Emerging roles in Library & Information Science: consolidation in the scientific literature and appropriation by professionals of the discipline

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Abstract

In recent years, profound transformations have taken place in the treatment, access and use of information, leading to the emergence of several concepts that reflect specific functions performed by Library and Information Science (LIS) professionals. The objective of this study is to identify the terminology related to emerging roles in the area of information science, quantifying the extent to which this terminology appears in the scientific literature and the extent to which it is associated with LIS. The roles most closely associated with LIS come under the categories of "librarianship" and "treatment and provision of document services", revealing their enduring status as the core areas of the discipline. However, we identified several other roles related to content organization and management, the web, and knowledge management, which constitute other potential career opportunities for LIS professionals, although in today's competitive job market a number of disciplines are vying to claim these roles as their own. Teaching, research support and advisory roles related to the ethical and legal issues in information science constitute other important emerging career prospects.

Keywords

Information professionals; Information Science; Emerging roles; Librarians' roles; Changing information landscape; Competitive environment.

Introduction

The knowledge and skills required of Library and Information Science (LIS) professionals have undergone significant changes in recent years. Such changes are inevitable in the dynamic environment these professionals work in, the defining characteristics of which are, inter alia: continual transformation due to technological development, the importance of globalization and the knowledge economy, increasing specialization and changes in the mode of access to information. All these factors drive the need for LIS professionals to constantly update their skills and knowledge in order to take on new functions or services, or rather they have led to the emergence of new roles and specialized professional profiles (Ghosh 2009; Goetsch 2008; Hedman 2005).

Different papers have analyzed emerging roles performed by LIS professionals. In some of these studies, roles were identified through content analysis of job advertisements, for example, Cooper and Crum (2013) characterized the roles of librarians specializing in medical health sciences librarianship based on their analysis of job advertisements featured in the Medical Library Association email discussion list archives from 2008–2012. In other cases, roles are delineated through case studies, surveys or interviews with professionals, for instance, Petersohn (2014) interviewed 28 experts to determine if bibliometric services in research libraries can be considered an emerging role. Other papers are theoretical reflections based on personal experiences. Melchionda's (2007) work falls under this category, analyzing the attitudes of library professionals regarding their evolving roles in the age of the Internet and its effect on their working life. Moreover, we also identified some literature reviews that undertake a qualitative analysis of scientific literature related to professional roles in different areas of LIS (Cooper and Crum 2013; Cox and Corral 2013; Vassilakaki and Moniarou-Papaconstantinou 2015; Vassilakaki and Moniarou-Papaconstantinou 2017). However, none of the studies we found analyze the extent to which these roles are associated with LIS specifically. The aim of this study is threefold: firstly, to identify the terminology related to potential emerging roles performed by LIS professionals; secondly, to quantify the extent to which these roles appear in the scientific literature; and thirdly, to quantify the extent to which they are specifically associated with LIS as opposed to other fields.

Materials and methods

In methodological terms, the study process consisted of:

a) Compiling nomenclature related to emerging roles for information professionals.

An emerging role is a neologism introduced to personalize or make specific reference to a specialized function or set of functions performed by a group of professionals. With regard to delineating the concept of "emerging", Small et al. (2014) performed a literature review, reporting that despite the widespread use of the concept across a variety of contexts (for example to refer to a topic or a technology), the definition of "emerging" in the literature is quite vague, relating simply to novelty (newness) or growth. To identify the emerging roles related to LIS that appear in scientific and professional journals of the discipline and of other areas of knowledge, we performed literature searches using the concepts "role*" and "information professional*" y "role*" and "archivist*" in the Library and Information Science Abstracts (LISA) database, which is specific to the area of LIS, and in the multidisciplinary databases Scopus and Web of Science (WoS). The distinguishing feature of Scopus is its inclusion of more journals than the WoS databases. As of October 2017, Scopus had indexed the contents of 254 journals in the area of Library and Information Science, compared to the 85 LIS journals in WoS in the same year. Abrizah et al. (2013) performed a comparative analysis between these two databases in terms of the coverage, impact, and subject categorization in the area of LIS, finding that the journals included in Scopus but not in WoS tended to be more focused, usually with a primarily nationally based readership and serving a domestic or otherwise specific research community. The paper also reported a close correlation between the high-impact journals featured in each respective database. We extracted the terminology by examining the titles, abstracts and key words of the retrieved documents, paying particular attention to published literature reviews on the topic and the references cited in these reviews. In that sense, key references analyzing the presence of professional roles in LIS include the review by Cox and Corral (2013), in which the authors describe the historic origin and evolution of the roles developed in nine academic librarianship specialties: systems librarians; electronic resources librarians; digital librarians; repository managers; clinical librarians and informationists; digital curators/research data managers; teaching librarians/information literacy educators; information and knowledge managers; and Web managers and web teams. The endurance of many of these traditional roles and the capacity for adaptation of the profession—with new roles related to teaching, open access, and data management—are notable. For their part, Vassilakaki and Moniarou-Papaconstantinou (2015) undertook a literature review on roles linked with librarians and

information professionals, analyzing papers published in 2000–2014 and identifying six roles adopted by librarians, mostly relating to academic libraries: teachers, technology specialists, embedded librarians, information consultants, knowledge managers and subject librarians. Cooper and Crum (2013) focused on specialized roles associated with health and medical libraries; in addition to analyzing job announcements, they reviewed the roles mentioned in the scientific literature and adopted by health sciences librarians from 1992 to 2012, describing the roles of embedded librarian, systematic review librarian, emerging technologies librarian, continuing medical education librarian, grants development librarian and data management LIS librarian. Vassilakaki and Moniarou-Papaconstantinou (2017) focused on archival sciences, performing a systematic review of the literature published from 2000 to 2015 that covered roles played by archivists; in addition to the traditional roles of "record-keeper" and "collection manager", they identified the new roles of "digital archivist", "archivist as educator", "archivist as researcher" and "dual archivist/librarian". Other literature reviews focus on a single role or analyze specific aspects, such as the papers describing the activities of embedded librarians (Abrizah et al. 2016), the skills needed to succeed in project management literature (Millhollan and Kaarst-Brown, 2016), or the role of librarians and information professionals in systematic review teams in the area of health sciences (Spencer and Eldredge 2018). When we could no longer identify new terms, we asked two LIS experts and two LIS researchers to check whether any relevant terms had been omitted.

b) Standardizing terminology and grouping it into thematic categories.

In order to systematize our analysis, we grouped together all the synonyms representing a single linguistic concept or meaning and assigned a subject category to each group of synonyms. For this process we consulted the taxonomy of the field of information science proposed by Hawkins et al. (2003), adapting it to the identified roles related to the professional side of the discipline.

c) Analyzing to what extent the identified emerging roles appear in the scientific literature and to what extent they are associated with LIS professionals.

To determine the extent to which the identified roles appear in the scientific literature, we quantified the number of articles and reviews from the LISA, Scopus and Web of Science databases that were published between 2000 and 2017 and included these terms. This involved performing literature searches of each concept in the title, abstract and keywords

fields, including all the synonyms for each concept and truncating where necessary to retrieve all grammatical variants. In order to distinguish between emerging and traditional roles, we considered the two features that characterize the concept of emerging roles (their novel nature plus a substantial growth in scientific production related to them) and analyzed the evolution in the number of documents published over the course of the study period. We also identified the main scientific journals mentioning these roles in order to define their disciplinary focus or other characteristics associated with the sources where the roles were most frequently mentioned. We used Scopus for this analysis, as it has a greater coverage of multidisciplinary journals than WoS and is more up-to-date than LISA with regard to recently published documents. The bibliographic searches in the three databases used for the performance of the study were undertaken in March 2017.

In addition, to analyze the extent to which these roles were performed by LIS professionals, we calculated the percentage of documents retrieved from Web of Science that were published in the category Information Science & Library Science (IS&LS). Scopus treats LIS as one integrated field, assigning many papers related to Information Science to the categories of Information Systems or Management Information Systems. In contrast, WoS merges two subfields (Library Science and Information Science) into a single category and also exercises more consistency in the subject indexing for journals on Library Science and Information Resources (Abrizah et al. 2013). These differences make WoS a more appropriate source for determining the link between the roles analyzed in the LIS discipline as a whole.

Results

Terminology related to emerging roles and extent to which they appear in the scientific and professional literature.

We identified 115 terms related to potential emerging roles for information professionals. The terminology standardization process reduced this number to 60. Table 1 shows the number of documents in the LISA, Scopus and Web of Science databases that include each term. The terms are grouped by subject categories.

Table 1. Inclusion of concepts related to emerging roles for LIS professionals in the documents found in the LISA, Scopus and Web of Science databases.

Category	Concept	LISA	Scopus	Web of Science	% docs in the category of IS&LS of WoS
1. Generic terms	Information professional	4605	1722	819	85.22
	Information specialist	533	480	342	31.87
2. Libraries	Librarian - librarianship - Library practitioner	40482	14941	6823	81.03
	Metadata librarian	32	25	7	100
	Cyber librarian - cybrarian	22	5	1	100
	Scholarly publishing consultant - scholarly communications librarian	4	10	3	100
	Bioinformationist librarian	8	5	5	100
	Emerging technologies librarian	17	4	1	100
	Outreach librarian	73	20	9	100
	Liaison librarian	162	120	64	96.87
	Subject librarian	277	129	61	96.72
	Academic librarian	3002	1109	614	96.09
	Digital librarian	83	57	21	95.24
	Librarian as teacher - teaching librarian - professor librarian - instruction librarian - librarian as educator	285	231	87	91.95
	Public librarian	469	220	119	90.76
	Hospital librarian	668	169	22	81.82
	Embedded/blended librarian	248	207	79	81.01
	School librarian - library/information school educator	2190	235	128	75.78
	Reference librarian	1659	632	213	68.54
	Consumer health librarian	22	20	10	50
	Medical librarian - Health science librarian	575	678	261	45.98
	Archivist – archiver - archive practitioner	2710	1473	624	36.38
	Archivist as educator - Teaching archivist	3	2	1	100

3. Archives and records administration	Dual archivist/librarian	6	3	3	100
	Digital archivist	10	9	6	66.67
	Archivist as researcher	17	10	4	50
	Collection manager	70	85	47	46.81
	Records manager	549	928	199	38.69
	Record keeper	28	64	48	31.25
4. Publication, communication and scientific evaluation	Bibliometrician – Scientometrician – Informetrician	51	53	59	89.83
	Information scientist	302	354	162	67.9
	Knowledge editor/worker	300	1696	1063	15.8
	Report writer	10	30	18	5.56
5. Communication and Marketing	Content curator	7	9	11	27.27
	Knowledge/information disseminator	7	33	17	17.65
	Community manager	21	122	73	15.07
	Disseminator	48	386	291	6.19
6. Regulatory aspects	Copyright advisor	9	4	2	100
7. Web, software and technology services	Information architect	392	654	371	39.89
	Interface designer - Web organizer/designer/developer/builder	121	410	263	20.53
	Technology expert/specialist	72	518	231	9.09
	Data extractor/synthesizer	3	40	32	6.25
	Usability engineer	23	1483	171	5.26
	Knowledge mapper/engineer	98	3837	922	5.21
	Database designer	9	54	39	2.56
8. Treatment and provision of document services	Cataloger	429	458	144	96.53
	Document supplier	26	22	19	89.47
	Expert searcher - search strategist	38	30	22	81.82
	Indexer	407	350	250	31.2
	Information/content provider	772	1808	1202	15.72

	System analyst	7	265	81	6.17
	Abstractor	11	480	430	2.56
9. Specialized information	Disaster information specialist	3	4	1	100
	Clinical/Health informationist	19	13	8	87.5
10. Knowledge management	Information/knowledge consultant	32	21	13	53.85
	Knowledge gatekeeper	5	19	12	33.33
	Knowledge manager	92	145	84	32.14
	Project manager/leader	273	4855	2716	4.82
	Networker - knowledge broker	37	573	486	3.91
	Information controller	1	10	8	0

* IS&LS: Information Science & Library Science; WoS: Web of Science.

Of the three databases, LISA contains the most documents related to library science specializations. Along with concepts related to types of centre ("school librarian", "academic librarian", "hospital librarian" and "public librarian"), several other roles appear in a large number of documents, including but not limited to "reference librarian" (n=1659), "librarian as teacher" (n=285), "subject librarian" (n=277), "embedded/blended librarian" (n=248), "liaison librarian" (n=162) and "digital librarian" (n=83). This LIS-specific database also contains the largest number of documents that fall under the category "treatment and provision of document services", such as "information/content provider" (n=772), "cataloger" (n=429), "indexer" (n=407), "expert searcher" (n=38) and "document supplier" (n=26). In the "regulatory aspects" category, we identified the role of "copyright advisor" (n=9) and in "specialized information" the most frequently retrieved term was "clinical/health informationist" (n=19). In relation with the category "archives and records administration", and in addition to "archivists" (n=2710), the roles of "records manager" (n=549), "collection manager" (n=70) and "record keeper" (n=28) are the most prominent.

The multidisciplinary databases contain more documents related to roles from all the other categories. In the Scopus database, for example, the most frequently retrieved roles of the category "scientific publication and evaluation" are "knowledge editor/worker" (n=1696), "information scientist" (n=354) and "bibliometrician - scientometrician -

informetrician" (n=53). In "communication and marketing" the most common roles are "disseminator" (n=386) and "community manager" (n=122), and in the category "web, software and technological services" the most common roles are "knowledge mapper/engineer" (n=3837), "usability engineer" (n=1483), "information architect/mechanic" (n=654), "technology expert/specialist" (n=518) and "interface designer - web organizer/designer/developer/builder" (n=410). Lastly, in the category "knowledge management" the roles retrieved most often are "project manager/leader" (n=4855), "networker - knowledge broker" (n=573) and "knowledge manager" (n=145).

With regard to the number of documents that make reference to generic roles (Figure 1), the appearance of both "Information professional" and "Information specialist" present an upward trend over the study period, especially in the most recent time period. We also observed much more growth in the sphere of libraries compared to archiving. Concerning the type of center, we found that "academic librarian" and "medical librarian" showed very pronounced growth compared to the relatively stable roles associated with other types of centers.
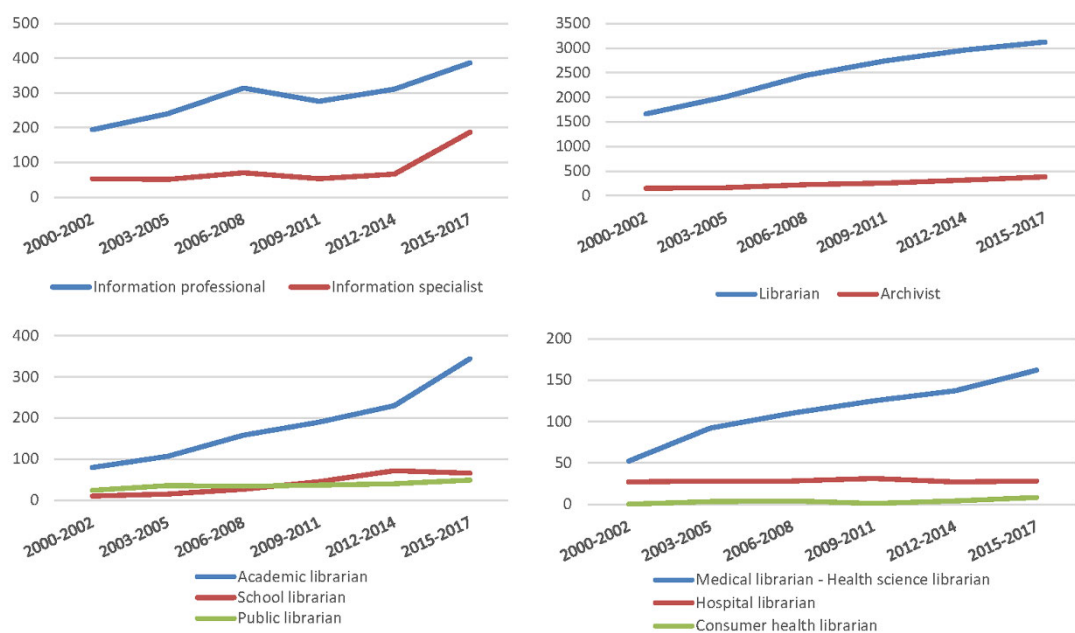

Fig. 1 Number of documents that make reference to generic roles in LIS (Scopus database, 2000-2017)

Among the more specific roles (Figure 2), "embedded/blended librarian" stood out as the most rapidly emerging role in the area of libraries: virtually all of the documents mentioning this role were published in the second half of the study period (reflecting the

novel nature of this position), and this term also presents the most marked growth. "Metadata librarian" is also characterized by these two key features, although on a quantitative level it has much less importance. Two other roles, "liaison librarian" and "subject librarian", were present throughout the period, but the frequency of their mentions showed an increasing trend. The rest of the roles identified in the area of libraries showed a more stable nature, and in the cases of "reference librarian" and "digital librarian", the time trends even reflect a slight downward turn. In the area of "Publication, communication and scientific evaluation", the roles showing growth were "knowledge editor/worker" and "bibliometrician – scientometrician – informetrician". The latter also has a markedly novel nature and can thus be considered—although very nascently—as an emerging role. In "Communication and marketing", the growth observed for "disseminator" and "community manager" also stand out. Again, this latter role is also characterized by its novelty (and thus its emergence), as most of the documents mentioning the term were published in the second half of the study period. Finally, the increased presence of the roles "information/content provider" (in the area of "Treatment and provision of document services") and of "project manager/leader" and "networker/knowledge broker" (in "Knowledge management") is notable, with "networker/knowledge broker" also reflecting a novel character.
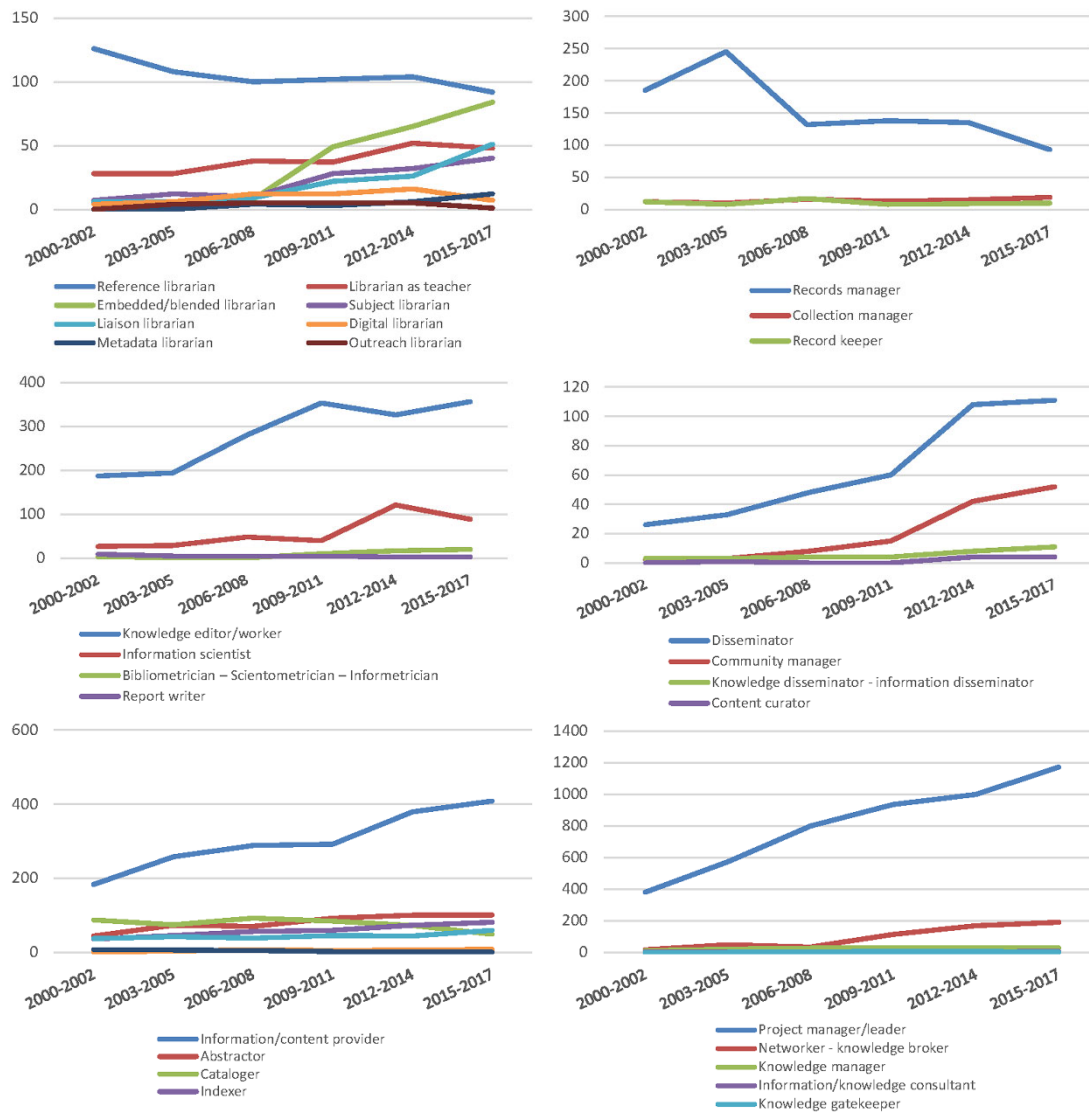
Fig. 2 Number of documents that make reference to specific roles in LIS (Scopus database, 2000-2017)

Association of the identified roles with the area of LIS

The concepts most closely linked to LIS describe library science specializations. With the exception of "consumer health librarian" and "medical librarian", between 68% and 100% of the documents that include these terms were published in IS&LS journals. This is also the case for many of the concepts related to the treatment and provision of document services. Of all the documents that include the role "cataloger", 96.5% were published in IS&LS journals. This proportion is 89.5% for the term "document supplier" and 81.8% for "expert searcher. In other categories, the concepts most closely associated with LIS are "bibliometrician-scientometrician-informetrician" (89.8%), "information

scientist" (67.9%), "information consultant" (53.8%), "information architect" (39.9%), "knowledge gatekeeper" (33.3%), "knowledge manager" (32.1%) and "content curator" (27.3%).

With regard to the journals mentioning the roles, these are often general LIS journals or journals specializing content by the type of center (academic librarian and hospital librarian) or around the most consolidated roles of the profession (e.g. reference librarian or cataloger). In contrast, emerging roles are associated with niche publications, focusing on topics that are tangential to LIS, such as distance learning or human behavior. Journals from areas such as Computer Science, Health Sciences, or Management are also present, in consonance with the links that these fields share with Information Science or with the overlapping roles played by their professionals (table 2).

Table 2. Journals publishing the most documents in relation to roles for LIS professionals (> 1 document in Scopus database)

Category	Concept	Journal 1	Journal 2	Journal 3
1. Generic terms	Information professional	Journal of Information Science (113)	Business Information Review (98)	Health Information and Libraries Journal (65)
	Information specialist	Cochrane Database of Systematic Reviews (114)	Systematic Reviews (14)	Health Information and Libraries Journal (12)
2. Libraries	Librarian - librarianship - Library practitioner	Reference Services Review (470)	Journal of Library Administration (368)	Reference Librarian (360)
	Metadata librarian	Cataloging and Classification Quarterly (4)	Journal of Library Metadata (4)	Library Hi Tech (4)
	Cyber librarian – cybrarian	Serials Review (2)	-	-
	Scholarly publishing consultant - scholarly communications librarian	Serials Review (5)	-	-
	Bioinformationist librarian	Journal of the Medical Library Association (4)	-	-
	Emerging technologies librarian	-	-	-
	Outreach librarian	Health Information and Libraries Journal (4)	Reference Services Review (3)	Journal of Library Administration (2)
	Liaison librarian	Medical Reference Services Quarterly (13)	Evidence Based Library and Information Practice (7)	Journal of Academic Librarianship (6)
	Subject librarian	Collection Management (10)	College and Undergraduate Libraries / Journal of Academic Librarianship / Journal of Librarianship and Information Science / Library Management (6)	
	Academic librarian	Journal of Academic Librarianship (113)	College and Research Libraries (66)	Portal (56)
	Digital librarian	OCLC Systems and Services (9)	Library Review (4)	D Lib Magazine / Journal of Academic Librarianship / Malaysian Journal of Library and Information Science / New Library World (3)
	Librarian as teacher - teaching librarian - professor librarian - instruction librarian - librarian as educator	Reference Services (46)	College and Undergraduate Libraries (18)	Communications in Information Literacy (14)
	Public librarian	Public Library Quarterly (27)	Library Trends (14)	Library Review (13)
	Hospital librarian	Journal of Hospital Librarianship (111)	Medical Reference Services Quarterly (23)	Journal of the Medical Library Association (11)
	Embedded/blended librarian	Journal of Library and Information Services in Distance Learning (29)	Public Services Quarterly (22)	Medical Reference Services Quarterly (13)
	School librarian - library/information school educator	School Library Research (35)	School Library Media Research (13)	Library and Information Science Research (11)
	Reference librarian	Reference Librarian (120)	Reference Services Review (59)	Reference and User Services Quarterly (26)

	Consumer health librarian	Journal of Consumer Health on the Internet (10)	Journal of Hospital Librarianship (3)	Journal of the Medical Library Association (2) / Public Library Quarterly (2)
	Medical librarian - Health science librarian	Journal of Hospital Librarianship (96)	Medical Reference Services Quarterly (89)	Journal of the Medical Library Association (86)
3. Archives and records administration	Archivist – archiver - archive practitioner	American Archivist (157)	Archivaria (126)	Archival Science (95)
	Archivist as educator - Teaching archivist	-	-	-
	Dual archivist/librarian	-	-	-
	Digital archivist	-	-	-
	Archivist as researcher	-	-	-
	Collection manager	Collection Management (11)	Library Collections Acquisition And Technical Services (4)	Collection Building / Journal Of Cultural Heritage (3)
	Records manager	Journal of the American Health Information Management Association (351)	Records Management Journal (50)	Health Information Management Journal (20)
	Record keeper	Libraries And The Cultural Record (9)	Archivaria (3)	-
4. Publication, communication and scientific evaluation	Bibliometrician – Scientometrician – Informetrician	Scientometrics (19)	Journal of Informetrics (6)	Journal of the American Society for Information Science and Technology (5)
	Information scientist	Journal of Computing Science And Engineering (112)	Journal Of The American Society For Information Science And Technology (19)	El Profesional de la Informacion (16)
	Knowledge editor/worker	Journal of Knowledge Management (67)	Vine: Journal of Information and Knowledge Management Systems (18)	International Journal Of Human Resource Management (18)
	Report writer	-	-	-
5. Communication and Marketing	Content curator	-	-	-
	Knowledge/information disseminator	-	-	-
	Community manager	Computers In Human Behavior (6)	Estudios sobre el Mensaje Periodistico (4)	El Profesional de la Informacion (4)
	Disseminator	Plos One (6)	Management Decision (3)	Collection Management / Decision Support Systens / Digital Journalism (2)
6. Regulatory aspects	Copyright advisor	-	-	-
7. Web, software and technology services	Information architect	Bulletin of the American Society for Information Science and Technology (17)	El Profesional de la Informacion (17)	Journal of the American Society for Information Science and Technology (12)
	Interface designer - Web organizer/designer/developer/builder	Interacting with Computers (11)	International Journal of Human Computer Studies (9)	Lecture Notes In Computer Science (9)
	Technology expert/specialist	Jane S Defence Industry (16)	Engineer (6)	Health Estate / Journal of Research on Technology in Education (5)
	Data extractor/synthesizer	IEICE Transactions on Fundamentals of Electronics Communications and Computer Sciences (2)	-	-
	Usability engineer	International Journal of Human Computer Interaction (57)	Interacting with Computers (54)	Behaviour and Information Technology (49)
	Knowledge mapper/engineer	Data and Knowledge Engineering (115)	Expert Systems with Applications (87)	Lecture Notes in Computer Science (67)
	Database designer	Information and Software Technology (3)	Lecture Notes in Computer Science (3)	Communications Of The ACM / IEEE Transactions On Knowledge And Data Engineering / Proceedings Of The VLDB Endowment (2)
8. Treatment and provision of document services	Cataloger	Cataloging and Classification Quarterly (148)	Library Resources and Technical Services (36)	Technical Services Quarterly (32)
	Document supplier	Interlending and Document Supply (13)	-	-
	Expert searcher - search strategist	Journal of the American Society for Information Science and Technology (4)	Health Information and Libraries Journal (3)	Journal of the Medical Library Association (3)
	Indexer	Journal of the American Society for Information Science and Technology (14)	Knowledge Organization (12)	Cataloging and Classification Quarterly / Information Wissenschaft und Praxis / Journal of Documentation (7)
	Information/content provider	Econtent (42)	Lecture Notes in Computer Science (34)	Computer Networks (19)
	System analyst	Journal of Computer Information Systems (5)	Communications of the ACM (4)	Lecture Notes in Computer Science (4)

	Abstractor	-	-	-
9. Specialized information	Disaster information specialist	-	-	-
	Clinical/Health informationist	Health Information and Libraries Journal (4)	Journal of the Medical Library Association (2)	
10. Knowledge management	Information/knowledge consultant	New Library World (2)	-	-
	Knowledge gatekeeper	Journal of Knowledge Management (4)	Entrepreneurship and Regional Development / International Journal of Innovation and Learning (2)	
	Knowledge manager	Journal of Knowledge Management (15)	Expert Systems with Applications / Human Systems Management / Journal of Information and Knowledge Management / Learning Organization (3)	Journal of Knowledge Management (15)
	Project manager/leader	International Journal of Project Management (302)	Journal of Construction Engineering and Management (97)	International Journal of Managing Projects in Business (88)
	Networker - knowledge broker	Implementation Science (19)	Evidence and Policy (15)	Environmental Science and Policy (11)
	Information controller	-	-	-

Discussion

Analyzing the use in the scientific literature of neologisms that describe emerging roles in the LIS profession provides a good indicator for monitoring emerging professional areas and determining their relevance in scientific research. The Special Libraries Association affirms that "an information professional strategically uses information in his/her job to advance the mission of the organization. This is accomplished through the development, deployment, and management of information resources and services" (Special Libraries Association 2017). The WoS search performed in our study shows a close link between information professionals and the field of LIS, since 85% of the retrieved documents that mention this concept were published in IS&LS journals. Interestingly, "information specialist" appears to be far less relevant in the field of LIS, with only 34% of the documents found in the category IS&LS. This is all the more striking considering that the same analysis performed on documents published before the year 2000 gave a proportion of 73%. This undoubtedly reflects the reduced role of intermediaries and the reduced control of information access by LIS professionals, but is probably also due to the growing importance of "information specialists" who are also "domain specialists" (Cooper and Crum 2013; Nielsen and Hjørland 2014).

The roles that appear most often and that have the strongest link with LIS are related to library science, demonstrating the continuing dominance of this discipline within LIS. At the same time, some of the concepts retrieved ("outreach librarian", "liaison librarian" and "embedded/blended librarian") reveal a repositioning of librarians as specialists who either participate in expanded roles outside the library (Abrizah et al. 2016) or have an

emerging role ("bibliometrician"), providing new services or specialized functions in academic libraries (Cox et al. 2017)., This trend will probably intensify over the coming years (Cooper and Crum 2013). Other emerging roles such as "community manager" or "networker/knowledge broker" refer to new services developed by information specialists in different institutions in response to the development of the Internet and social media (Silva Robles 2017). For the roles whose importance shows an upward trend (if not an emergent nature), such as "knowledge editor/worker", "disseminator" o "information/content provider", these reflect the continued relevance of providing and disseminating information and knowledge among professionals working in the discipline.

For archives and records administration, the fact that we identified fewer roles, with comparatively less weight in a quantitative sense, illustrates the tentative nature of the new functions and activities being assumed in this field. That said, different papers do signal the need to strategically adapt archival institutions and practitioners with an eye toward the future, transforming the traditionally understood role of the archivist to one with new roles in teaching, research support, and digital technology (Gauld 2017; Millar 2017; Vassilakaki and Moniarou-Papaconstantinou 2017). The relatively low proportion of archivists (32%) in the category of IS&LS can be explained by the traditional link between this profession and History, which is also associated with LIS (Taylor 1977).

The numerous roles identified outside the area of library science – especially in relation to the organization of information, the web and content and knowledge management – reveal potential functions for LIS professionals beyond the traditional scope of the discipline. This diversity of roles could prove to be advantageous for information professionals, provided that they are able to adapt to the changing information landscape (Wolfe et al. 2010). In order for this to occur, however, study plans must be updated to reflect a broad view of the professional field, without abandoning the traditional areas of the discipline. This update must also include specialized training programs that develop the competencies and skills required to take advantage of the wide range of potential career opportunities mentioned in the literature (Kenan et al. 2014; Park et al. 2009; Vassilakaki and Moniarou-Papaconstantinou 2015). This is particularly important given today's competitive environment, in which several disciplines are vying to claim the roles as their own, as shown by the findings of this study. The activities related to planning and design of information systems (covered to a great extent by IT) and to management and utilization of knowledge (where disciplines such as Management and Business play a key

role) are the main areas where LIS concurs with other disciplines (Jain 2009; Martin et al. 2006; Prebor 2010).

The analysis of the topics covered in the journals is consistent with the fact that the emerging roles identified do not yet have specific channels of publication. The appearance of a focused journal that promotes research in an area is essential for the consolidation of these emerging roles, as it facilitates the communication processes as well as the cohesion and interconnectedness of a research community or among the professionals with ties to it. These journals also favor greater visibility and impact for specific topics than general stream journals (Abrizah et al. 2013).

Although every area of the LIS profession has undergone profound and unquestionable transformations over the past several years as a result of the dynamic changes in technology, scholarly communications, and information management, these new roles are being adopted very unevenly, with no clear definition of the skills associated with each or of the professional status enjoyed by those working in the discipline (Campbell-Meier and Hussey 2018; Fraser-Arnott 2017). This variability suggests that the field is developing in large part thanks to specific initiatives launched by individual institutions along with the innovative roles assumed by some forward-thinking information scientists. This hypothesis is supported by the fact that a more traditional approach still predominates in public libraries and school libraries, whereas advances in the field are originating in academic libraries, which have closer and more direct links with innovation and the generation of knowledge. Other factors would also influence this process, such as the greater demands made by users in terms of library services or the fact that academic librarianship attracts professionals interested in teaching and research activities, which facilitates synergies between faculty members and librarians, who will in turn more readily assume new roles (Klain-Gabbay and Shoham 2017).

The results of this study demonstrate the importance of developing theoretical reflections and empirical studies that justify potential roles for LIS professionals. Such steps are required for a number of reasons: so that LIS professionals can defend their position in the face of increasing competition from other disciplines as well as negative perceptions and resistance to change within the LIS field (Melchionda 2007); to secure consensus on the roles that can be assumed by the different professionals of the area, since, for example, the teaching functions of academic librarians have not always been recognized by LIS

teachers and library administrators (Sun et al. 2011); and to strengthen the appeal of the discipline. Indeed, the main factors described for choosing this degree course should include not only those traditionally mentioned in the literature (i.e. an interest in books, reading, librarianship, and helping people) but also other motivations related to emerging roles, including the appeal of information technology, research, and teaching (Moniarou-Papaconstantinou et al. 2015). It is also essential to address the limited understanding of the roles played by information professionals and of the LIS profession itself, as this lack of knowledge constrains the potential for students to specialize in LIS (Newbutt and Sen 2009; Mugot 2012) and for graduates to be recognized as professionals and to access the job market. In that sense, promoting initiatives that help labor market actors to understand which functions can be performed by LIS professionals is also crucial. It has been shown, for example, that the participation of LIS professionals in knowledge management programs in some organizations has been limited by a lack of understanding of their potential roles (Ajiferuke 2003).

Conclusion

This study has some limitations, due to possible biases in the manual extraction and terminology standardization processes, and because specific terms have yet to be established to reflect some of the functions performed by professionals in the field (Gwyer 2015). Nevertheless, we consider that the perspective offered by this contribution could be of interest to professionals, teachers and students of LIS, and it should stimulate reflection on the roles they could perform and the relevance of these roles in the scientific literature, both within and outside the discipline. Although library science, the web, and content and knowledge management are the most visible areas in which new roles for LIS professionals have emerged (Melchionda 2007; Rao and Babu 2001), teaching and research support duties in the production, dissemination and evaluation of research, as well as advisory roles related to the ethical and legal aspects of information, also constitute important emerging career opportunities (Kenan et al. 2014; Sun et al. 2011; Åström and Hansson, 2013).

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