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Innovation in libraries: A service-oriented perspective

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ABSTRACT

This article is devoted to the question of innovation in libraries. Ignored by 'service studies', this question occupies an important place in library and information science, but is all too often approached in a way that is factual and descriptive. Drawing on advances in service economics and management, this article adopts a perspective of the library as an 'architectural' or 'assembled' service bringing together a number of core and peripheral services, and mobilizing competences and different types of technology to collaboratively generate, utilities for the user or community. We discuss how such a representation of the product can systematically account for the full complexity of the forms and dynamics of innovation in libraries. We have thus identified and empirically illustrated three general innovation logics (horizontal, vertical and diagonal), which differ according to the components of the library service on which they act, and which operate according to different modalities, reflecting different innovation trajectories.

1. Introduction

Inspired by a similar exercise carried out by Ben Martin (2016) for 'innovation studies' in general, Gallouj and Djellal (2018) identify the main challenges facing 'service innovation studies' in the future in a book entitled 'A research agenda for service innovation'. These include the identification and exploration of forgotten service sectors whose nature and innovation dynamics need to be understood. Paradoxically, libraries do not appear among these sectors. And yet, these are services well and truly forgotten by 'service innovation studies'. Indeed, to our knowledge, there are no articles devoted to innovation in libraries in the main journals, either in the field of services or in the field of innovation. As part of the European research project LibrarIN ('Value Co-creation and Social Innovation for a New Generation of European Libraries'), Rubalcaba et al. (2023) identified over 400 references on innovation in academic libraries, using the Web of Science database. None of these references had been published in innovation and services journals.

This lack of interest in library innovation across both service and innovation studies is all the more paradoxical, given that a major innovation (namely the internet and all its offshoots and associated services) has led to fears of the outright disappearance of libraries (Goulding, 2006; Leadbeater, 2003; Coates, 2004) under the effect of the Schumpeterian principle of creative destruction. It is only because libraries have themselves been innovative in the face of this competition – even making internet access a core mission (McClure et al., 2009) – that libraries have not, as was once feared, disappeared in the face of invasive online access to information and knowledge (e.g. Google Scholar, Wikipedia, e-books and e-journals, etc.).

While this struggle (through innovation) for survival has been of little interest to researchers in the field of services and innovation (more concerned with market services, and more recently with public administrations[1]), it has been the object of extensive literature in the general field of library and information science (LIS),[2] including in the corresponding professional literature. This literature is of great interest in its description (mainly through significant case studies) of the nature of innovation in libraries and the way it is organized. However, it remains overly descriptive and factual. Though it does offer definitions and typologies of innovation in libraries, it more often than not lacks the theoretical foundation that would enable systematic mapping and analysis (Yeh and Ramirez, 2016). Both Rubalcaba et al. (2023) and

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[1] For a recent review of the literature on service innovation, see Gallouj et al. (2023).

[2] LIS relies on a number of specialist journals that regularly publish articles on innovation in libraries. Examples include: Journal of Academic Librarianship, Journal of Librarianship and Information Science, Library Hi Tech, International Journal on Digital Libraries, Library Philosophy and Practice, Public Library Quarterly, Journal of Library Administration, Library Management, etc.

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Desmarchelier and Gallouj (2023) have produced recent reviews of the literature on innovation in libraries (see also Jantz, 2012; Brundy, 2015; Pellack, 2022). The typologies proposed in librarianship represent a departure from the traditional Schumpeterian categories, which are deemed incapable of taking into account the specificities and the totality of the forms of innovation in libraries. Thus, specific typologies are proposed. For example, Rubin et al. (2011) identified 10 "areas of innovation": technology, service, culture, vague, character, use, program, facility, resource, and partnership. Nicholson (2017) proposed 5 types of innovation: in collections, customer services, technology, programs, and library buildings. Using a database of 80 cases of innovation compiled from interviews with 108 librarians in the United States, Potnis et al. (2020) identified 4 types of innovation, each with different modalities: program (access-oriented/use-oriented), process (efficiency-driven/effectiveness-driven), partnership (internal/external), and pechnology (web-based technologies/assistive technologies/artificial intelligence). Most of these typologies are less than entirely satisfactory, either because they include too many types, or strange types (such as 'vague' – when the subject of innovation cannot be identified – in the typology by Rubin et al., 2011), or because the boundaries between some of these types are difficult to establish. It should also be noted that social innovation, which plays an important role in public libraries, is not included in any of the abovementioned typologies. However, rather than being absent from the literature, it is the subject of separate typologies. For example, Winberry and Potnis (2021) distinguish six types (or fields, to be more precise) of social innovation in public libraries: lifelong learning, emergency response, civic engagement, health, and diversity and inclusion.

The aim of this article is to mobilize a number of theoretical constructs established in the field of service (and service innovation) economics and management, in order to provide theoretical support for this professional literature. Our plan is thus to bring together fields of research that have, until now, essentially ignored each other: the economics and management of services (and service innovation), on the one hand, and librarianship, on the other.

This article is organized into three main sections. In Section 2, we take a service-oriented approach to library activity, based on Gadrey's (1991, 1996) definition of service (popularized by the 'service triangle' metaphor), and the resulting functional breakdown of the 'product'. In particular, this functional breakdown makes it possible to identify the evolution over time of the different perspectives conceivable for understanding library service: the library as collection, the library as information system and the library as complex service. In Section 3, this functional breakdown is enriched by adding in the competences and technologies mobilized by the various actors (librarians, users and other partners) involved in the service, and the direct and indirect utilities (or use values) generated for users (individual or collective) by the library service. A general representation of the 'product', developed in 'services studies' to account for so-called 'architectural' or 'assembled' services (i.e. those defined as the association of a number of other constituent services) is thus adapted to the library activity (Djellal and Gallouj, 2005, 2008; Djellal, 2023). Lastly, in Section 4, we discuss the way in which such a representation of the product makes it possible to account, both analytically and systematically, for all the complexity of the forms and dynamics of innovation in libraries.

2. A service-oriented definition of library activities

Library science defines the library as a place and set of activities available to all citizens, with the following objectives: "information, education, recreation, culture and economic regeneration" (Williamson, 2000, p. 179). This broad definition encompasses both longstanding (historical) conceptions of libraries (focused on inventorying, cataloging, curating, and making available books) and contemporary conceptions of libraries as providers of multiple services (sometimes having no connection whatsoever to books or written documents). Within this general framework, the literature highlights a diversity of library types: national library, public library, academic library, virtual library, specialist library, professional library, school library, and public agency library (Edwards, 2009; Hansson, 2010), distinguished by their specific objectives and the publics they serve, with national particularities. However, the distinction most frequently used in the literature is between the academic library and the public library (Nicholson, 2017; Hansson, 2010).

In their efforts to define and typify libraries, library science and service science seem to mutually ignore one another. Yet every library is a service provider, regardless of form/type. Defining it in terms of service theory is therefore both desirable and relevant.

The most conceptually elaborate definition of services is attributed to Hill (1977). In distinguishing goods from services, this definition foregoes the use of technical criteria (intangibility, heterogeneity, interactivity, perishability),[3] relying both on an analytical dissociation between customer and service medium, and on a distinction between service as a process and service as a result. For Hill (1977, p. 318), a service is thus "a change in the condition of a person, or of a good belonging to some economic unit, which is brought about as the result of the activity of some other economic unit, with the prior agreement of the former person or economic unit". Gadrey (1991, 1996) enriches and refines this definition, providing a schematic representation: the 'service triangle' (see Fig. 1).

The service is thus defined as a set of operations for processing (transforming) the state of a medium (SM), implemented by a service provider (SP) for the benefit of a customer/user (C), and in many cases in collaboration with him or her, with SM, SP and C constituting the vertices of the service triangle. The medium (which belongs, or is linked in various ways to the customer) may be: goods or a technical system; codified information (including monetary symbols); collective skills and knowledge (of organizations), as well as individuals themselves in their "physical and bodily dimension (health, maintenance, transport), intellectual dimension (training, culture), relational dimension (communications, leisure, information)" (Gadrey, 1991, p. 9).

Applying this general definition to traditional (contemporary) library services, we can describe them as a set of processing operations carried out by the librarian on *a medium that is the user themselves*, in their intellectual and relational dimensions, and in collaboration with this user. Indeed, the purpose of the library service is to improve individuals' education and cultural knowledge, inform them and provide them with leisure activities.

However, this general definition is abstract and simplistic. As Gadrey

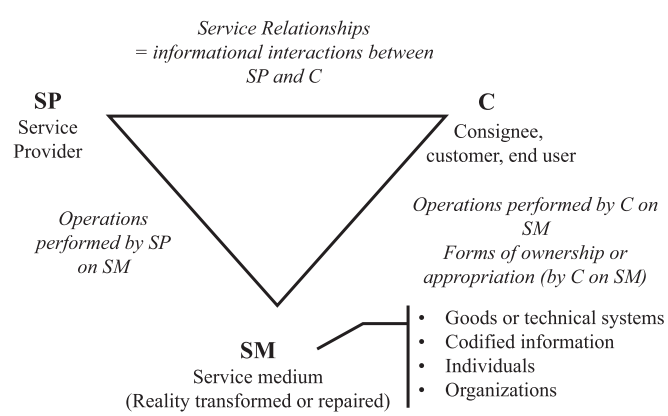

Fig. 1. The service triangle (after Gadrey, 1996).

[3] The so-called IHIP paradigm.

(1991, 1996) himself acknowledges, with regard to services in general, it conceals the fact that, in reality, a service activity (and that of libraries in particular) can, to varying degrees, be carried out *on several media at once*. Indeed, it can be seen as the combination (in differing proportions and varying in space and time), of various groups of operations (or functions) involving the different media established by the service triangle (cf. Fig. 2):

- 'material' operations or functions [M], which consist of 'processing' tangible objects (books, in the case of libraries, but also other objects in, for example, the case of the so-called 'library of things'), i.e. transporting, storing, transforming, maintaining, repairing them, etc. Insofar as the library is a 'physical space', we propose to add to these functions the operations of organizing and arranging spaces and furniture;
- 'informational' operations or functions [I], which consist in 'processing' 'codified' information, i.e. producing, capturing, transporting it and so on. In the case of libraries, informational operations can be divided into two different groups: on the one hand, operations concerning the digitization of collections and the provision of IT-based services, and on the other, operations concerning the administrative and accounting management of libraries. These operations take place in a 'digital space', which complements (and sometimes replaces) the 'physical space';
- 'cognitive' or 'methodological' or 'organizational engineering' operations or functions [K], which focus on the collective skills and knowledge of organizations (in this case, libraries and their partners), and on their structures, which need to be transformed. These operations may involve the implementation of new or improved methods (i.e., codified routines, intangible techniques) or new or improved organizations/structures. In the case of libraries, examples of methods implemented include those relating to the classification of books and documents;
- 'contactual' or 'relational' service operations [R], those whose main medium is the customer or user themselves, and which consist of direct (in-contact) service.

Fig. 3 shows how the proportion of the four library functions ('material', 'informational', 'methodological' and 'relational') has varied over time, highlighting three different conceptions of the library: as collection, as information system, and as complex service (the dominant contemporary conception).

Historically, then, library activity has long focused essentially on relatively rare material objects (M): books, manuscripts, parchments, documents, which had to be collected, stored, referenced and maintained in order to be made available to readers, or lent out (Hayes and Walter, 1996; Hansson, 2010). These objects, which are stored and made available to users in appropriate physical spaces, have an obvious materiality, even though what the reader and curator are primarily interested in is the (immaterial) information and knowledge they convey. This physical dimension of the object (the book) is a longstanding one. It is the heir to clay tablets, papyrus rolls, parchments and codex (Martin, 1996). We label this first conception 'collection-oriented library', although the literature uses other expressions conveying the same idea of domination of the material (physical) medium of the service: paper-based library, material-based library, (books) warehouse-library (Bee, 2008). The material dimension of library services is not limited (at least in contemporary libraries) to the supply of books. Other objects can also be offered, making up what is known as the 'Library of Things'. These include bicycles, musical instruments, cameras, board games, fishing rods, balls and kitchen appliances. Seed libraries also belong to these 'Libraries of Things'.

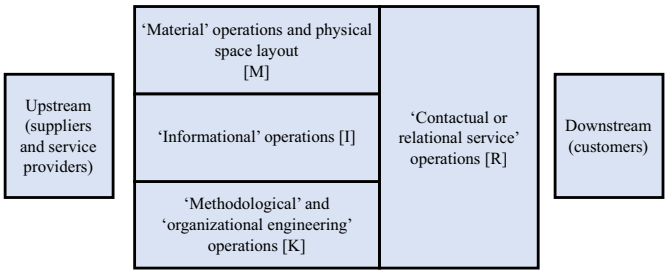

Fig. 2. Functional breakdown of the service.
(Adapted from Gadrey, 1991).

With the advent of information technology, the internet and digitization, the main target of the service has shifted from the material object (M) to codified information (I), giving rise to another conception of the library: the 'library as information system'. Relying on referencing and management systems that have themselves been digitized, the library now manages an extreme bulk of digital resources: out-of-print antiquarian books/documents, which are the subject of a digitization policy, contemporary books published in digital form from the outset, digital journals, etc. It thus organizes 'access packages' for users who no longer necessarily travel to the library (Calenge, 2015). Some of these resources (digital journals, for example) do not belong to the library, which must itself negotiate access and subscribe to them. In turn, the library provides users with access and technical support. Although there are borderline cases where material processing functions (M) disappear with the rise of informational processing functions (I) (the so-called – strictly – digital library), more often than not, the two coexist. The literature uses the term 'hybrid library' (Rusbridge, 1998; Oppenheim and Smithson, 1999), to describe this conception of the library, combining traditional material processing functions of collections (M) (physical library) with informational processing functions (I) (digital library).

A third conception of the library can be envisaged, reflecting the growing importance of the cognitive (K) and, above all, of the in-contact services and relational components (R) of its 'product'. We propose calling it 'library as complex service (or architectural or assembled service)'. Without neglecting other targets, the one libraries are now increasingly concerned with is the users themselves (R), whose characteristics they are striving to change, in a direct, in-contact relationship. Libraries are now 'people-centered' rather than 'collection-centered'. Some academic libraries, for example, are becoming 'Learning Centers', offering users numerous opportunities for experimentation and interaction, and are concerned not only with the transmission of information and knowledge, but also with their emotional and social well-being. The library is thus also a place for socializing, experimentation, conviviality and relaxation — a third place. It offers music, exhibitions, meetings with authors and more. In this conception of the library, the librarian acts as a 'tour operator', a guide, a hub integrating a certain number of services (in an 'architectural' logic) for the well-being of users (training services, social services, advisory services in multiple fields, etc.). It is no longer just the information and knowledge transmitted that is important, but also the general context in which potential readers/learners evolve, and the efforts made to empower them.

This evolution in these different conceptions of the library (from 'library as collection' to 'library as information system', then to 'library as complex service') parallels several other developments:

- the shift in the main targets of service: from the object to the information, then to the organization in its cognitive and structural dimensions, and finally to the individual (in various aspects) — in other words, the shift 'from collection to connection' (technological and/or human) (Nybø, 2014).
- the shift from scarcity (of collections) to plethora of information/knowledge.
- the shift from accumulation (memory) to transmission and interaction (knowledge), then to genuine co-production (in different ways).

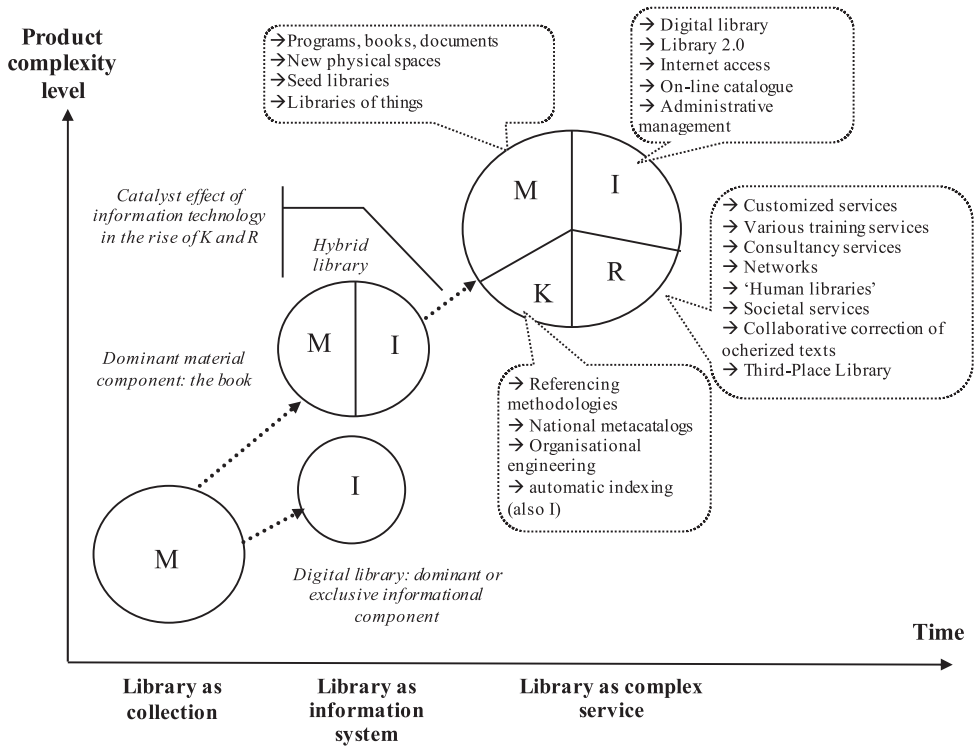

Fig. 3. Product functional breakdown and evolution of library concepts.

– the shift from product standardization to service customization.
– the shift from linear interaction models to diverse interactive models, involving users in particular.

It is important to note that in reality, at each stage of its evolution, the library implements all four of the functions/activities envisaged (material, informational, methodological and relational). Thus, what differs from one stage to the next is, in fact, the proportion (relative importance) of each function. In other words, although material functions (book processing and logistics) are indeed dominant in the 'library as collection', this is not to the exclusion of informational, methodological (referencing methods) and relational (consultancy) functions. Both the rise of a given function/activity and the evolution towards the 'library as a complex service system' are often reflected in the addition of sub-functions/activities within a given function. As we shall see in Section 4, this increase in complexity is generated by innovation trajectories (and extension trajectories in particular).

3. An 'architectural' approach to library activity

The nature of library service has thus changed and become more complex over time. The rise of the 'library-as-complex-service-provider' concept has reinforced the architectural dimension of contemporary library service. In other words, library activity is increasingly akin to what we call 'architectural or assembled services', to designate services which, like hospital services, airports, amusement parks, large-scale retail outlets, etc., are more or less complex packages of other constituent services, added to a core service (Djellal, 2023). Here, too, it is possible to draw on the contributions of service economics and management in building our understanding of contemporary library services.

The theoretical representation of 'architectural' (or assembled) services proposed by Djellal and Gallouj (2005, 2008) seems particularly well-suited to the multiplicity of services offered by contemporary libraries. This product representation incorporates theoretical elements from service economics and management, in particular the definition of service based on the service triangle metaphor, and the functional breakdown of service provision (see previous section). It also incorporates a Lancasterian-inspired, characteristics-based approach to services (Gallouj and Weinstein, 1997; de Vries, 2006; Windrum and Garçia-Goñi, 2008), and certain contributions from service marketing — in particular, the core-peripheral service approach (Eiglier and Langeard, 1987; Lovelock, 1996).

Like any architectural service provider, the library can be described by linking the following six variables (Djellal and Gallouj, 2005, 2008) (see Table 1):

1) the constituent services (S_i) making up the library package.
2) the user competences (C').
3) the user technologies (T').
4) the competences (C) of the librarians involved in the various 'constituent services'.
5) the technologies (T) of the service providers, associated with the various possible targets/media of the library's services.
6) the final service characteristics or utilities obtained or sought by/for users and/or the community (Y).

1. The constituent services (S_i) making up the library package are represented by the rows in Table 1. They belong to two different categories highlighted, in particular, by service marketing (Eiglier and Langeard, 1987; Lovelock, 1996): 1) the core service or services, which constitute (at least historically) the heart of the package, and which justify its existence (lending of books in a library), and 2); peripheral services, which bring together a more or less broad range of secondary services, which come in support of the core service (e.g., internet access, cafeteria, social area, in libraries).

   In the now dominant concept of the library as a complex (or architectural) service, the provision of collections (the library's core service) is just one service among many. The book (or, more precisely, its lending), formerly the core service, may become a peripheral service, or even disappear altogether (from the offer itself or from the user's preference system), as the user comes to the library

Table 1
A framework for analyzing architectural service provision: an application to libraries.

Constituent services	User competences	User technologies	Service provider competences	Service provider technologies (T) associated with a service medium and with corresponding operations or functions				('External') use, final or service characteristics or functions	
Si (s_{i1}, s_{i2} … s_{ij} … s_{im})	C′ Competences in (the use of) technologies or competences directly mobilized	T_I' Mainly informational technologies	C Competences in (the use of) technologies (C_M, C_I, C_K, C_R) or competences directly mobilized	T_M 'Material' sciences and technologies corresponding to 'material' operations (M) (including operations of organizing and arranging spaces and furnitures)	T_I 'Informational' sciences and technologies corresponding to 'informational' operations (I)	T_K 'Methodological and organizational engineering' sciences and technologies and corresponding 'Methodological and organizational engineering' (K)	T_R 'Contactual or relational' sciences and technologies corresponding to 'contactual or relational' service operations (R)	Y_d Direct service characteristics	Y_I Indirect service characteristics
S_1 Book lending									
S_2 Internet access									
S_3									
…									
S_i									
…									
S_n									

(Adapted from Djellal and Gallouj, 2008).

looking for something else than a book: for example, a workspace, a space for socializing, leisure activities, support in drawing up administrative documents, etc. The reduction in centrality (or even the disappearance) of the historical core service of access to collections depends on the type of library. For example, books remain central in national libraries, while 'social' services are tending to supplant books in some public libraries. This possible loss of centrality of the core service is a particularity of library services compared to other architectural services. For example, regardless of the package of services considered, care remains the main reason for patient recourse to the hospital.

2. User competences (C′) are not those that libraries are likely to pass on to users through their activities, and which constitute their core business. These last are 'output competences' that are either new constituent services (S_i) offered by librarians (for example, 'information competences' or 'information literacy' (Moselen and Wang, 2014) or, more generally, the fruit of educational services of all kinds), or general utilities generated by the library's activities (Y_i). The 'input competences' (C′) referred to here are the initial competences held by users and mobilized by them in order to take advantage of library services (e.g. technological literacy).

3. Users can use a number of technologies (T′) to access library services. These are essentially information technologies (T'_I) (computers, tablets, e-readers, personal cell phones, etc.). Here again, when some of this equipment is lent out by libraries, it is no longer a question of T′, but of constituent services delivered (S_i), for example, the lending of a reading device.

4. The competences (C) of the librarians involved in the different services may be competences in the different technologies brought into play during the different operations (C_M, C_I, C_K, C_R) or more general competences, or competences independent of these technologies (C_G) (interpersonal and mediation competences, creative, operative/manual competences). These competences can be individual or collective. The rise of the information function (I), of the corresponding digital technologies and of digital-based services is leading to a rise in the digital competences (C_I) of librarians. Similarly, the growing importance of libraries' social and societal missions is leading to an increase in their social/civic competences. Both types of competences (digital and social/civic) can also be sought or obtained through partnerships with other agents, e.g. public administrations or non-profit organizations.

5. Depending on the main target/medium of the service, and the corresponding transformation operations (M, I, K, R) (see Section 2), specific technologies (material technologies — T_M, informational technologies — T_I, cognitive and organizational engineering technologies — T_K, relational technologies — T_R) will be mobilized to produce the (core or peripheral) service. Even if there is some overlap, the different operations/functions making up the service (material, informational, cognitive and relational operations/functions) generally correspond to different technological families (for example, T_M, robotics and mechanics, but also architecture and interior design, for function M; T_I, information technology and telecommunications, for function I; T_K, various methodologies and protocols and organizational engineering, for function K, etc.).

6. The Y variable (the utilities or service characteristics generated by the library service) is based on a Lancasterian characteristics-based approach to service (Gallouj and Weinstein, 1997). The Ys reflect the library's impact on user well-being, in other words, the 'value' of the library service. A distinction has to be made between a *direct or immediate* value/utility (the satisfaction obtained immediately by users in their own service experience — in this case, the use of a

library service) and an *indirect or mediate* value/utility (outcome, satisfaction obtained in the longer term, for example, the impact of using the library on increasing skills, passing exams and obtaining a diploma or job, etc.) (Eleuche, 2017). The utilities in question are most often desired by both the user and the librarian, though they can also be positive or negative externalities generated unintentionally. In research on digital literacy, Ginger (2015) describes the unexpected utilities of free internet access in the public library of a small town in the United States. This free service reaches beyond the library walls insofar as — even after closing time, young people gather in cars in the nearby car park to take advantage of the internet access to listen to music or watch YouTube videos. A distinction has also to be made between utilities for users themselves and utilities for the community as a whole. For example, independently of its success, measured by various volumes (e.g., attendance volumes), a library (like an incubator, a swimming pool, etc.) produces reputation for the community that owns one (Hayes and Walter, 1996).

It should be noted that we have enriched Djellal and Gallouj's (2005, 2008) analytical representation of 'architectural' services in several ways (shown in gray in Table 1):

1. By introducing a column in Table 1 representing user competences (C′). Users may be more or less skilled in service interaction and the use of technology. Combating illiteracy (including technological illiteracy) is a key social objective of libraries.
2. By introducing the user's own technologies (T′) (e.g. computer, tablet, cell phone) — which can be mobilized as part of the service relationship. In some cases, libraries offer these technologies on loan; they are then peripheral services (S_i) added to the core service.
3. By introducing distinctions between direct service characteristics (short term effects) and indirect service characteristics (outcome, long term effects), individual and collective/community service characteristics, and also by accounting for unintended service characteristics, generated as externalities (positive or negative).
4. By emphasizing the dual nature of competences and techniques in libraries. These can refer to skills and technical characteristics (i.e. [C] and [T] vectors, respectively) as well as services characteristics ([Y] vector).
5. By introducing technologies linked to (buildings) architecture, interior design and corresponding furniture in the vector of material technologies [T_M].

The first two enrichments emphasize user participation in the co-creation of value [Y], i.e. the co-production and co-creation dimensions of a library service by users.

As an 'architectural' service, the 'theoretical' contemporary library (of any type) can be defined and represented as simply the association of a number of constituent services (core service(s) plus peripheral services). These, in turn, can be described as the mobilization of external competences and technologies (those of users) and internal competences and technologies (those of librarians), relating to groups of operations for processing different material, informational, cognitive or individual media — which are transformed to generate use value for individuals and communities.

4. From analyzing the library 'product' to analyzing library innovation

The architectural representation of the library product we have proposed, based on contributions made by service economics and management, can be used to provide a theoretical (but systematic) account of innovation dynamics in libraries, regardless of the type of library in question, from an evolutionary and neo-Schumpeterian perspective that emphasizes innovation not only as an outcome, but also as a process (innovation trajectories).

In a way, it can be said that innovation is reflected in (more or less significant) change in one or more boxes of the analytical framework constituted by Table 1. To make these diverse changes more intelligible, we can classify them into three main 'innovation logics' (i.e. 'organizing principles'), the first two of which are ideal-types (pure logics), while the last is in reality the commonest operating logic:

1. a horizontal logic (operating in two modes: extensive and regressive)
2. a vertical (or intensive) logic operating in four modes (material, informational, cognitive and contactual/relational)
3. a diagonal (or combinatory) logic, which links the different modalities of the preceding logics in various configurations

4.1. A horizontal innovation logic

The horizontal innovation logic reflects an innovation dynamic that affects the lines of the analytical framework illustrated in Table 1. It can take either an *extensive* form, which consists of adding peripheral constituent services (S_i) to the library's core service (in other words, adding lines to the table) or a *regressive* form, which consists, conversely, of deleting constituent services (i.e. deleting lines from the table). The regressive form, which is common in other architectural services (and whose canonical form is 'low-cost'), seems to be less so in library services. Nevertheless, some highly specialized libraries (e.g., those specializing in particular collections) are, in a way, the fruit of implementation of this logic, and the strategies for outsourcing certain activities (Goulding, 2006) implemented by libraries as part of the New Public Management paradigm are also part of this logic.

The extensive modality of this horizontal logic is much more frequent. It can be envisaged at organizational level (the reference library), intra-organizational level (a department, a component of this library) and inter-organizational level (a network of various organizations collaborating with the reference library). In the latter case, the extensive logic blurs together with the network logic. Indeed, it consists of 'adding' organizations to the reference library (which can themselves be seen as packages of constituent services). 'Adding' here means establishing a partnership of any form, including the merger of organizations.

A survey of the literature (Windrum et al., 2023; Gilbert, 2010; Nicholson, 2017; Calenge, 2015, etc.) makes it possible to identify six generic categories of services into which the new services (introduced according to an extensive innovation logic) can be grouped. These categories, which are considered here regardless of library type (academic or municipal) are as follows: 1. Reading, education and lifelong learning services; 2. Community and government services; 3. Social services (for vulnerable people); 4. Health, wellbeing, leisure and cultural services; 5. Creativity services; and 6. Research, business and employment services.

These six generic categories are illustrated (cf. Table 2) by examples drawn from two sources: first, a survey of the scientific and professional literature which entailed the collection of examples of new services, and second, our own empirical work (interviews conducted at some 20 libraries) as part of a European research project. These six generic categories of services and their illustrations can themselves be divided into different sub-groups, depending on the main medium of the service: ICT, books, various other objects, the individual, the physical space.

The 'Reading, education and lifelong learning' category corresponds to traditional library services focused on reading at different stages of life: reading services for very young children; services to support secondary education (science, technology, engineering, and mathematics (STEM) services); lifelong learning for adults. This category may consist of ICT-based (reading and learning) services (e.g. providing access to and support for numerous online self-training services (MOOCs) across multiple fields, coding clubs for young children to learn the rudiments of programming, lending various learning technical devices: e-readers, etc.). However, it may also consist of traditional library services,

Table 2
Examples of new services introduced as part of extensive horizontal innovation (source: literature survey and our own empirical work).

Category of services added (S_i)	Examples
1. Reading, education and lifelong learning	– Providing access to and support for numerous online self-training services (MOOCs) across multiple fields – Training in the use of social media – Technology petting zoos: a collection of technical tools (e.g. e-readers, laptops, tablets, digital audio-services) made available for users to try out and learn how they work – Personalized online librarian query services, 24/7 – Early learning (play-based) sessions for young children (e.g., 'coding clubs' to learn the rudiments of programming) – Reading boxes in the city – Home library services – Hospital libraries – Mobile libraries – Beach reading huts – Library in town shops – Library services at airports and public transport stations – Use of bicycles to bring books for loan or mobile Wi-Fi hotspots in particular locations or events (pop-up libraries/ ephemeral libraries) – Multimedia language laboratory – A bookshop in the library. Example: St Pancras Library – Book vending machines – Event space, e.g. for meetings with authors – Provision of library 'spaces' where users can temporarily deposit books
2. Community and government services	– Internet and e-government training – Community services: provision of general information for the community, covering a wide range of fields (road safety, various local events, etc.) – Legal services (beyond simply providing documentation) – New emergency service functions – Library housing relays for national or municipal public services (help with administrative procedures) – Services for ethnocultural minority groups in Canada
3. Societal services (childhood, aging, migrants, minorities, precariousness, unemployment, etc.)	– Talking book programs (for the blind, the elderly) initially based on cassettes and now on computer equipment – Services for seniors: training seniors to surf the web for reliable medical information. Seniorgamer: a games program for people with early-onset dementia (Drammen Library, Norway) – Homework help and school failure prevention – Services to combat illiteracy – Services linked to professional integration and employment: CV writing, job dating, career reorientation advice, interview preparation – Services for migrants and foreigners – Services for the homeless – Library integrating social center services – Collections and services for LGBT people – Setting up crèches
4. Health, wellbeing, leisure and cultural services	– Lending (in bygone era) of videocassettes, CDs, DVDs providing health information and advice – Training service to help find relevant health information on the web – Talking book programs, audio books (for the sick) previously with cassettes, now with computer equipment – Sports halls within libraries – Lending of sport equipment (balls, skiing equipment, etc.) – The library as a 'Third Place' in the original sense of the term – Cafeterias, restaurants within libraries – Seed libraries – Art galleries and exhibition spaces in libraries – Toy libraries – Yoga sessions in libraries
5. Creativity services	– Online Catalog 2.0, which allows users to add their inputs (comments, notes, tags) to a document – Game-coding workshops – Music recording studios and stages in libraries – The library as a 'Third Place' in the new sense of the term – Introduction of the 'human library' concept: users come and talk about themselves, their particular experience, a particular book (speed-reading inspired by speed-dating) – Users can share their collections (rare documents, family heirlooms, pictures), possibly through digitization – Author-related services (writing workshops, collective creation of a theater piece, etc.) – Encouragement of 'content creation' by users (in various forms: paper works, digital works, artistic works, etc.). These diverse productions are integrated into library collections – Collaborative proofreading of ocerized texts – Lending of various material objects: musical instruments, kitchen appliances, cameras, etc.
6. Research, business and employment services	– Services for university researchers: personalized bibliographic support, training in bibliographic management tools, support in obtaining research contracts – 'Borrow a librarian' service – Transmission of information skills to university library students (new pedagogical service) – Library support for user training leading to recognized qualifications – Collections and services (especially information) to the local economic community

sometimes provided in unusual places beyond the library walls (e.g. home library services, hospital libraries, mobile libraries, beach reading huts, libraries in shops, library services in airports and public transport stations, etc.), and the establishment of new spaces in libraries (multimedia language laboratory, a bookshop in the library such as St Pancras Library, event spaces, e.g. for meetings with authors, the provision of library 'spaces' where users can temporarily deposit books).

The 'Community and government services' category consists of general government information services for citizens (general and practical information relating to community life covering a wide range of fields: road safety, various local events, etc.) (Lamy, 1992). In some countries such as Canada, it also covers services for ethnocultural minority groups, not necessarily in a social sense (that is, aimed at dealing with wicked social problems — see next category), but with a view to heritage preservation. More generally, it covers access to government

services, particularly tax administration (e-government).

The third category is that of 'Societal services'. This is a set of services provided by libraries in response to (sometimes interrelated) major social problems ('wicked problems'), involving school drop-out, aging, migration and minorities, long-term unemployment, illness, etc. These new societal services are often synonymous with social innovations, i.e. innovations that are social in both their end (solving a social problem) and their means (empowering users, multi-agent collaboration). Indeed, they are often developed within collaborative networks, which can be referred to as 'public service innovation networks for social innovation-PSINSIs' (Desmarchelier et al., 2020, 2021). These new services can also be based on ICTs (coding clubs for young children in deprived areas; talking book programs (for blind and elderly people), which used to be audio cassette based but now use computer equipment; training seniors to surf the web for reliable medical information, games programs for people with early-onset dementia, etc.). They may be part of new physical spaces established in libraries (setting up creches) or correspond to the offering of new, clearly-differentiated collections (e.g. collections and services for LGBT people, etc.).

First and foremost, the 'Health and well-being services, leisure and culture' category covers information, advice and training services focused on health and well-being (prevention of various types of illness, yoga classes, dietetics classes, etc.). It also covers facilities for sporting activities (sports halls within libraries), relaxation, meeting and socializing (cafeterias, restaurants within libraries). It should be noted that while libraries can incorporate this traditional type of "third place" (cafeterias, restaurants within libraries), they can also set up relaxation and socialization facilities independently of these old modes. This generic category also includes leisure and cultural services (other than those centered on books): seed libraries, art galleries and exhibition spaces in libraries, toy libraries, lending board games, etc.

The 'creative services' category covers the provision of activities, materials and spaces to facilitate people's creativity. This is another category that can be divided into several sub-groups. The first sub-group is made up of creative services based on ICTs (online Catalog 2.0, which allows users to add their inputs – comments, notes, tags – to a document, game-coding workshops, collaborative proofreading of ocerized texts) or other technologies (music recording studios and stages in libraries, lending of various material objects – musical instruments, kitchen appliances, cameras, etc. – in the general context of what is known as the 'library of things'). The second sub-group is that of activities in which users themselves are either the actual service or the service providers, and content producers. In the case of 'human libraries' (Calenge, 2015), for example, users come to talk about themselves and their particular experiences. This category also includes examples in which users transform themselves, as it were, into librarians, depositing works for loan in dedicated spaces, or making their own collections of rare documents, family heirlooms or photos available to libraries (particularly in digitized form). It also includes author-related services (writing workshops, collective creation of a theatrical production, etc.). The third subgroup concerns the provision of spaces for creative collaboration: third places. But beyond the simple quest for socialization and conviviality mentioned above, 'Third Places' offered by libraries now cover numerous structural arrangements (informal in their operation), and physical spaces dedicated to learning in its various forms (learning by doing, using, trying, etc.) and to collaboration between users around a common project. These include Coworking spaces, but above all Fab Labs or Makerspaces, Living Labs and so on.

Lastly, the 'Research, business and employment services' category concerns information, consulting, training and engineering services linked to scientific or economic activities. It includes support services for researchers, in university libraries (personalized bibliographic support, training in bibliographic management tools, support in obtaining research contracts), but also support services for local economic communities and business creation (for example, training users to obtain recognized professional qualifications, fee-based documentary research on a given subject, technology watch services, space rental, etc.).

This typology of service categories or functions offered by libraries calls for a number of comments.

It should be noted that the 'digital services' category, which is found in many typologies of library services (see in particular Windrum et al., 2023), is absent from the typology used in this paper. Indeed, it is considered a transversal category, reflecting a natural trajectory of innovation that concerns all six of the service categories/functions considered.

The six service categories identified are not always completely independent of each other. For example, while a game-coding workshop offered by a public library does belong to the 'creative services' category, it is also a way of engaging users (particularly younger ones) in learning about science, technology, engineering and mathematics (STEM) (Bolstad, 2016). From this point of view, it also belongs in the 'Reading, education and lifelong learning' category. Similarly, some services providing access to the administration may fall into service categories 2 and 6 — depending on whether the citizen simply needs information on tax processing, or whether they need to deal with the tax authorities when setting up a business.

4.2. A vertical or intensive innovation logic

Particularly strong in library services, the vertical or intensive innovation logic focuses on modifying the way in which a given S_i service (or combination of services) is produced. This innovation logic therefore concerns what Eiglier and Langeard (1987) call 'servuction'. It operates through action(s) on the columns of Table 1, representing our analytical framework. It consists of modifying, in various ways (addition, deletion, improvement, etc.), the competences and technologies relating to the material, informational, cognitive or relational processing functions (T_M, T_I, T_K, T_R) of the service – in other words, in deploying or strengthening material, informational, cognitive/methodological or relational innovation trajectories (Table 3).

4.2.1. The material innovation trajectory

The material innovation trajectory manifests itself in the M component of the service provided by libraries (and their partners, when a network approach is adopted), where the main medium for the transformation process is a material object (in this case, the book[4]), whose logistics and material transformation (curation, lending) must be ensured by implementing the corresponding technological innovations. This material trajectory, which is one of increasing mechanization and economies of scale, illustrates what Nelson and Winter (1982) call a 'natural technological trajectory', i.e. one that is a 'categorical imperative' imposed on all economic sectors. In the case of the core book lending service, examples of technological innovations that fall under the M component include handling technologies, carts and shelving, and, in the case of the makerspace service, sewing machines, 3D printers, laser cutters and milling machines. It should be noted that these essentially material processing technologies increasingly also have an information processing dimension, insofar as they also have a digital component (cf. paragraph 4.3). This material trajectory also includes all changes concerning the library as a physical space. For example, the disappearance of 'reception desks', the reorganization of spaces and the use of adapted furniture are all part of this material innovation trajectory.

4.2.2. The informational innovation trajectory

The informational innovation trajectory affects the informational component I of the library product. Two different innovation dynamics

[4] Material media differ, of course, depending on the peripheral service in question. For example, food and beverages in a cafeteria, seeds in a seed library, material objects on loan in a "Library of Things"….

Table 3
The different types of innovation trajectories at work in the vertical or intensive innovation logic.

Type of innovation trajectory	Examples of innovation[a]
Material innovation trajectory	– Relocation of a public library to a new building – Redesign of library interior – Provision of sewing machines, 3D printers, laser cutters, milling machines in makerspaces – Implementation of handling, storage and logistics systems – Implementation of automated loan and return systems (kiosks) for books – Implementation of automated loan and return systems for laptops
Information and telecommunications innovation trajectory	– Biometric access cards – Online user accounts to reserve books or extend books lending – Online public access catalog – Specialized software (multimedia creation, programming) in makerspaces – RFID (Radio Frequency IDentification) technology used in smart shelves
Cognitive/methodological/ organizational engineering innovation trajectory	– Dewey Decimal Classification – Invention of new collection classification systems – Implementation of a quality management system in a university library – Automatic indexing
Relational or service innovation trajectory	– Consulting services – Training services – Customized services – Open shelves – Home visits – Library services for disabled people – 'Rent a librarian'

[a] It should be noted that some examples used to illustrate one trajectory may also illustrate others, insofar as they involve hybrid technologies.

can be distinguished. The first is not specific to library services; it brings together innovations in information and communication systems that are aimed at reducing the cost of communication and information processing, and at networking and producing both new information, and new uses for information. The information in question here is administrative, accounting, financial, statistical and library management information (including catalog management). The second dynamic is specific to library activities; it is akin to a 'specific natural trajectory' in the sense of evolutionary theory. The innovations at work in this second case are induced by the introduction of new or improved digital technologies into the services that make up the library (digitized collections and traditional IT-based services first and foremost, but also all other services). Given the growing importance of digital collections using quality metadata, recent initiatives based on Artificial Intelligence are also part of this informational trajectory (Brygfjeld, 2019).

The trajectory of informational innovation in libraries seems to confirm Barras' (1986, 1990) reverse cycle model. Indeed, the introduction of information technologies (mainframe computing, then mini- and micro-computing, and finally networks) have respectively induced, in this order: incremental process innovations (for example, innovations in administrative and library functions: administrative management, archiving, cataloging); radical process innovations (e.g., automatic loan and return systems for books and other physical artifacts), and product innovations (online catalogs and numerous remote electronic services, all of which are part of what we call the horizontal/extensive logic). This cycle is the opposite of the one observed in manufacturing industry. In the traditional industrial cycle, the dominant product innovation phase precedes the dominant process innovation phase (Abernathy and Utterback, 1978).

4.2.3. *The cognitive, methodological or organizational innovation trajectory*

This innovation trajectory emerges in the cognitive and structural component (K) of library service provision and library organization. It describes the adaptation of organizations both through the design and implementation of formalized methods i.e. knowledge-processing protocols, and through organizational engineering. According to Pungitore (1995), the Public Library Association introduced a major managerial innovation in 1980 (based on two books: 'A Planning Process for Public Libraries' (Palmour et al., 1980) and 'Output Measures for Public Libraries' (Zweizig and Rodger, 1982)), which spread to all American libraries. Such managerial innovation is part of the trajectory of cognitive innovation (K). It consists of a set of techniques "developed and promoted by their national professional association, that allows public librarians to engage in user-oriented planning, community-specific role setting, and the self-evaluation of their library's performance" (Pungitore, 1995, p. xi).

4.2.4. *The relational or service innovation trajectory*

The relational or service innovation trajectory manifests itself in the R 'relational' or 'in-contact service' component of a library service. Here, the main medium of activity is the user, with whom the service provider establishes a more or less significant interaction. This trajectory describes the changes in the direct service and the ways in which the user and service provider interact, as well as the introduction of new in-contact services and new ways of interacting. It also describes strategies for linking users together in networks, i.e. strategies for community building (Desmarchelier and Gallouj, 2023). This trajectory is sometimes difficult to dissociate from other innovation trajectories (material, informational, methodological) insofar as downstream changes in in-contact service operations or the implementation of new relationship modes can certainly rely exclusively on competences (C) — but also, more often than not, they mobilize upstream technologies for processing matter, information or knowledge, and a new structural arrangement (cf. Fig. 2). Examples include the provision of a wide range of consulting and training services, or the introduction of open shelves as an expression of self-service. It should be noted that this relational or service-based trajectory (considered here as a modality of vertical logic) can (because it involves the addition of new constituent services to existing ones) in some cases be confused with an expression of extensive horizontal logic.

4.3. *Diagonal (combinatory) innovation logic*

The horizontal (extensive) and vertical (intensive) logics discussed above are ideal-types ('pure logics'), and are particularly useful for mapping the full diversity of innovation dynamics in libraries. However, it is not always easy to distinguish between horizontal innovation logics (focused on the product) and vertical innovation logics (focused on the process for a given product). The assignment of certain innovations to one category or another (Tables 2 and 3) is sometimes subjective. This difficulty can be explained by the specific nature of service activities in general (beyond libraries) — in which, precisely because "in many cases, the 'product' (…) is in fact a process" (Gallouj, 2002, p. 40), it is not easy to distinguish product from process. The concept of "vague innovation" (Rubin et al., 2011) used in the library literature reflects both this blurred dimension of 'product' and the problem of the boundary between product and process. More generally, innovation rarely takes place within pure logics, but rather within hybrid, combinatory or diagonal logics, which mobilize both horizontal and vertical logics. These last are able to link several innovation trajectories at once, in different ways.

In a diagonal/combinatory logic, then, depending on the scale of the innovation in question, innovation affects several rows and columns of

our analytical framework (Table 1) at once, rather than a single row or column at a time. It consists of simultaneously adding (or even deleting) one or more constituent services to the core service of lending books (*rows* of the table/horizontal extensive or regressive logic) and acting (again, through the mechanisms of addition, deletion, association, dissociation, and/or improvement) on the competences and technologies relating to one or more functions of these services (*columns* of the table/vertical or intensive logic) (see Fig. 4). Like 'pure' logics, this diagonal/combinatory logic can be considered at organizational, intra-organizational and inter-organizational levels.

At the organizational level, the manifestation of the diagonal logic can be illustrated by the implementation of totally new and innovative organizations (libraries). The UK's 'Idea Stores' offer one example of this. This library concept (which goes as far as renouncing the name of 'library') is inspired by the retailing model, particularly in terms of the diversity of services offered (horizontal logic) and technologies mobilized (vertical logic), and geographical location and opening hours (Pateman and Williment, 2017). Another example is that of 'Learning Centers', which are increasingly replacing traditional university libraries, multiplying the number of new services offered (horizontal/extensive logic) and becoming part of different trajectories of innovation (vertical/intensive logic), particularly the informational trajectory.

The introduction of new services (horizontal logic) to a given library is often accompanied by innovations in one or more of the technologies falling within the scope of one or more of the four identified innovation trajectories (vertical logic). For example, the introduction of a makerspace to a library is an expression of a horizontal/extensive innovation logic, since a new constituent peripheral service is offered to users. This is a new service belonging to the 'services linked to 'new spaces' in libraries' category illustrated in Table 2. However, by offering material processing tools – such as sewing machines, 3D printers, or information processing tools such as creative software packages – the introduction of a makerspace is also part of both material and informational technological trajectories, respectively (vertical logic). We might add that, by proposing new modes of relationship between both users and librarians and between users themselves, this service also falls within the scope of a relational innovation trajectory. Similarly, the introduction of 'book vending machines' in hospitals (Khan, 2013) falls within the scope of both a horizontal logic (the addition of a peripheral service) and several modalities of the vertical logic: a material (processing of a material object: a book), informational (use of RFID technologies) and a relational (new form of relationship-building: self-service) innovation trajectory. Further, in this particular example these different logics manifest themselves at an inter-organizational level insofar as they involve a partnership between library and hospital. Lastly, innovations around the provision of personalized 24/7 online librarian inquiry services, such as 'Le Guichet du Savoir' in Lyon, 'Ask a Librarian', or Ubib (Gilbert and Jacquinet, 2011) fall within the scope of both a horizontal/extensive (a new service) logic and a vertical/intensive (relational and informational) logic.

The diagonal/combinatory logic is also often expressed at the level of the different modalities of the vertical (intensive) innovation logic. At this vertical level, combination can take place in two different ways. The first is the simple juxtaposition, within a library or library department, of several innovation trajectories (columns in the table), which remain essentially independent of one another. The combination (via juxtaposition) of (independent) technologies relating to the processing of material operations (T_M) and the processing of informational operations (T_I) reflects the notion of the 'hybrid library' that is developed in the literature (Rusbridge, 1998; Oppenheim and Smithson, 1999). The second modality of combination is the hybridization (in the literal sense) of trajectories and corresponding technologies, which are combined in a single artifact (merging of table columns). For example, automated storage and retrieval systems can be said to reflect both a material and an informational innovation trajectory, since they integrate, within a single artifact, a traditional storage technology component (T_M) and an informational technology component (T_I), such as RFID. The same is true of the 3D printers used in the makerspaces of certain libraries, or the automatic loan and return systems that are part of both a material (mechanical/automatic) and informational/communicational (RFID technology) innovation trajectory. The provision of social media training by libraries is part of both an informational and relational innovation trajectory, while the implementation of automatic collection indexing processes (such as the Finnish National Library's Annif Project, see Suominen, 2019) or of national metacatalogs (such as Swissbib, see Hipler and Witzig, 2019) reflect a hybridization of methodological and informational trajectories.

The combination of innovation trajectories, whether by simple juxtaposition or by hybridization per se, presupposes a combination/hybridization of libraries' competences (C). Thus, the existence of the

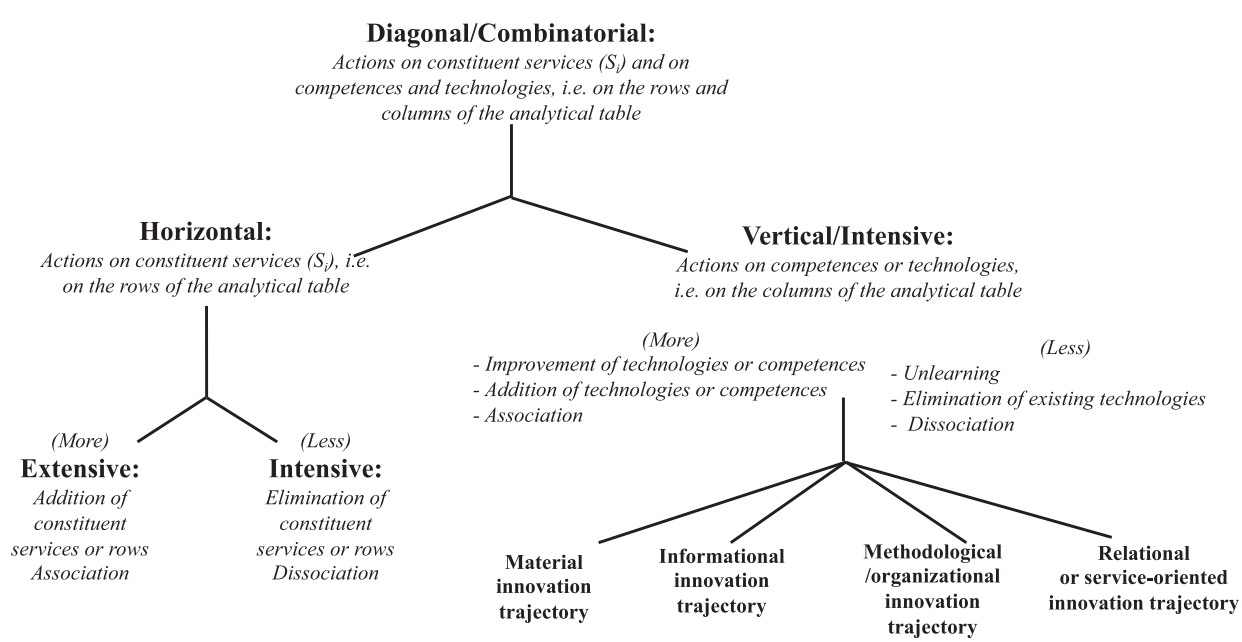

Fig. 4. The combinatory/diagonal principle (logic) as the implementation (in multiple configurations) of 'pure' principles (logics).

'hybrid library' presupposes the existence of 'hybrid librarians' bringing traditional librarianship competences (focused on printed documents) together with technological and informational competences (computing and telecommunications) (Allen, 2005). Of course, this hybridization of competences also goes beyond technical competences; it also concerns service competences (relational and human-centered).

At the inter-organizational level, partnerships, by their very nature, fall within the scope of a diagonal/combinatory logic. They combine the services of different agents (horizontal/extensive logic) while mobilizing different competences and technologies (vertical/intensive logic). One such example are the 'Discovery Centres' in the county of Hampshire, UK, which assemble under one roof a whole range of 'cultural facilities – public libraries, museum, heritage center, art gallery, performance space, community café' (Pateman and Williment, 2017).

5. Conclusion

This article was prompted by two observations: first, the absence of libraries from the growing literature on innovation in services, and second, the undeniable presence of the innovation issue in the field of library science that is more often than not reduced to a mere patchwork of heterogeneous cases.

In response to these observations, we have attempted to construct a systematic framework for analyzing innovation in library services that is based on solid theoretical foundations and thus avoids the overly descriptive and factual nature of existing librarianship work. The proposed framework draws on advances in service economics and management – in particular, the definition of service-based on the service triangle metaphor and the functional breakdown of service activity into different groups of operations (material, informational, methodological and relational), the characteristics-based approach to services and a conception of library service as an architectural service. This approach brings together two fields that have until now largely ignored each other: service studies and library science. The dialogue established in this article between service economics and library science has made it possible to build a theoretically-supported analytical framework for innovation dynamics in libraries.

The proposed analytical framework is more than a simple exercise in applying an existing 'service' framework to libraries. On the contrary, this new framework introduces to the analysis several new variables that are of great importance to understanding the dynamics of innovation and evaluating their performance (beyond libraries alone): 1. User competences and technologies mobilized in service provision, 2. The characteristics of the services considered at different levels (individual vs. collective, direct vs. indirect (outcome), desired vs. unintended (externalities)), 3. The dual nature of skills and techniques in libraries ('input' competences and techniques used to provide the service vs. 'output' competences and techniques corresponding to the service provided itself). The addition of these new variables to the initial framework make it possible not only to account for certain specific features of the library service, but also to provide a more general framework that is applicable to all service activities.

Service economics and management allow for three different conceptions of the library, depending on the main medium/target of the service: the library as collection, the library as information system and the now dominant conception of the library as complex service. In the context of this last conception, the analytical tools of service economics and management have been used to highlight several innovation 'logics' (or organizing principles) which, unlike the often heterogeneous case inventories drawn up by library science, allow a systematic mapping of the innovation dynamics at work in libraries.

The first two innovation logics are 'pure' (or 'ideal-type') logics, for which it is not always easy to find (purified) examples. The first of these is the horizontal innovation logic, which is based on the principle of adding/removing constituent services to the core service of lending books. This horizontal logic is said to be extensive when (as is most often the case) it is based on the mechanism of adding peripheral services. Conversely, it is said to be regressive when based on a mechanism for eliminating peripheral services. The second is the vertical or intensive innovation logic, which operates on the various components (material, informational, methodological or organizational engineering, relational or service-related) of the service activity and feeds the corresponding innovation trajectories. The third innovation logic (diagonal or combinatory logic) is the most frequent operating modality. It consists of the implementation (in different ways and in various combinations) of various pure logics – for example, the introduction of one or more peripheral service alongside the introduction of different types of business process innovations, which are themselves part of different innovation trajectories, simply juxtaposed or hybridized, in the same technical artifacts.

The proposed theoretical framework, which we have discussed from the point of view of the library (organizational level), can easily be extended to the inter-organizational level, where the service or innovation is carried out in partnership with other agents (as is often the case in social innovation, for example). In order to adapt the analytical framework proposed and illustrated in Table 1, we simply need to add as many additional organizations (Oi) as necessary to the reference library representation (O1), i.e. as many rows in the table as there are partners. Libraries have a wide range of partners in innovation projects. Examples include other libraries, training and research establishments, municipalities, industrial or service companies, associations, central public administrations, etc. (Picard, 2017; Dauphin, 2011; Bolstad, 2016; Yarrow et al., 2008; Walker and Manjarrez, 2003; Bats, 2015).

Our theoretical framework raises a number of scientific, managerial, societal and public policy issues. By way of conclusion, we briefly mention a few of these:

1. The public library has been used as a public policy tool to promote the education and emancipation of citizens as well as cultural equality, social progress and democracy. Not surprisingly, this is an organization that is conducive to social innovation. This form of innovation can form part of any of the innovation logics we have highlighted (and not just one of them). Thus, even if 'Societal services' is its preferred domain, social innovation can, in the horizontal/extensive innovation logic, operate within all six categories of generic services identified. Similarly, in the vertical/intensive innovation logic, all innovation trajectories are concerned by social innovation. While this seems self-evident for the relational and service innovation trajectory (new services designed to care for vulnerable people), it is also true for the informational innovation trajectory (indeed, many electronic services are designed to solve wicked problems affecting vulnerable people).
2. The horizontal (extensive) innovation logic benefits from a positive a priori based on the assumption that adding new services is, by nature, always beneficial. However, such an assumption can be challenged by asking whether there may be a limit to the addition of new services (an optimum). In addition to the growing difficulty of coordinating diverse activities, isn't there also a risk of losing legitimacy by moving too far away from the core service and expertise? Might too many missions kill the mission?
3. In particular, the previous question concerns the addition of administrative and social services to the core library service. We may well ask not only to what extent it is the library's vocation to replace certain administrative and social services, but also whether these new library missions (for which the librarian is not necessarily well trained) might illustrate a failure of administration and public policy, rather than an improvement in public services thanks to libraries.
4. When it manifests itself in the multiplication of stakeholders (the constitution and reinforcement of networks), this extensive logic poses the question of optimal network size. It also raises the usual questions about the dynamics of innovation networks: their mode of formation (spontaneous or planned), their mode of operation

(horizontal or vertical), and the evaluation of their success and performance.

5. With regard to library performance (whether from the point of view of librarians or public authorities), our analytical framework provides the basis for a multi-criteria evaluation. Indeed, the proposed framework considers different dimensions of output (direct or indirect, individual or collective, desired and unintended), which correspond to different dimensions of performance. One challenge for both librarians and public authorities is the construction of performance indicators associated with these different dimensions.
6. The framework seems compatible with the typology of innovation established by the latest version of the Oslo Manual (OECD/Eurostat, 2018), which distinguishes between two types of innovation: product innovation and business process innovation (BPI). Product innovations concern both goods and services, while BPI covers all innovations concerning the 'product' production process. A parallel can be drawn between 'product' innovations and the horizontal innovation logic (addition of new services), on the one hand, and BPIs and the vertical/intensive innovation logic, on the other. In the Oslo Manual, BPIs are broken down according to the six major management functions as they appear in the discipline's textbooks, and are taught in Business Schools (1. Production of goods and services, 2. Distribution and logistics, 3. Marketing and sales, 4. Information and communication systems, 5. Administration and management (including strategic management, HRM, accounting, etc., 6. Product and business process development). To some extent, these functions can also be paralleled with the different categories of the functional breakdown of the product (material, informational, methodological, relational operations) and the corresponding technologies. Thus, again to a certain extent, material operations can be associated with the 'production of goods and services' and 'distribution and logistics' functions, informational operations with the 'information and communication systems' functions, cognitive, methodological and organizational engineering operations with the 'administration and management' functions (including strategic management, HRM, accounting, etc.), relational and contact service operations with the 'marketing and sales' functions, and so on. Given this compatibility between our analytical framework and the definitions of the Oslo Manual, it is both possible and desirable for libraries to be included in the Community Innovation Survey based on the Oslo Manual.

Our analysis does, however, have a number of limitations and raise a number of questions, some of which we mention briefly here as potential avenues for further work.

For the sake of simplicity, we have taken a 'standard undifferentiated library' as the reference point for our analysis, without considering its type (national, public, academic, etc.). Clearly, the framework for representing the product, and mapping innovation dynamics, would benefit from being applied separately to each type of existing library in order to highlight similarities and differences in their innovation dynamics. It is therefore possible to hypothesize (subject to empirical verification) that the informational trajectory in academic and national libraries is broader and more powerful than in municipal libraries, or that books (in whatever format) and their curation will always remain a core service in national libraries, while both municipal and university libraries will increasingly welcome users for activities that are totally independent of books (library as a 'third place', 'libraries of things', or 'human libraries' in which individuals present their own experiences, etc.).

The framework we propose is essentially focused on mapping innovation in libraries. This mapping cannot in itself be up to the task of explaining innovation dynamics as a whole (their drivers, their obstacles). To achieve such an objective, future research will have to explicitly introduce to the framework the economic, social, scientific and political environments that are major determinants of innovation in libraries.

CRediT authorship contribution statement

Benoît Desmarchelier: Writing – review & editing, Writing – original draft. **Faridah Djellal:** Writing – review & editing, Writing – original draft. **Faïz Gallouj:** Writing – review & editing, Writing – original draft.

Declaration of competing interest

No conflict of interest.

Data availability

No data was used for the research described in the article.

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