

# An Italian perspective of European scientific collaboration in Library and Information Science (2010–2014)

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**Jordi Ardanuy** (jordi\_ardanuy@ub.edu): orcid.org/0000-0001-8453-586X

**Cristóbal Urbano** (urbano@ub.edu): orcid.org/0000-0003-0935-6436

Universitat de Barcelona. Departament de Biblioteconomia i Documentació  
Melcior de Palau, 140. 08014 Barcelona

**Abstract:** This article provides the preliminary results of an ongoing study on scientific collaboration in the European Union in the field of Library and Information Science. The analysis is based on output for the period 2010–2014, as indexed by Scopus. As it was considered essential to have a longitudinal view of the situation, we also analysed the output between 1990 and 2014 in 15 journals on the core of the discipline. No single area of knowledge dominated the output, and traditional LIS departments were not strongly represented. Only a small percentage of Italian authors of papers were affiliated with departments related to the world of libraries and non-IT aspects of the processing of documents and information. In the group of EU countries, the degree of cooperation was low, and was mostly national or even non-EU. Intra-community collaboration represented a mere 6.1% of the total. However, the percentages of both general and intra-community collaboration were slightly higher for Italy than for other countries.

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## 1. Introduction

Italy is one of the founding members of what is now known as the European Union (EU) and the treaty that in 1957 established the European Economic Community, a precursor of the EU, was signed in Rome. Despite the difficulty of the undertaking, the European integration movement has achieved very important milestones since then, among which we could clearly include exchanges and collaboration between university researchers, lecturers and students from all over the continent. Therefore, an analysis of European scientific collaboration from an Italian perspective is a way for this journal to refer to the origins of the EU and honour the historic path that has been taken.

In fact, for many people, their experiences as Erasmus students or participation in international research teams is what comes to mind when they think about a certain idea of European citizenship. In recent decades, both Erasmus and research have been increasingly supported and funded through various integration programmes designed to improve international cooperation. This is one of the main priorities recognized by the EU<sup>1</sup>. However, precisely because of the considerable amount of funding allocated to these research policies and their strategic value, it is increasingly important to assess the results of this cooperation.

This study presents some preliminary results of an ongoing study on European scientific collaboration in the area of Library and Information Science (LIS)<sup>2</sup>. The emphasis on the case of Italy responds to a request made by the *Biblioteche Oggi* as a result of hearing the presentation we made on this study at the LIS-ER Seminar, organized by the University of Barcelona's Faculty of Library and Information Science on the occasion of its centenary<sup>3</sup>.

## 2. Evaluation of European projects and analysis of collaboration in LIS

In relative terms, the budget for European social sciences and humanities (SSH) projects in the Framework Programmes (FP) has been very small: 1.23% of the total for FP7, for example. In addition, this budget was not implemented until fairly late on, as it did not appear until FP4 in 1994–1998. These two factors make it difficult to specifically analyse SSH results, in contrast to the situation in the experimental sciences and technology. The Publications Office of the European Union has only published one study on SSH results<sup>4</sup>. This study, which was defined as merely exploratory, used bibliometrics to examine the scientific impact of a sample of social sciences and humanities projects in FP5 (1998–2002). However, the results were not very conclusive. Although various studies have addressed the consequences and impact of the FP<sup>5</sup>, the analysis of SSH has been largely overlooked.

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<sup>1</sup> EC. *The European Research Area; New Perspectives. Green Paper 04.04.2007*, Luxembourg: Office for Official Publications of the European Communities, 2007; EC. *Drivers of International collaboration in research. Final Report*. Luxembourg: Publications Office of the European Union, 2009.

<sup>2</sup> Throughout this paper, the well-known acronym LIS is used for Library and Information Science.

<sup>3</sup> J. Ardanuy - C. Urbano, Some research questions to frame a European Union overview of LIS research. III International Seminar on LIS Education and Research (LIS-ER) (2015) [http://bd.ub.edu/liser/sites/bd.ub.edu.liser/files/Programa/ppt/slides\\_ArdanuyUrbano\\_LIS-ER\\_5June2015.pdf](http://bd.ub.edu/liser/sites/bd.ub.edu.liser/files/Programa/ppt/slides_ArdanuyUrbano_LIS-ER_5June2015.pdf) (2015). Some of the results included in this paper were described in the above presentation.

<sup>4</sup> V. PETER - L. RIVERA LEON - Y. CADIOU - M. DOUSSINEAU, *Evaluation of the Impact of Framework Programme supported Social Sciences and Humanities Research. A bibliometric approach*. Luxembourg: Publications Office of the European Union, 2010 (Studies & Reports EUR 24311 EN).

<sup>5</sup> E. ARNOLD - J. CLARK - A. MUSCIO, *What the evaluation record tells us about European Union Framework Programme performance*. Science and Public Policy, 32 (2005), n. 5, pp. 385–397.

A. CHESSA - A. MORESCALCHI - F. PAMMOLLI - O. PENNER - A. M. PETERSEN - M. RICCABONI (2013). *Is Europe Evolving Toward an Integrated Research Area?* Science, 339 (2013), n. 6120, pp. 650–651.

An examination of how European SSH projects are assessed reveals a lack of traceability and analysis of their impact in terms of formal, evaluated scientific publications, and particularly journal articles. This situation led us to consider the current state of collaboration in LIS at an EU level, as a way to provide evidence of the lack of participation of our discipline in European projects, and the potential lack of translation of LIS-related projects into articles in quality journals.

Openness and international or interdisciplinary information sharing are fundamental to the progress of an academic field such as LIS that is at a crossroads, due to the digital transformation that has particularly affected its area of research. For this reason, our ongoing exploratory study is focused on determining the co-authorship of papers in LIS journals in the EU, which could reveal strengths and weaknesses in the relationship between our field and fields that address related issues, and shed light on the internationalization of the research.

We could argue that different forms of collaboration are essential to reach the critical mass needed for LIS to progress as a field of study in a changing, complex epistemic environment. In 1996, Van House and Sutton<sup>6</sup> considered changes in the library and information science environment, and the higher education environment in general, in terms of the ecological theory of evolution and extinction of species applied to LIS educational programmes. They concluded that our field is operating in an extremely dynamic, highly competitive environment, in which the central importance of the phenomenon of “information” in all areas of life is attracting other professions and disciplines to this field of study. Given this situation, they proposed that LIS educational programmes should not focus on just one niche (libraries), but should be information-centred, and adopt a wide range of institutional approaches. We believe that this transition is well-established in education after twenty years. However, in research we question whether there is sufficient consistency in the aforementioned openness, a well-defined research agenda that reflects social, professional and business needs, or a legitimate intellectual position of seeking scientific answers per se.

If we extended Van House and Sutton’s<sup>7</sup> ecological theory for teaching proposals to research stakeholders, we could deduce that scientific collaboration (within a discipline, multidisciplinary or interdisciplinary) and academic-professional synergies are the best way to avoid research niches that are not sufficiently diverse or open. The capacity to attract funds for relevant research with a certain degree of ambition and the capacity to influence the establishment of national or EU research agendas cannot

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J. HOEKMAN - T. SCHERNGELL - K. FRENKEN - R. TIJSSEN. *Acquisition of European research funds and its effect on international scientific collaboration*. *Journal of Economic Geography*, 13(2013), n.1, pp. 23–52.

<sup>6</sup> N. VAN HOUSE – S. SUTTON, *The panda syndrome: an ecology of LIS education*. *Journal of Education for Library and Information Science*, 37(1996), n. 2, pp. 131–147.

<sup>7</sup> Ibid.

be attained without a critical mass: a “viable” population of researchers who are well-connected and can advance knowledge. We believe that an understanding of changes in the degree of collaboration in co-authorship, obtained by analysing the geographic, institutional, professional or disciplinary scope of collaborations, could shed light on the state of LIS research in Europe in general, and in Italy in particular.

In short, the existence of a specific geographic area with sufficient critical mass of human and material resources, as well as intellectual and professional interactions, appears to be a necessary condition for progress in an academic discipline. We aim to find out whether LIS researchers are using the European framework to go beyond national boundaries, in response to the digital challenge and globalization.

### 3. Method

One of the first tasks in our ongoing study is to define what we understand by LIS research. This is not only a methodological problem relating to the selection of data for analysis. It is also an epistemological problem about the scope of what we now know as LIS, in contrast to other disciplines that address the subjects and problems that form part of the extensive, wide-ranging catalogue of research areas described in the personal profiles of members of LIS departments, whether these departments are more or less traditional, and regardless of what they are called.

In this case a pragmatic approach was taken, which consisted in defining LIS output as that found in LIS journals, according to a system of assessing periodical publications and proceedings, such as Scimago Journal & Country Rank (SJR)<sup>8</sup>. To obtain a sufficiently broad picture of the LIS field for 2010–2014, we initially considered all of the journals listed in the “Library and Information Sciences” category of the SJR<sup>9</sup>. We used Scopus<sup>10</sup> as a source to obtain the records of journal articles, as this database provides access to a greater number of publications in the field than the Thomson Reuters Web of Science (WoS). As a result, we could consider a higher number of titles in languages other than English, which we considered necessary in the context of EU countries.

As Scopus does not provide a tool for selecting articles only in LIS journals, we used journal titles to extract the records. We took into account any potential changes in journal titles during the period, such as that of the *Journal of the Association for Information Science and Technology (JASIST)*. The records were then exported to a relational database, so that they could be normalized and used in bibliometrics.

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<sup>8</sup> SCImago. (2007). SJR — SCImago Journal & Country Rank. <<http://www.scimagojr.com>>.

<sup>9</sup> As well as the Journal of the American Society for Information Science and Technology (JASIST), which is not included in this category.

<sup>10</sup> Records extracted on 27–28 March 2015.

We obtained records from a selection of 211 titles: mainly journals, although there were also some conference proceedings. The publications were from fields that we consider to be part of Library and Information Science (LIS) in a broad sense; information management systems, which, according to various studies, should not be included in LIS<sup>11</sup>; and the intersection of both areas with information and communication technologies.

In an attempt to reduce the noise caused by the publications that were furthest from the core, or cores, of the discipline, we calculated the average defined as 5% of the number of citations of the 211 citing journals for each of the 2,834 cited serial publications that could be clearly identified. This resulted in an average profile of citation that tended to exclude self-citations of the publication itself. Then, for each title, we calculated the correlation coefficient between the number of citations of each citing journal and the number of citations of the average profile. In other words, we compared the profile of the literature cited by each journal with the average for the entire LIS category in the SJR. According to this calculation, *Aslib Proceedings: New Information Perspectives* had the highest Pearson correlation coefficient (0.78), whilst publications such as the IEEE International Workshop on Variable Structure Systems or the International Summer School of Automatic Control had more disparate results (-0.02). The set of 211 titles were divided into quartiles according to the Pearson coefficient that was obtained. Titles in the last quartile were excluded, except for journals corresponding to archival science, such as the *American Archivist* or *Archivaria*. This left a total of 151 titles to examine. Table 1 shows the publications selected for this study that had a correlation coefficient above 0.60.

A set of 29,337 records for the 2010–2014 period were extracted from the 151 titles under study. This dataset was basically used to obtain an image of the current state of the discipline in the EU, in contrast with the worldwide output. However, to gain a better understanding of the current situation, it was considered necessary to obtain a longitudinal view of a longer time period, to establish some characteristics of the evolution and changes experienced in the last 25 years in European community countries. To achieve this, we referred to the list of titles used by Fredrik Åström<sup>12</sup> in his study of changes in LIS research areas between 1990 and 2005. Taking as a basis the LIS journals in the Web of Science, Åström excluded titles that received a high

<sup>11</sup> See, for example: S. MILOJEVIĆ - C. R. SUGIMOTO - E. YAN - Y. DING, *The cognitive structure of library and information science: analysis of article title words*. Journal of the American Society for Information Science and Technology, 62(2011), n. 10, pp. 1933–1953.

L. WALTMAN - E. YAN - N. VAN ECK, *A recursive field-normalized bibliometric performance indicator: An application to the field of library and information science*. Scientometrics, 89(2011), n. 1, pp. 301–314.

A. ABRIZAH - A. NOORHIDAWATI - A. N. ZAINAB, *LIS journals categorization in the Journal Citation Report: a stated preference study*. Scientometrics. 102 (2015), n. 2, pp. 1083–1099.

<sup>12</sup> F. ÅSTRÖM, *Changes in the LIS research front: Time-sliced cocitation analyses of LIS journal articles, 1990–2004*. Journal of the American Society for Information Science and Technology, 58(2007), n. 7, pp. 947–957.

number of citations from journals that were unrelated to the discipline. In the present study, we also excluded journals in which very few papers were published by EU authors in the 2010–2014 period. This resulted in 15 titles (Table 2)<sup>13</sup> that were analysed for the 1990–1994 period in the same way as the aforementioned 151 titles.

**Table 1. Journals that best fit the general profile of the discipline**

<b>Title</b>	<b>Correlation coefficient</b>
<i>Aslib Proceedings: New Information Perspectives</i>	0.78
<i>Library and Information Science Research</i>	0.73
<i>Library Review</i>	0.73
<i>Journal of Librarianship and Information Science</i>	0.70
<i>International Information and Library Review</i>	0.70
<i>Journal of Academic Librarianship</i>	0.68
<i>Proceedings of the ASIST Annual Meeting</i>	0.67
<i>Journal of Educational Media and Library Science</i>	0.66
<i>Information-Wissenschaft und Praxis</i>	0.66
<i>Webology</i>	0.66
<i>Canadian Journal of Information and Library Science</i>	0.65
<i>Information Research</i>	0.64
<i>Library Trends</i>	0.64
<i>JASIST</i>	0.62
<i>Journal of Documentation</i>	0.61
<i>Library Hi Tech</i>	0.61
<i>Journal of Information Science</i>	0.61

**Table 2. Journals used to analyse the evolution between 1990 and 2014**

<b>Titles</b>
<i>Aslib Proceedings; Aslib Journal of Information Management</i>
<i>Electronic Library</i>
<i>Information Processing &amp; Management</i>
<i>Information Technology and Libraries</i>
<i>Interlending &amp; Document Supply</i>
<i>JASIST</i>
<i>Journal of Academic Librarianship</i>
<i>Journal of Documentation</i>
<i>Journal of Information Science</i>
<i>Journal of Librarianship (continues as: Journal of Librarianship and Information Science)</i>
<i>Library &amp; Information Science Research</i>
<i>Library Journal</i>

<sup>13</sup> Records for these publications were obtained from Scopus on 28 April 2015, using a process similar to that described previously.

<i>Library Trends</i>
<i>Libri</i>
<i>Scientometrics</i>

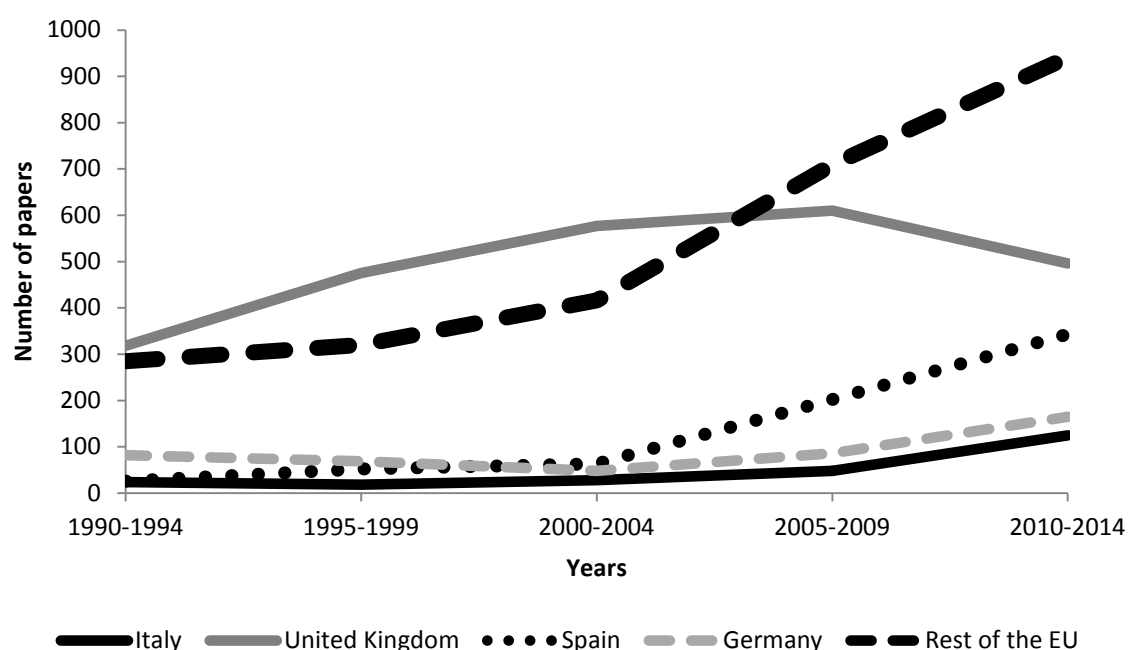
## 4. Results and discussion

### 4.1 Evolution of output and collaboration (1990–2014)

Trends in total LIS output in the EU and Italy for this period<sup>14</sup> can help us to better interpret the current situation, which will be analysed in greater depth using data for 2010–2014. Italy was ranked eighth in the EU, with a total of 243 articles, which represents 3.7% of the total. However, this percentage varied over time. In particular, there was a significant increase in the 2010–2014 period, during which Italian papers represented 6% of the total.

The contribution of EU countries to scientific output in LIS increased considerably from 2000 onwards. However, a certain degree of fatigue was noted in the output of the United Kingdom, the most prolific country, which led to a reduction in the later period. In Spain, output increased notably, and evolved in a similar way to Germany and Italy.

**Figure 1. Evolution of the number of papers over time in the EU**

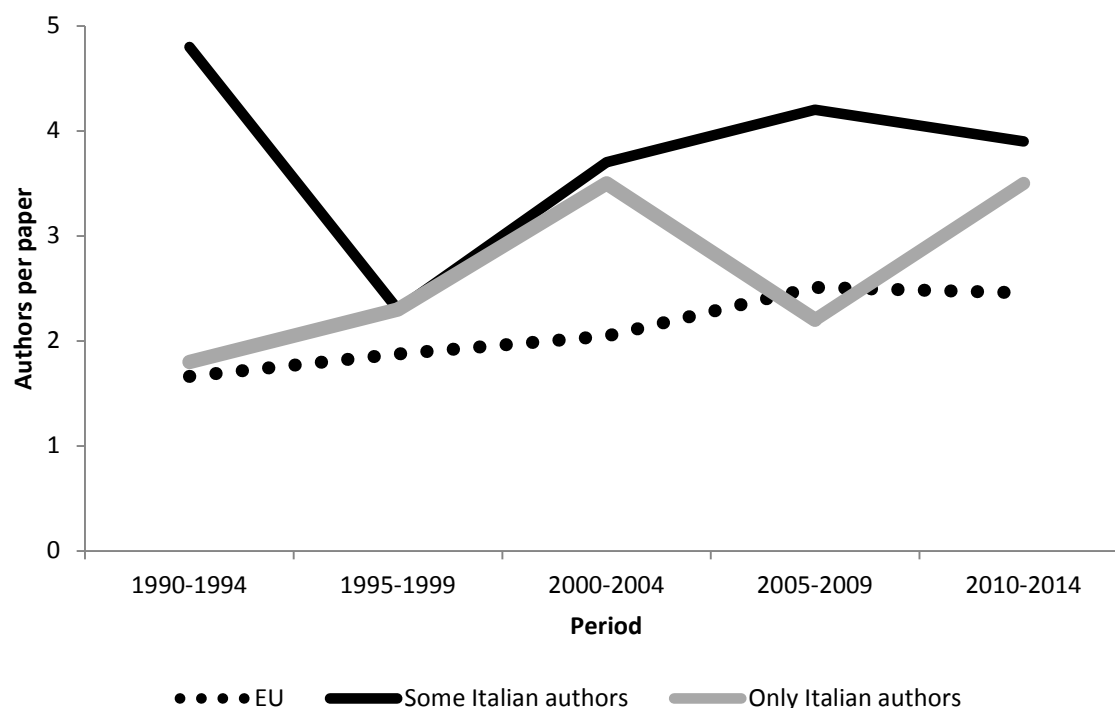


If we measure overall collaboration by level of co-authorship, the evolution in the number of authors per article over time was erratic for the case of Italy, but the figures were above the EU average. This was due to some papers with a very high number of

<sup>14</sup> Based on an analysis of the core of 15 publications.

authors that had a considerable impact on the total because of the relatively low total output. Generally, in both the EU and in Italy, the percentage of co-authored papers increased slightly over time: the figures rose from 1.7 to 2.5 authors per paper in 1990–1994, to 2.5 authors per paper in 2010–2014.

Figure 2. Evolution in the number of authors per paper over time



## 4.2 Distribution of authors by country

If we analyse the last 5 years<sup>15</sup> and the 8,732 papers that have an affiliation in the EU, and count the number of authors, we find a situation that is consistent with that shown in the above graph: three countries, the United Kingdom, Spain and Germany, account for over half of the authors (Table 3). A total of 388 papers have one or more affiliations to an Italian institution, which is 1.3% of the total worldwide and 4.2% of the total by authors in the European Union.

In Spain, one strategy over the last fifteen years has been to internationalize research results in journals indexed in WoS or Scopus. However, a large number of the papers by Spanish authors were published in the seven Spanish journals indexed in Scopus, which are mainly written in Spanish. This is not the case of Italy, where the majority of articles (98.5%) were published in English. The presence of European journals in languages other than English in Scopus explains the difference between the number of papers published in English and other languages in the USA and the EU. In the USA, almost all papers are in English, whereas in the EU the percentage drops to 81.5%, and

<sup>15</sup> Data on the 151 titles corresponding to 2010–2014.



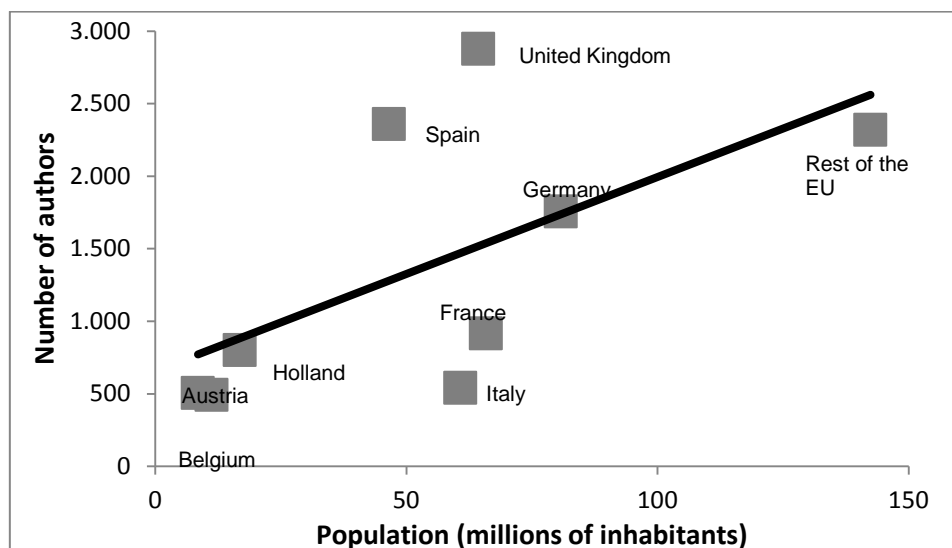
Spanish (7.4%) and German (6.0%) are the most common other languages used in articles.

**Table 3. Relative presence of authors by country**

Region	% of authors (worldwide)	% of authors (EU)
<b>EU</b>	<b>30.1%</b>	100.0%
United Kingdom	6.7%	22.2%
Spain	5.5%	18.2%
Germany	4.1%	13.6%
France	2.1%	7.1%
Holland	1.9%	6.2%
<b>Italy</b>	<b>1.3%</b>	<b>4.2%</b>
Austria	1.2%	3.9%
Belgium	1.1%	3.8%
Rest of the EU	6.3%	21.0%
<b>USA</b>	<b>35.1%</b>	—
<b>Other countries</b>	<b>34.8%</b>	—

Figure 3 shows the relationship between the number of authors and the population in the EU countries with the greatest output<sup>16</sup>. The level of output with respect to population is above average in the United Kingdom and Spain, average in Germany and Holland, and clearly below the average in other countries such as France, and Italy. However, we should stress that journals written in Spanish and German have an impact on these calculations. This also indicates that Spain and Germany have publications that have passed the quality filters established by Scopus.

**Figure 3. Relationship between the number of authors and the population**



<sup>16</sup> Population data from Eurostat, using information from 1 January 2014.

### 4.3 Institutional affiliation of Italian authors

Table 4 shows the distribution of affiliations of Italian authors. Clearly, there were more authors from the Consiglio Nazionale delle Ricerche (CNR) than from other institutions.

**Table 4. Distribution of affiliations of Italian authors in Scopus**

Affiliation	% of authors
Consiglio Nazionale delle Ricerche	18.2%
Università degli Studi di Roma Tor Vergata	7.3%
Politecnico di Torino	5.4%
Università degli Studi di Padova	3.7%
Università degli Studi di Trento	3.7%
Università di Bologna	3.7%
Università degli Studi di Torino	3.6%
Università degli Studi di Milano-Bicocca	3.3%
Università degli Studi di Milano	2.6%
Università Commerciale Luigi Bocconi – Milano	2.4%
Sapienza - Università di Roma	2.2%
Università degli Studi di Siena	2.2%
Politecnico di Milano	2.0%
Others	39.6%

Out of the total number of authors affiliated with the CNR, 6.1% were from CNR libraries and documentation centres; the rest were researchers. A total of 37.8% were from the Istituto di Scienza e Tecnologie dell'Informazione “Alessandro Faedo” (ISTI), followed by 25% from the Istituto di Analisi dei Sistemi ed Informatica “Antonio Ruberti” (IASI) and 10.1% from the Istituto di ricerca sull'impresa e lo sviluppo (CERIS). A lower number of authors were from a further 13 CNR institutes.

An analysis of the type of affiliation of Italian authors to their institution (Table 5) shows that 60.3% are lecturers or researchers from university departments, 16.2% are attached to research centres, 5.8% to libraries, 5.2% to intergovernmental organizations and 3% to private companies. An insignificant number of authors were affiliated with an archive. Altogether, over three quarters of the authors were academics, and the rest were from different areas in the professional world.

An in-depth analysis of the type of departments revealed that 58.4% of the authors belonged to computing, mathematics, and science and engineering departments in general (Table 6). A total of 32.5% of authors were from management, politics and economics departments. Consequently, most of the Italian authors who published articles that were included in Scopus were not associated with departments focused on libraries and the less technological aspects of the processing of documents and

information. Only a small percentage of authors were from communication, education, other social and behavioural sciences, and arts and humanities departments.

**Table 5. Types of affiliation of Italian authors to their institution**

Type of attachment	%
University departments	60.3%
Research centres	16.2%
Libraries	5.8%
Intergovernmental organizations	5.2%
Private companies	3.0%
Hospitals	0.8%
Archives	0.1%
Others	7.2%
No data	1.4%

**Table 6. Distribution of affiliations by type of departments**

Type of department	%
Management, politics and economics	32.5%
Mathematics and computer science	28.9%
Science, engineering, architecture and the environment	27.5%
Social and behavioural sciences	4.5%
Arts and humanities	2.5%
Health sciences	2.0%
Communication	1.8%
Education	0.4%

Out of the total number of authors attached to libraries, almost two-thirds worked in university services (64.8); one-quarter in research centres (24.1%); 5.6% in public libraries; and a similar percentage in other specialized libraries.

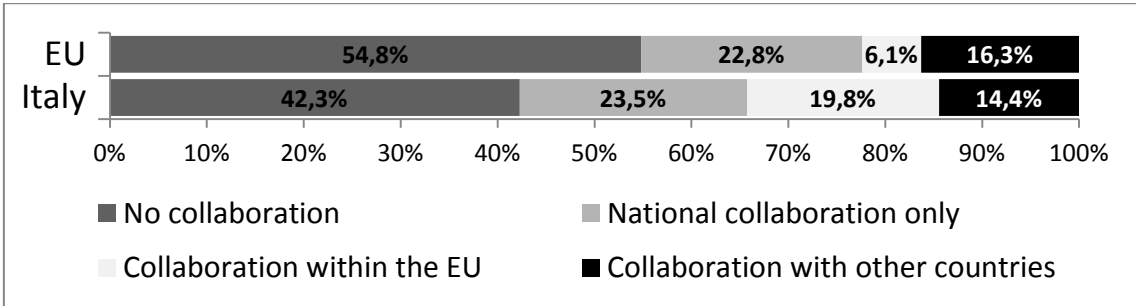
#### 4.4 Collaboration

The percentage of papers by just one Italian author was 42.3%. This figure went up to 54.9% when all of the EU was considered. Out of the total number of LIS papers written in the European Union, only 6.1% involved collaboration between authors from two or more EU countries. In contrast, in Italy 19.8% of the LIS papers were written with intra-community collaboration (Figure 4).

Despite the complexity of the interactions, the network of LIS collaboration among EU countries and between EU countries and the rest of the world (Figure 5) adequately illustrates the main relationships. The lighter nodes in Figure 5 represent EU countries,

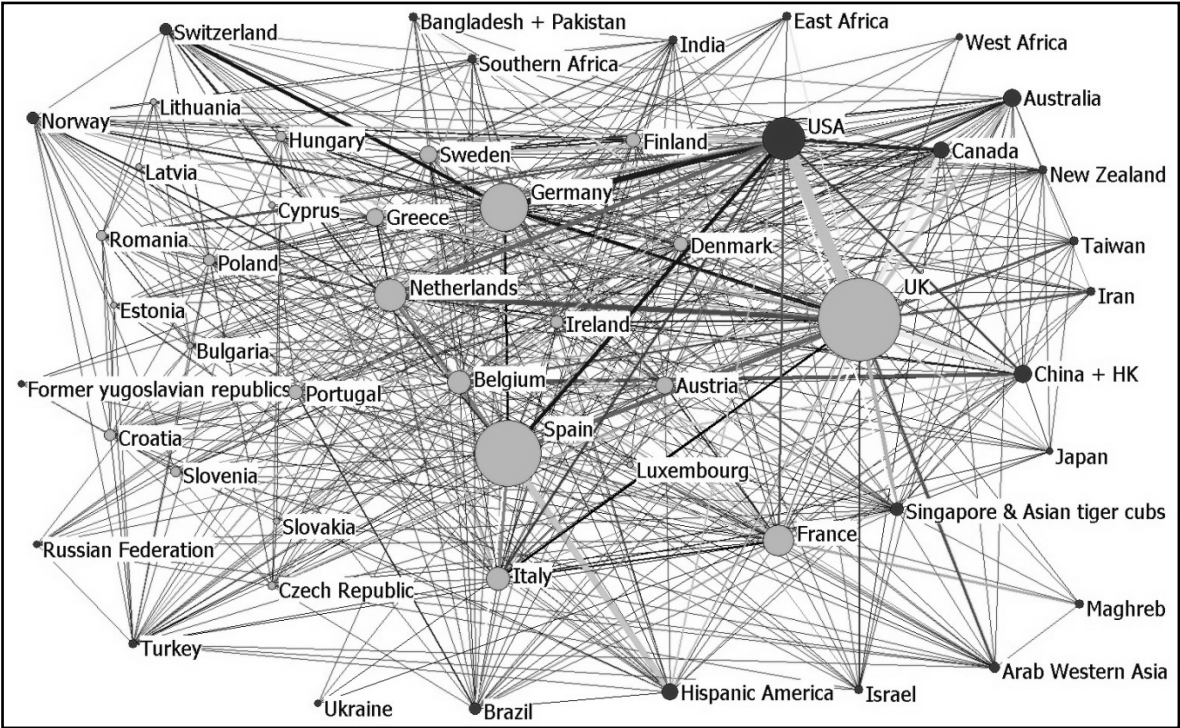
whilst the black nodes correspond to other countries. The size of the nodes is based on the number of papers written in collaboration with countries in the EU, and the thickness of the lines shows the strength of the association, calculated from the number of collaborations.

Figure 4. Types and percentages of collaboration in the EU and Italy



The USA was the country with the highest number of collaborations with the EU, followed at some distance by countries such as Norway, Switzerland, Australia, Canada and China. The strongest relationship by far was established between the United Kingdom and the USA. There was also notable collaboration between US authors and authors from Spain and Germany. Within the EU, the level of collaboration was limited in relative and absolute terms. In this case, the strongest collaboration was established by the United Kingdom with Germany and with Italy.

Figure 5. Network of LIS collaboration in EU countries



A comparison of intra-community (EU) networks of collaboration with general European collaboration networks revealed that relationships between EU members were no more intense or varied than general relationships. Language and cultural affinities and geographic proximity appear to have more influence on collaboration than EU membership, and could explain the relationship observed between Switzerland and Germany, or between Denmark and Norway<sup>17</sup>. However, Spain, France and Italy do not follow this pattern: Spain's output differs considerably from the other two countries'; and scientific collaboration between the three is very low, despite their neighbour's status.

Finally, we should consider that a high number of collaborations with countries outside the EU are the result of the UK's many professional and academic contacts in its area of influence (the Commonwealth) and with professionals who have graduated from its universities. A similar situation, but on a smaller scale, can be found in Spain and Latin America.

#### 4.5. Distribution of output by journal

Table 7 shows the journals with the highest output of papers from EU countries, and reveals the difference between the EU and the USA. In fact, if we consider the set of journals, the relationship between the rankings of both regions is not statistically significant. Notably, there is an enormous difference in the case of *Scientometrics*, which was the journal with the highest percentage of the total EU authors (8.1%) in this study. EU authors contributed 28.8% of the total number of papers published in this journal, compared to 12.2% contributed by authors from the USA. The journal was in 8<sup>th</sup> place in the US ranking by number of papers. *Scientometrics* was also the journal with the highest number of papers by Italian authors. In fact, this journal was ranked as one of the 3 most important in 21 of the 28 EU Member States. Part of the difference between the EU and US rankings can be explained by the narrower international scope of journals such as *El Profesional de la Información*, *VOEB-Mitteilungen*, *Zeitschrift für Bibliothekswesen und Bibliographie* and *Information-Wissenschaft und Praxis*, whose content is not essentially in English.

Much of the EU's LIS output can be found in the journals with the widest thematic scope, in which multidisciplinary or interdisciplinary approaches are accommodated to a greater extent, and where the target audience of authors and readers is larger and more diverse than it is for traditional library and information science journals. The titles of these journals do not tend to contain the term "library" and its derivatives.

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<sup>17</sup> However, we cannot rule out a slight influence in some cases of the EU policy of giving members of the European Research Area priority in research and exchange programmes. Many European countries belong to the Area, including Norway, Switzerland, Serbia, Turkey, Iceland and Montenegro.

However, a different picture emerges if we analyse the titles that are not listed in Table 7: they contain fewer EU papers, and the root “biblio” or the word “library” is commonly found.

These data indicate that the group of most productive, dynamic authors in Europe is either researchers in areas other than LIS (non-LIS), or researchers from LIS departments who have opted to publish in journals with a greater impact in more open subject areas (that may appeal to other disciplinary areas). One example of this was seen in the profile of Italian authors in Table 6, where contributions from the world of experimental sciences, technology and management predominated.

An analysis of the ranking of journals with the highest and lowest number of EU papers also indicates that the two communities of European and US authors behave differently. In many cases, we could argue that the coexistence (if not collaboration) between readers and authors on both sides of the Atlantic is far from being strong enough to call journals fully international.

**Table 7. Journals with the greatest output within the EU**

Journal	By geographic area					By journal	
	EU papers	% total EU	EU ranking	Italian ranking	US ranking	% EU	% USA
<i>Scientometrics</i>	707	8.1%	1	1	8	28.8%	12.2%
<i>Americas Conference on information Systems</i>	632	7.2%	2	37	1	22.2%	48.3%
<i>JASIST</i>	384	4.4%	3	4	3	25.5%	36.4%
<i>El Profesional de la Informacion</i>	365	4.2%	4	21	122	84.5%	1.6%
<i>Intelligent Systems Reference Library</i>	265	3.0%	5	2	24	33.2%	20.3%
<i>VOEB-Mitteilungen</i>	202	2.3%	6	46	145	97.6%	0.0%
<i>Zeitschrift für Bibliothekswesen und Bibliographie</i>	200	2.3%	7	–	141	95.2%	0.5%
<i>Information-Wissenschaft und Praxis</i>	176	2.0%	8	–	135	96.2%	1.1%
<i>International Journal of Information Management</i>	174	2.0%	9	13	49	28.7%	15.7%
<i>Information Communication and Society</i>	161	1.8%	10	13	13	30.3%	44.4%

In the case of Italy, the publication with the highest number of papers was *Scientometrics*, which accounted for 19.7% of the total. The other publications were quite far behind this journal, although 8 titles together were responsible for 50% of the output (Table 8). Broadly speaking, the general pattern of EU publication mentioned in the previous paragraphs was followed. These data serve to confirm what the affiliations indicated: that the Italian output with the greatest international reach, which is therefore indexed in a database such as Scopus, comes from academic and scientific contexts that are essentially non-LIS.



**Table 8. Journals with the highest Italian output**

Publication	Papers	% of total	Cumulative %	Italian ranking	EU ranking
<i>Scientometrics</i>	76	19.4%	19.4%	1	1
<i>Intelligent Systems Reference Library</i>	30	7.7%	27.1%	2	5
<i>Information Processing and Management</i>	23	5.9%	33.0%	3	11
<i>JASIST</i>	20	5.1%	38.1%	4	4
<i>Knowledge Management Research and Practice</i>	16	4.1%	42.2%	5	26
<i>International Journal of Metadata. Semantics and Ontologies</i>	13	3.3%	45.5%	6	28
<i>Research Evaluation</i>	13	3.3%	48.8%	7	25
<i>Knowledge Organization</i>	12	3.1%	51.9%	8	35

If we look at the distribution in quartiles of the published papers, based on the "Library and Information Science" category of the SJR (Table 9), we can see that the EU's position is less favourable than the USA's. Only 37.4% of EU papers are in journals that are in the first quartile, compared to 42.1% of US papers. However, if we compare the first and second quartiles together, the situation is even worse: 59.2% compared to 77.7%. Very few US papers are published in journals in the last quartile.

Italy publishes over half of its papers in journals in the first quartile. The rest are distributed between the other quartiles in descending order, in terms of the overall percentage of papers. As stated above, Italy does not have any national journals indexed in Scopus, unlike Spain, Germany, Austria or Croatia. These regional journals are not generally found in the upper quartiles, which explains why Italy's results are on the whole better than the EU's in this respect. Certainly, the challenge for journals that do not publish in English and cannot attract enough authors from a range of geographic origins is that authors in the journal's own country may be reluctant to send in certain papers.

In any case, the gap between the USA and the EU in the percentage of papers in the first two quartiles, i.e., the high impact journals, shows that the increase in European output is not totally satisfactory. Greater collaboration at all levels (national, European and intercontinental) could improve this simple indicator. Despite its simplistic nature, it is nevertheless taken into account by managers of scientific policy, to determine progress in LIS research.

**Table 9. Distribution of publications in quartiles by impact factor in the SJR**

Geographic area	1C	2C	3C	4C	1C+2C
EU	37.4%	21.8%	24.3%	16.6%	59.2%
USA	42.1%	35.5%	18.0%	4.3%	77.7%
Italy	51.9%	19.1%	17.9%	11.0%	71.1%

Also of note is the high concentration of authors in a limited number of titles, which differ widely for each country in the European Union. The exception is *Scientometrics*, which tends to always figure among the top ten and which in 21 of the 28 countries is among the three top journals, by number of authors. Obviously, in some of the countries that have journals in their own languages (as mentioned above), the top three titles include one journal published in their territory. If we excluded these journals, *Scientometrics* would have an even better position and top position in the case of Austria and Spain.

#### **4.6 Subject areas in the output: the most common keywords**

In most cases, the keywords provided by Scopus are allocated by authors or journal editors, which leads to a lack of consistency. Nevertheless, keywords were considered an acceptable source of data for analysing the main trends in issues and aspects addressed in the papers under study. Although a wide range of keywords were found, an analysis of the most frequently occurring terms provides an overview of the subjects that were discussed most.

A total of 94,397 keywords were counted in the papers corresponding to the EU. Of these, 22,185 were different terms, taking into account some slight, very obvious variations of the same word such as “E-book” and “ebook”, “behaviour” and “behavior” and singular or plural variations that do not carry any kind of semantic difference. “Information Systems” was the only term found in over 1% of the entire set. Figure 6 shows the most common keywords in the EU papers in the form of a word cloud. The relative size of the letters reflects the relative frequency of the keyword compared to the other terms in the illustration. The keywords for EU papers shows the importance of three areas, beyond the traditional field of libraries. Although the word “Libraries” is present, its position is not as strong and central as the words describing three other areas: systems for processing and recovering information; information and knowledge management; and assessment of research, scientific communication and bibliometrics.

The study of each country individually shows a situation that is far from uniform, with significant, non-converging variations that have implications for the idea of true European integration of LIS research agendas. In the case of Italy (Figure 7), “Bibliometrics” was the most frequently occurring term, followed by “Italy”, “Universities”, “Information Retrieval”, “Research Evaluation” and “Ontologies”. In the countries with the highest output, the keyword “Public libraries” only just crossed the established threshold of frequency, and by an extremely narrow margin in the case of the United Kingdom. The results of a comparison of Italy and Germany or Spain and the UK are also interesting: it seems that the countries with the most productive



national systems of science and technology are the least concerned about bibliometric studies, as if there were some kind of inverse function in certain countries between the volume of scientific output and the generation of scientific knowledge.

**Figure 6. Cloud of the most common keywords (EU)**



Another set of data that was analysed was the presence of geographic terms in the keywords. In the EU papers, geographic terms accounted for 2.2% of the total number of keywords. The most frequently occurring terms were “Spain” and the “United Kingdom” (13.8% and 10.2%, respectively), which is in keeping with the higher number of authors from these countries, followed at some distance by the word “Europe” (5.5%).

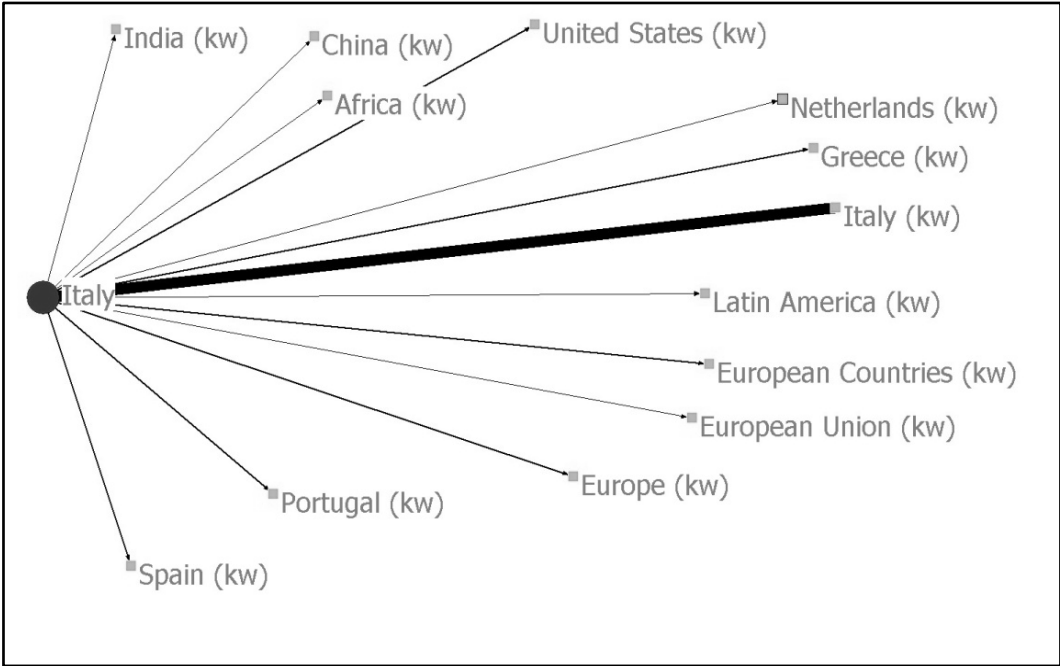
The analysis of these geographic terms also offers an interesting perspective on the lack of international openness and intra-community exchange, as indicated in other aspects of this study. For example, in publications with Italian authors (Figure 8), except for the term “Italy”, there is very low occurrence of country names: some EU Member States are not mentioned, and notably France, Germany and the United Kingdom are absent. Similarly, two keywords that refer to the continent as a whole, “Europe” and “European Countries”, are found infrequently. A similar situation was found in many other countries for which we have sufficient data. These additional data support the image of low international collaboration observed in previous sections of this paper. They could also be explained as a lack of openness to the statistics and

evidence of other countries as a way of comparing the situation in one's own country. This result is even more surprising if we consider that the occurrence of "European Union" or "European Countries" in the geographic terms of the output of each country is comparable to, or less than, the frequency of the few other specific countries that are mentioned.

Figure 7. Cloud of the most common keywords (Italy)



Figure 8. Geographic terms that appear in the keywords of Italian authors



## 5. Conclusions

In the current exploratory, descriptive stage of our study, it is rather premature to draw firm conclusions. In fact, this was not the aim in the case of Italy, which served in this paper merely as a point of contrast with Europe as a whole. However, we can propose four points for reflection, which are also fully valid for Italy, on weaknesses in European scientific collaboration in LIS. These weaknesses apply particularly to the participation of researchers who are members of what to date have been the traditional university departments associated with cultural heritage, museums, libraries and archives<sup>18</sup> or the professionals who work in these areas.

First, in all of the journals analysed, papers on emerging subject areas related to all aspects of the phenomenon of information were notable for their high volume and potential impact. No area of knowledge clearly predominated, nor were traditional LIS departments present in particularly high numbers. Although a complex analysis of departmental affiliation is still required to verify the extent to which scientific traditions are mixed in each of the co-authored papers, our first impression is that there is a certain degree of disciplinary isolation in most collaborative studies. In other words, a range of scientific traditions and institutional affiliations was not found within the papers. It could be said that authors who publish in the journals with the greatest output and potential impact practise “living apart together”.

Second, the degree of collaboration in the EU countries is low, with co-authored papers representing no more than 50% of the total. When collaboration does occur, it tends to be at a national level (22.8%) or with collaborators from outside the EU (16.3%), rather than intra-community (6.1%). This result is particularly striking if we take into consideration the EU policy of integration in university matters, science and technology. We understand that there is considerable room for improvement for all authors who publish in journals classified as LIS, as collaboration is a key factor for the progress of knowledge. Researchers in the areas included in the set of journals analysed do not appear to have taken full advantage of the vehicle of European projects. This may be due to difficulties in obtaining funding or the failure to communicate the results of projects in indexed journals that are internationally relevant.

Third, we consider that many of the papers published in the journals analysed in this study could have greater validity if the results were supported by an analysis of the data and the situation in more than one country, particularly in the case of the EU countries dealt with here. In our exploratory analysis, the frequency of place names in the keywords is revealing, and shows a geographic self-limitation and low occurrence

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<sup>18</sup> An area that is well-defined in English by the acronym GLAM (Galleries, Libraries, Archives and Museums).

of an overall European approach in most studies, where such a dimension would be relevant due to its descriptive and comparative nature. As illustrated in Figure 8 for Italy, in all the countries only a small number of geographic areas other than the country itself are taken into consideration; and with respect to other areas of the world, there is a low occurrence of terms that represent the European continent or the EU as a geographic entity. We consider that this is due both to the weakness of the European environment as a real cultural context for the authors of comparative studies, and to the low number of studies undertaken with intra-community collaboration, which is also a consequence of the previous point.

Fourth, the distribution of the main subject areas in the word clouds should be prompting more debate on whether the published research reflects a planned, balanced research agenda, or to what extent an important part of the professional activity traditionally associated with LIS is sufficiently represented in this agenda, even if it is in terms of the need to adapt to existing challenges, or considerations of cultural and educational policies associated with the digital transition. In the absence of analyses of other sources relating to research agendas that cover LIS subjects and their funding, the published results reveal gaps and a worrying stagnation in these subject areas in terms of research results, at a key moment of digital transformation in the world of libraries, archives and documentary information services.

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