables for innovation support factors, such as management support for innovation and a lack of funding as an obstacle. Country dummies (not shown in the regression results) control for remaining national differences in innovation governance and culture within public libraries.

4. Results

Appendix Table A1 provides frequencies for all variables used in the descriptive and regression results.

4.1. Prevalence of co-creation

Table 1 provides the percentage of main public libraries that ‘only consult’ users for their focal innovation and the percentage that reported the participation of users, non-managerial staff, representatives from non-profits, and business representatives in co-creation activities.

User involvement is common, with 81.8% of libraries reporting either consultation or co-creation with users. However, the most frequently used method for obtaining knowledge from users is consulting only, reported by 57.1% of libraries. Co-creation with users is only reported by 24.3% of libraries. Non-managerial library staff are the most frequent participant in co-creation activities, at 52.9%. For all sources of knowledge, co-creation is more prevalent in large libraries.

Several factors are positively correlated with the involvement of library users and other sources of knowledge in co-creation. Co-creation with users

Table 1. Per cent of public libraries that used consult-only and co-creation methods to involve different groups in developing the focal innovation.

	<50 employees	50+ employees	Total
N	441	102	543
Consultation only			
Library users	59.4	49.0	57.5
Co-creation			
Library non-managerial staff	49.0	69.6	52.9
Library users	20.9	39.2	24.3
Non-profits	16.1	26.5	18.1
Businesses	14.3	17.7	14.9
At least one type of co-creation listed above present	51.0	70.6	54.7
Involvement of users through either consultation or co-creation	80.3	88.2	81.8

is reported by 22.9% of respondents that find that management ‘rarely’ supports innovation, versus 32.3% that find that management ‘always’ supports innovation (no table provided). The share of libraries that involve users in co-creation increases with the level of connection, from 18.1% when connection is of low importance to 32.1% when connection is of high importance (see Table 2).

4.2. Acquisition of useful knowledge, support factors and constraints

Table 3 provides results for the usefulness of knowledge for the focal innovation from seven groups. The knowledge can be obtained through ‘any means’, including not only co-creation and consulting but possibly collaboration, meetings at conferences, etc. Only 7.4% of respondents report that they did not use inputs from non-management staff, while over 50% of respondents did not use inputs from non-profits, businesses, or library associations. The most frequent “very useful” knowledge source is non-management staff, cited by 68.1%, followed at a considerable distance by other libraries at 29.3% and users at 25.6%.

Table 4 provides ordered logit results for the factors correlated with the usefulness of knowledge from library users (model 1), non-managerial library staff (model 2), non-profits (model 3) and businesses (model 4).

Table 2. Per cent of user involvement in developing the focal innovation by the importance of connection activities to library goals.

Method of involving users	Importance of connection ¹		
	Low	Moderate	High
<i>N</i>	182	177	184
Neither consultation nor co-creation	20.9%	18.6%	15.2%
Consultation only	61.0%	58.8%	52.7%
Co-creation	18.1%	22.6%	32.1%
	100.0%	100.0%	100.0%

1: Low = a score of 8 or less, medium = score of 9 or 10, high = score of 11 or 12.

Table 3. Usefulness of knowledge from each group, per cent of all libraries.

	Not used	Slightly useful	Moderately useful	Very useful	Don't know	
Library non-management staff	7.4%	5.9%	17.3%	68.1%	1.3%	100%
Other libraries	34.1%	14.6%	18.6%	29.3%	3.5%	100%
Library users	31.1%	19.0%	21.9%	25.6%	2.4%	100%
Non-profits	56.9%	12.2%	12.2%	14.9%	3.9%	100%
Businesses	63.9%	9.6%	7.4%	15.3%	3.9%	100%
Library associations	53.6%	14.2%	14.4%	14.4%	3.5%	100%
Municipal government/politicians	45.9%	20.8%	17.9%	12.5%	3.0%	100%

N = 543.

Table 4. Ordered logit models for usefulness of knowledge obtained from four sources for developing the focal innovation

	Model 1 Library users		Model 2 Non-managerial staff	
	Coef.	Sig.	Coef.	Sig.
Factors applying to all innovations				
Connection	.118	**	.138	**
D_newmedia/tech	-.143		-.119	
D_user ideas	.267	**	-.005	
Obs_lack staff	.009		-.078	
Obs_lack funding	-.100		.231	*
Obs_staff resistance	-.051		-.257	**
Mgmt innov support	.225		.138	
Staff innov support	-.032		.479	*
Design thinking skills	.320		.137	
Innov experience	-.006		.199	**
Knowledge sources for the focal innovation				
Consult users	1.379	***	.370	
C-Cusers	1.796	***	-.302	
C-Cnmgmt staff	-.557	**	1.813	***
C-Cnonprofit	-.156		-.244	
C-Cbusiness	-.678	**	-.750	**
OtherHigh useful sources	.466	***	.200	**
Innovation characteristics				
Service_only	.356	**	.569	***
Digital	-.379	**	.077	
Control variables				
Large library	-.035		-.365	
Country Dummies	YES		YES	
cut1	2.493		-.012	
cut2	3.571		.684	
cut3	4.887		1.960	
No. observations	543		543	
Pseudo r-squared	0.154		0.143	
Chi-square	191.1		137.4	
Prob. > chi2	0.000		0.000	
Akaike crit. (AIC)	1312.0		938.5	
***p<.01, ** p<.05, * p<.1				
	Model 3 Non-profits		Model 4 Businesses	
	Coef.	Sig.	Coef.	Sig.
Factors applying to all innovations				
Connection	.086		-.044	
D_newmedia/tech	.311	**	.276	**
D_user ideas	.163		.002	
Obs_lack staff	-.118		.080	
Obs_lack funding	.066		.193	
Obs_staff resistance	.217	*	.102	
Mgmt innov support	-.360		-.190	
Staff innov support	.126		.278	
Design thinking skills	.427	*	.127	
Innov experience	.043		.062	
Knowledge sources for the focal innovation				
Consult users	.373		-.400	

(Continued)

Table 4. (Continued).

C-Cusers	.188		.092	
C-Cnmgmt staff	-1.076	***	-.727	***
C-Cnonprofit	3.439	***	-.413	
C-Cbusiness	-.023		2.683	***
OtherHigh useful sources	.185	**	.296	***
Innovation characteristics				
Service_only	.544	**	-.199	
Digital	-.466	**	.551	**
Control variables				
Large library	.293		-.566	**
Country Dummies	YES		YES	
cut1	3.995		2.888	
cut2	4.896		3.548	
cut3	6.102		4.185	
No. observations	543		543	
Pseudo r-squared	0.234		0.158	
Chi-square	226.5		157.0	
Prob. > chi2	0.000		0.000	
Akaike crit. (AIC)	974.0		944.3	
***p<.01, ** p<.05, * p<.1				

Complementarity occurs when both the co-creation variable for the source of interest and another knowledge source are positive. Synergy occurs when the variable for ‘other highly useful sources’ is positive and significant, as in model 1. This indicates that an increase in the number of highly useful sources increases the usefulness of knowledge from the source of interest. Substitution is identified when the co-creation variable for the source of interest is positive but the co-creation variable for one of the other sources in the same regression model is negative. For example, the coefficient for co-creation with users in Table 4 model 1 is positive (1.796), while the coefficient for co-creation for non-management staff is negative (−.557). This indicates that co-creation with nonmanagement staff reduces the usefulness of knowledge obtained from users.

4.2.1. Library users

Model 1 finds that co-creation with users (coef. =1.796) and consulting with users (1.379) are complementary sources of knowledge, with both increasing the usefulness of knowledge from library users. Conversely, as noted above, co-creation with non-management library staff is negative, indicating substitution. Co-creation with businesses is also negative (coef. = −.678), suggesting that some businesses provide knowledge that substitutes that of users. The number of other highly useful knowledge sources is significant and

positive (coef. = .466), indicating a positive synergistic effect on the usefulness of knowledge from library users.

Only two of the ten variables for support and constraint factors are statistically significant: the importance of connection activities as a library goal (coef. = .118) and ideas from library users (coef. = .267). The other factors are not significant. The lack of significance for management support is because this factor is captured by other variables such as co-creation, with management support having no independent relationship with knowledge usefulness. For innovation characteristics, the usefulness of knowledge from users is higher for service only innovations (compared to service-process innovations) and lower for innovations with a digital component.

4.2.2. Non-management library staff

Model 2 shows that co-creation is positively correlated with the usefulness of knowledge obtained from non-management staff (coef. = 1.813), while co-creation with users and non-profits are not significant, indicating no substitution or complementarity from these two sources. However, co-creation with businesses is negative (coef. = -.750), suggesting substitution for knowledge from non-management staff. This could be due to both sources providing knowledge of relevance to processes for combined process-service innovations. The number of other highly useful knowledge sources has a positive effect on the usefulness of knowledge from non-managerial staff (coef. = .200).

For the support and constraint variables, a focus on connection increases the usefulness of knowledge obtained from non-management staff as does a lack of funding as a general obstacle to innovation. The latter could be due to an increased role for non-managerial staff when faced with insufficient financial resources to obtain relevant knowledge from other stakeholders. However, staff resistance to change reduces the usefulness of knowledge from non-managerial staff (coef. = -.257). A diversity of innovation experience is positive, possibly because it results in better informed or trained non-management staff.

For the variables on the characteristics of the focal innovation, the usefulness of knowledge from non-management staff increases for service-only innovations, but there is no relationship for digital innovations.

4.2.3. Non-profits

Co-creation with non-profits (see Model 3) is positively correlated with the usefulness of knowledge from this source (coef. = 3.439). There is a substitution effect for co-creation with non-management staff (coef. = -1.076), suggesting that knowledge from non-management staff is a substitute for knowledge from non-profits. The obstacle 'staff resistance

to change' is positive (coef. = .217), indicating that libraries depend more on knowledge from non-profits when faced with staff resistance.

For the support and constraint factors, connection has no effect, but there are positive correlations for new media or technology as a driver (coef. = .311) and the presence of design thinking skills (coef. = .427). Knowledge from non-profits is more useful for service only innovations, and of lower usefulness for digital innovations. This is the same pattern observed for users, suggesting that non-profits play a similar role.

4.2.4. Businesses

Co-creation has a positive effect on the usefulness of knowledge obtained from businesses (coef. = 2.683), but co-creation with non-management staff is negative (coef. = -.727), implying substitution. This mirrors model 2, where co-creation with businesses reduces the usefulness of knowledge from non-management staff, suggesting that businesses and non-management staff provide similar knowledge, possibly for internal library processes. The number of other highly useful sources is significant and positive. Out of the support and constraint factors, only new media/technology as a driver has a significant effect on the usefulness of knowledge from businesses. This is in line with the positive effect for digital technology, indicating that businesses play a role in innovations that involve new technologies.

5. Discussion

5.1. Prevalence of co-creation

This exploratory paper examines different ways of eliciting knowledge from users, including non-interactive consultation and interactive co-creation. A key finding is that user co-creation is not the most prevalent method for involving users in developing library innovations. Non-interactive consulting through online surveys or conversations with front-line staff is the only direct method of obtaining knowledge from users for 57.5% of libraries that innovate, versus 24.3% reporting co-creation. This aligns with a recent systematic review (Acar, Steen, and Verschuere 2025) and suggests that the use co-creation is selective and project-based rather than fully embedded in organizational routines (Loeffler and Bovaird 2016; Voorberg, Bekkers, and Tummers 2015).

Co-creation is more likely to be mobilized in strategic or high-visibility initiatives where the expected benefits outweigh coordination and transaction costs (Bentzen 2022; Torfing, Sørensen, and Dečman 2023).

Consequently, our data are likely to over-estimate the prevalence of co-creation because they are limited to 'high priority' or 'high expected value' focal innovations where the use of costly and time-consuming methods such as cocreation (Figenschou et al. 2024) are justifiable.

5.2. Open innovation and knowledge

The research findings provide support for the application of ecosystem (Osborne et al. 2022) and open innovation theories (Figenschou et al. 2024) to the public sector. Ecosystem theories identify users, non-profits, and other libraries as part of the library innovation ecosystem (Cruz et al. 2020; Gesierich, Nordli, and Arundel 2024). This is confirmed by the results in Table 3 on the usefulness of knowledge from different sources. The most cited external source of 'very useful' knowledge is other libraries (29.3% of respondents) pointing to the importance of horizontal knowledge diffusion and peer learning within the library ecosystem (Potnis, Winberry, and Finn 2020; Syn, Sinn, and Kim 2023). This finding resonates with public service ecosystem perspectives emphasizing mutual interdependence and resource recombination across institutional boundaries (Osborne et al. 2022; Trischler and Charles 2019).

Open innovation requires internal actors within an organization to take part in acquiring external knowledge. In libraries, this could include management and innovation designers, which are not evaluated in this study. Instead, our results highlight the importance of internal knowledge from non-managerial staff, confirming the results of several case studies (Henkel et al. 2018; Robinson and Schroeder 2022). Over two-thirds of libraries find non-management staff to be a 'very useful' source of knowledge for innovation (Table 3). Their value is likely due to hands-on expertise, operational insights, and daily interaction with users. Non-managerial staff are a common participant in co-creation (Table 1), reported by 52.9% of libraries. This is consistent with open innovation theory, with staff playing a boundary-spanning role by translating external inputs into workable solutions (de Lima Figueiredo, Fernandes, and Abrantes 2026).

Open innovation theory posits that sourcing knowledge from external sources will positively add to internal knowledge. Open innovation is supported by the regression results in Table 4 on factors influencing the usefulness of knowledge. One of the main purposes of open innovation is to combine internal and external knowledge (Qi and Liang 2024; Miereles et al., 2022) in a way that increases the usefulness of knowledge for innovation. This is supported by the positive and complimentary effect on knowledge usefulness from cocreation and consulting with users and the synergistic effects for the number of other highly useful sources (Mahr,

Lievens, and Blazevic 2014; Jalonen et al. 2021), where knowledge can be obtained from unspecified and informal methods such as attending conferences or reading the literature. These results align with Torfing, Sørensen, and Dečman (2023) who argues that co-creation can generate epistemic diversity that improves problem framing and solution quality. The synergisms from involving multiple types of stakeholders also support innovation ecosystem theory (e.g. Kankanhalli, Zuiderwijk, and Tayi 2017; Osborne et al. 2022; Trischler and Charles 2019). Libraries benefit not only from structured co-creation, but also from broader forms of professional networking, informal exchanges, and inter-organizational collaboration. These findings reinforce the view that innovation ecosystems function through both formal and informal knowledge flows (Loeffler and Bovaird 2016; Voorberg, Bekkers, and Tummers 2015).

Further evidence in support for open innovation comes from evaluating the substitution effect for non-management staff. Non-management staff is always a partial substitute for the three external sources, but the usefulness of knowledge from non-management staff is never sufficient to fully replace the usefulness of other knowledge sources (the absolute value of the negative coefficient for non-management staff in Table 4 is always smaller than the positive co-creation coefficients for users, non-profits and businesses). This implies that co-creation with external actors contributes distinct and non-redundant knowledge resources that are not available within the library.

Other research suggests that non-profits can substitute for co-creation with users (Gesierich, Nordli, and Arundel 2024; Tuurnas 2015). Model 1 of Table 4 does not provide evidence to support this research, with co-creation with non-profits only having a slight non-significant negative effect on the usefulness of knowledge from users.

The expectation that co-creation has advantages over non-interactive methods for increasing creativity, expertise and understanding (Bentzen 2022; Torfing, Sørensen, and Røiseland 2019) is also supported by the larger effect of co-creation on the usefulness of knowledge obtained from users (1.796) compared to consulting with users (1.379). The benefits of co-creation are expected to be greatest when tacit knowledge is involved, as when obtaining experiential knowledge from users (Centeno 2025).

Using marginal effects to estimate the influence of co-creation on the probability of being in the highest usefulness category (very useful), we find that co-creation with users increases this probability by 25.4 percentage points. Co-creation with non-profits raises the probability of obtaining very useful knowledge from this group by 23.8 percentage points, while co-creation with business increases the probability of very

useful knowledge obtained from this group by 25.1 percentage points. The benefits of co-creation are therefore consistent across all different types of knowledge partners.

5.3. Support and constraint factors

Generally, support and constraint factor play only a limited role in the usefulness of knowledge from internal and external sources. In comparison, co-creation has a much larger impact. For example, a one unit increase in connection increases the probability of being in the highest usefulness category (very useful) for library users by 1.7 percentage points, the presence of user ideas as a driver to innovate increases this probability by 3.8 percentage points, while co-creation with users increases the probability by a substantial 25.4 percentage points. This supports the view that co-creation constitutes a structural intervention in the innovation process rather than a marginal adjustment (Acar, Steen, and Verschuere 2025; Edelenbos and van Meerkerk 2016; Torfing, Sørensen, and Røiseland 2019).

The exception for constraints and drivers is non-management staff, where five factors increase the usefulness of knowledge: connection, lack of funding, lack of staff resistance, positive staff support for innovation, and innovation experience. A possible explanation is that internal staff are continually affected by library policies, whereas the main factor influencing external sources is the initial, unobserved, decision to include them in developing the focal innovation (Boon, Wynen, and Callens 2021). This may reflect the embeddedness of internal staff within organizational structures and incentive systems and the sensitivity of internal knowledge mobilization to the organizational climate and resource conditions, consistent with research on absorptive capacity and innovation readiness (de Lima Figueiredo, Fernandes, and Abrantes 2026).

The variable 'connection' measures the intensity of library activities to improve the social connection of users through its services. As shown in Table 2, connection intensity is positively correlated with the use of co-creation and in Table 4 with the usefulness of knowledge from users and non-management staff. This suggests that strategic shifts in services from 'collections to connections' (Rasmussen 2016) are supported by participatory innovation practices (Council of Europe 2023; van Kempen et al. 2021). Libraries that explicitly prioritize social connection appear more inclined to institutionalize co-creation as a mechanism for generating public value. In addition, the positive effect of connection on the usefulness of knowledge from users could be due to an environment that requires staff to work with and accept user input, reducing constraints from staff preferences for input from public sector professionals (Fuglsang and Hansen 2022; Nordberg and Aflaki 2024).

6. Conclusions

These results provide empirical evidence in support of theories of the value of open innovation, co-creation and an innovation ecosystem that draws on knowledge from multiple stakeholders. The results are also relevant to management practices and policies. Given the strong positive effect of co-creation on the usefulness of knowledge for innovation from all four sources examined in this study, the low uptake of co-creation, particularly with users, is of concern. Overall, the survey results point to a strong policy case to support the greater use of co-creation as a method for obtaining useful knowledge for developing library service innovations, not only from users and non-management staff, but also from other stakeholders such as non-profits and businesses.

However, the results also show that co-creation with users and other external sources may not be appropriate for all innovations due to contextual factors. Knowledge from users and non-profits is less useful for innovations with a digital component, while knowledge from users, non-managerial staff, and non-profits are more useful for service-only innovations than for combined service-process innovations. Co-creation is expensive (Hurley, Trischler, and Dietrich 2018) and consequently libraries with limited resources may be able to rely, in some contexts, on non-management staff as a source of knowledge on user experiences. The appropriate mix of knowledge sources will depend on the type of innovation, the library's organizational capacity and the library's strategy. These considerations underscore the need for differentiated context-based approaches to developing service innovations.

As with all survey research, two important limitations are generalizability to countries that were not covered by the survey and the constraints of surveys. First, the survey only covers high-income European countries. Second, survey questionnaires must be short to obtain good response rates and data quality, which reduces question depth and diversity. This study lacked questions on knowledge management, which should be relevant given the observed complexity and interconnections between external knowledge sources. As noted by Koloniari, Vraimaki, and Fassoulis (2018), more empirical research is required on the role of knowledge management in library innovation activities.

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Appendix

Table A1: Descriptive statistics

Usefulness of knowledge from:	Percent very useful
Library users	25.6
Non-managerial staff	68.1
Non-profit organizations	14.9
Businesses or consultants	15.3
Independent binary variables (variable name)	Percent high imp.¹
<i>Drivers to innovate</i>	
New media and technologies [D_newmedia/tech]	32.8
Suggestions from library users [D_user ideas]	25.4
<i>Obstacles to innovate</i>	
Insufficient staff to take on new work [Obs_lack staff]	Percent high imp.¹
Insufficient financial resources [Obs_lack funding]	52.3
Library staff uninterested or resistant to change [Obs_staff resistance]	41.4
Management strongly supports innovation [Mgmt_innov_support]	7.4
Non-managerial staff highly motivated to innovate [Staff_innov_support]	Percent always
	47.3
	23.6
	Percent
Library has staff with design thinking skills [DT_skills]	35.4
Consulting with users: Informal conversations between library staff and library users OR surveys on the experiences of library users [Consult_users]	79.6
Co-creation with users: Involvement in focus groups, design thinking exercises, brainstorming, or workshops for developing the focal innovation [C-C_users]	24.3
Co-creation with non-managerial staff : involvement in focus groups, design thinking exercises, brainstorming, or workshops for developing the focal innovation [C-C_nmgmt_staff]	52.9
Co-creation with non-profit organizations : involvement in focus groups, design thinking exercises, brainstorming or workshops for developing the focal innovation [C-C_non-profit]	18.1
Co-creation with businesses : involvement in focus groups, design thinking exercises, brainstorming or workshops for developing the focal innovation [C-C_business]	14.9
<i>Development of focal innovation</i>	Percent
Adopting [Developed by adoption]	25.4
Modifying [reference category]	18.8

(Continued)

Table A1: (Continued).

Usefulness of knowledge from:		Percent very useful
Collaborating [Developed by collaboration]		18.2
In-house development [Developed inhouse]		37.6
The focal innovation is a service only [Service_only]		58.9
The focal innovation involved digital technologies [Digital]		58.8
Size: Library with 50 or more employees (head count) [Large_library]		18.8
<i>Country</i>		Percent
Austria		8.7
Belgium		7.7
Denmark		10.1
Finland		7.4
France		12.0
Germany		24.1
Greece		5.3
Spain		13.8
Netherlands		10.9
Continuous variables		
Connection index [Connection]		Mean
Diversity of innovation experience index [Innov experience]		9.2
Number of other highly useful sources - excluding users [Other high useful sources]		3.8
Number of other highly useful sources - excluding non-managerial staff [Other high useful sources]		1.6
Number of other highly useful sources - excluding non-profit organizations [Other high useful sources]		1.2
Number of other highly useful sources - excluding businesses or consultants [Other high useful sources]		1.7
1: high importance		1.2