

RESEARCH ARTICLE

Different views on Digital Scholarship: separate worlds or cohesive research field?

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This article presents a systematic review of the literature on Digital Scholarship, aimed at better understanding the collocation of this research area at the crossroad of several disciplines and strands of research. The authors analysed 45 articles in order to draw a picture of research in this area. In the first phase, the articles were classified, and relevant quantitative and qualitative data were analysed. Results showed that three clear strands of research do exist: Digital Libraries, Networked Scholarship and Digital Humanities. Moreover, researchers involved in this research area tackle the problems related to technological uptake in the scholar's profession from different points of view, and define the field in different – often complementary – ways, thus generating the perception of a research area still in need of a unifying vision. In the second phase, authors searched for evidence of the disciplinary contributions and interdisciplinary cohesion of research carried out in this area through the use of bibliometric maps. Results suggest that the area of Digital Scholarship, still in its infancy, is advancing in a rather fragmented way, shaping itself around the above-mentioned strands, each with its own research agenda. However, results from the cross-citation analysis suggest that the Networked Scholarship strand is more cohesive than the others in terms of cross-citations.

Keywords: Digital Scholarship; Digital Humanities; Networked Scholarship; Digital Libraries; systematic review

1. Introduction

The digital era is challenging all knowledge workers to develop new skills and literacies to work effectively within digital spaces (Goodfellow 2014). The academic profession is no exception (Borgman 2007; Pearce *et al.* 2010; Weller 2011), as digital technology offers unprecedented affordances to improve both research and teaching performance. The concept of *Digital Scholarship* emerged early in early in the 21st century (Andersen and Trinkle 2004; Ayers 2004) and, according to Wikipedia, refers to the use of information and communication technology to achieve scholarly and research goals. Among the scholars' activities that take advantage of technological affordances are: collecting evidence, carrying out investigations and research, publishing and disseminating results and preserving and making available outcomes. However, a fly-through the landscape of Digital Scholarship reveals that, although the term has become quite

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popular, it does not seem to have a widely agreed definition across the research disciplines that have contributed to its evolution.

According to Borgman (2007), for example, the concept of Digital Scholarship is tightly connected to the discourse about cyber infrastructures supporting new forms of doing research and science, namely eResearch and eScience, which involves the progressive digitisation of institutional infrastructures and impacts on scholars' practices in dealing with information and communication processes. Borgman's work, in fact, is deeply rooted in the field of information science whose primary aim is to improve the way libraries curate digital content and support scholarly work of all subject areas. This field of work also deals with the way scholars use the libraries' digital facilities to increase their reputation (Andersen 2004; Holliman 2010; Quigley *et al.* 2013; Zhao 2014).

At the same time, an important role in this field of research has been played by social science scholars who work at the crossroads between the humanities and digital technologies, thus identifying a new field of research, the *Digital Humanities* (Terras, Nyhan, and Vanhoutte 2013), which is also strictly related to Digital Scholarship. As these authors point out, 'Digital Humanities as a term (...) provides a big tent for all Digital Scholarship in the humanities' (p. 140). These scholars have worked intensely to define the borders of this field of research (Unsworth 2013), which embraces both the theory and the practices concerning the new forms of representation of cultural heritage, including history, arts and literature, through the digital medium (Bentkowska-Kafel 2013; Gardiner and Musto 2015; Kaltenbrunner 2015). Moreover, the term 'Digital Humanities' encompasses the area of debate about changing research methods and required professionalism in the humanities and the interdisciplinary dialogue with digital technologies (Klein 2015).

Under the influence of the ideas of Open Science and Open Access (den Besten, David, and Schroeder 2010; Suber 2009), the interest in the concept of digital scholarship has spread to social science researchers interested in investigating the complexities of the technological uptake by institutions and users as a cultural and social phenomenon. Socio-technical studies played a highly important role in this case by expanding the focus of Digital Scholarship research in a direction different from those described above (Borgman 2007, p. 43). This strand of research relates to academics' professional learning and identity in the digital era and is tightly connected to educational technology research. Its focus is on the ways scholars thrive to do (practices) and to be (identity) in the changing context of higher education, which pushes them – sometimes in rather conflictive and contradictory ways – to keep pace with innovations in digital, open and networked contexts (Goodfellow 2014). The conundrum of opening up science and education is hereby faced through the exploration of professional learning by open, digital and networked scholars, that not only adopt technologies as a means but also reflect on the nature and ethics of research, through their deontological position, and create new scenarios of practice (Costa 2014; Scanlon 2014; Veletsianos and Kimmons 2012b). This approach aligns with socio-technical studies going beyond technological determinism (Pearce *et al.* 2010). For this group of researchers, the research problems of Digital Scholarship are connected with the adoption of social media to do and share research, *social scholarship* (Greenhow and Gleason 2014; Manca and Ranieri 2016; Veletsianos 2012), with emerging forms of reputation based on general and bespoke media tools (Nicholas, Herman, and Jamali 2015; Weller 2012); with fluid processes of collaborative research entailing interdisciplinary dialogue, teaching and dissemination (Veletsianos and

Kimmons 2012a); and with a vision of Open Science that engages public audiences in the making of science, by extending the forms of participation along with the research process (Grand *et al.* 2012). The whole debate is connected to the need for improving scholars' literacy to participate in digital, networked and open contexts of scholarship (Goodfellow and Lea 2013; Veletsianos and Kimmons 2012b). The work of this group of researchers is rooted in the model by Boyer (1990) of the academic profession and suggests that Boyer's four dimensions (discovering, integration, application and teaching) are being enhanced and transformed by openness and networking, thus creating new professional ways of collaboration across geographical and institutional frontiers based on the affordances provided by Web 2.0 (Greenhow and Gleason 2014; Nicholas, Herman, and Jamali 2015; Weller 2011).

The above picture lets us appreciate that Digital Scholarship is a complex research area, guided by different research aims, rooted in several conceptual and methodological bases, and informed by diverse disciplinary traditions. Moreover, it appears that the concept of Digital Scholarship is rather fuzzy, embracing different concerns and using a variety of research methods, professional practices and scholars' identities.

This blurred picture stimulated the authors of this article to analyse the literature on the topic in order to identify more clearly the different areas of research involved and better understand their relative importance, the reciprocal influences, the common concerns and the specificities, in terms of the problems tackled, the topics dealt with and, more generally, the interplay of the disciplines involved. To this end, a systematic review of the literature on Digital Scholarship has been carried out, complemented with bibliometric maps aimed to reveal and investigate the main views on Digital Scholarship, the keywords used and the extent to which they build upon each other's results. The research aim is to explore whether, and to what extent, the emerging landscape depicts a unitary and cohesive research topic, or a fragmented disciplinary vision. As a result, our study should contribute to inform the evolution of this research topic, clarifying the areas where there is a need for better convergence of research problems and questions, and of connected constructs and methodological approaches.

2. Methodological approach

Set out as a classic systematic literature review (Petticrew and Roberts 2006), this study encompassed an initial identification of a significant sample of publications concerning the field of Digital Scholarship, followed by the construction of a database where such publications are classified according to relevant categories. Then, bibliometric maps have been used to identify the relationships between the papers and to spot existing agglomerates, corresponding to different strands of research. Both the systematic review and the bibliometric maps were adopted to explore the relationships between the three strands of research identified, namely Digital Libraries, Networked Scholarship and Digital Humanities. We searched for juxtapositions in the classification of research areas, the research aims, the methodological approaches adopted, the citations between contributing authors and the concepts emerging as mostly used (keywords) to achieve a better picture of Digital Scholarship as a research topic.

In the following subsections, we will describe the sample, the data collection process and the methods adopted for the data analysis.

2.1. Sample selection

The sample analysed comprised 45 papers of relevant scholarly literature published during the period January 2004–March 2015.

The sample, derived from the initial exploration of six specialised databases, namely Web of Science (WOS; 31% of all papers were found in this database), Scopus (75% of papers), the Directory of Open Access Journals (DOAJ; 7%), Educational Resources Information Centre (ERIC; 20%), EdITLib Digital Library (11%) and Google Scholar (93%), was arrived at through a search for the term ‘digital scholarship’ in the title, the abstract and the keywords. The search yielded 154 papers, which were filtered by eliminating (1) duplicated papers, due to overlaps between databases; (2) papers with full text in languages other than English, (3) pieces of work other than research papers (reports, position papers, magazine articles, etc.) and (4) proceedings papers. Technically, the authors searched for pieces of work representing consolidated research, thereby highlighting phenomena as well as conceptualisations that have passed a rigorous process of evaluation. This process led to the sample of 45 journal papers indexed by at least one of the above-mentioned databases.

The complete information of every article is documented in Annex 1 – references used for the review.

2.2. Data collection process and analysis

2.2.1. First phase: classification of articles

According to the systematic review approach, the next step consisted in defining the structure of a database destined to host the relevant information about the papers. The database records were structured as reported in Table 1, according to a procedure previously used elsewhere by Raffaghelli, Cucchiara, and Persico (2015). Table 1 shows the dimensions that the researchers deemed relevant for the analysis of the field of Digital Scholarship.

While the way the first three data fields of each record were filled in does not require further discussion, since researchers only had to report the data as found in the paper or in database sources, fields 4 and 5 require some additional explanations.

Field 4, corresponding to the dimension ‘View on Digital Scholarship’, refers to the three main perspectives on Digital Scholarship research described in the introduction of this paper. The first one was ‘Networked Scholarship’ and included all the papers that adopted social networks and other informal methods to disseminate research and teaching, as well as those that dealt with Open Science and open educational resources. The second one was ‘Digital Libraries’ and included papers analysing the digital infrastructures and their affordances, and the stakeholders’ policies with regard to them. The third category was ‘Digital Humanities’ and included papers on new research methods to capture or represent research objects within the Humanities. Although these three categories are consistent with the trends outlined in the analysis of the literature, in principle, some papers may simultaneously belong to two or even all three of the above-mentioned categories. For this reason, four hybrid categories were also created. However, there were no papers that were found to lie at the crossroad between the three categories.

As for the ‘Research approach’, the sub-field ‘research topic’ was an open field, and it was processed through a ‘*thematic analysis*’ procedure (Guest, MacQueen, and Namey 2011), a widely used qualitative research method based on an inductive

Table 1. Database fields and values assigned.

Data field	Data sub-field	Assigned values	Type of data
1 – Article identification	Article title	Title as published	Text/as found in paper
	Source	Journal title	
	Author(s)	Author(s) name and surname	
	Publication date	Year	
	Key words	Keywords as published	
2 – Scientific database	Abstract	Full abstract as published	Value/as found
	WOS	‘The article is indexed in the database’	
	https://apps. webofknowledge. com/	True/False (1/0)	
	Scopus		
	http://www.scopus. com/		
	ERIC		
	http://eric.ed.gov/		
	DOAJ		
	https://doaj.org/		
	EdITLib		
http://www.editlib. org/			
3 – Research area on the scientific Database	Research area on scientific database	Classification of research as extracted from the scientific database	Text/as found
	4 – View on DS	Classification of research taking into consideration the research area as well as the theoretical approach:	Text-label/ upon researcher’s interpretation
		a. NS b. DH c. DL d. NS/DL e. NS/DH f. DL/DH g. DL/DH/DS	
5 – Research approach	Research topic	The topic of research, if declared.	Text/upon researcher’s interpretation
	Research aim	The guiding research purpose	Text/upon researcher’s interpretation

DH, Digital Humanities; DL, Digital Libraries; DS, Digital Scholarship; NS, Networked Scholarship.

approach. The full text of the articles under analysis was explored by two researchers according to the following procedure: (1) the research topics were extracted by one researcher who created ‘subcategories’ in a first round of classification of articles (free codification); (2) the results of phase (1) were shared between the two researchers (member-checking); (3) both researchers independently coded five papers

using the agreed-upon sub-categories and the inter-rater analysis was carried out; and (4) both researchers proceeded with the classification by adopting the existing sub-categories as *themes* covering one or more free codes, which in this case represent the research topics.

In order to deal with possible biases in the researchers' judgement of database fields 4 and 5, the classification of the papers consisted three steps: the first step of joint 'training' was followed by the second step where both researchers classified independently the same five articles (12% of the whole sample) and the third step where the inter-rater agreement between the two raters was calculated. The inter-rater's percentage of agreement was 82%. Cohen's kappa coefficient was also calculated, obtaining a value of 0.98, which can be considered a high level of agreement (Hayes and Krippendorff 2007). Controversial cases were then discussed till a consensus was reached.

2.2.2. Second phase: bibliometric maps production and analysis

While the first phase of this study was meant to allow the authors to identify the main areas of investigation, the focus of the studies on Digital Scholarship and the type of research carried out, the second phase was based on bibliometric maps and aimed at investigating the relationships amongst the disciplinary perspectives.

Bibliometric maps are a form of representation of scientific networks (van Eck and Waltman 2014) used in Scientometrics as a means to understand connections between researchers and their work. They are based on three main elements: statistical analysis of written publications (often including text and data mining); different methods of visualisation (distance-based, graph-based and timeline-based) and digital tools supporting analysis and visualisation. Bibliometric maps are graphs consisting of *nodes* and *edges*; while the nodes may represent publications, journals, researchers or keywords, the edges represent relationships between the nodes. According to the type of nodes, the focus of analysis and the emerging map are different. The most frequent types of relationship studied through bibliometric maps are: citations among papers (to explore connections between publications), co-authorship relations (to explore connections inside a network of researchers) and keyword co-occurrences (providing information about the distribution of topics) (van Eck *et al.* 2010). Some forms of visualisation explore static relationships, highlighting groups (clusters) of nodes that are 'closer', while others explore their evolution in time.

In this research, *bibliometric maps* were used to analyse the sample of 45 papers in order to:

- (1) study the keywords characterising the field and differentiating agglomerates of papers and their relationships (i.e. central/peripheral, related/not related). The operational hypothesis guiding this analysis was that the three main groups of keywords, respectively, connected to the three Digital Scholarship views would emerge as *clusters* within the semantic universe connected to the construct of Digital Scholarship, and
- (2) study the relationships between bibliographic items in terms of citations. The operational hypothesis here was that the distinction between the three 'views' on Digital Scholarship would be reflected by *intense cross-citations within clusters of papers* and *few cross-citations between papers of different clusters*.

After a careful analysis of existing tools for bibliometric maps analysis and visualisation, the authors selected two software tools to carry out this phase of the study: VOSviewer,¹ for the analysis and visualisation of keywords, and CitNetExplorer² for the analysis and visualisation of cross-citations.

In the case of the cross-citations bibmap, the original sample consisting of the 45 papers studied in the first phase was integrated by three books (Borgman 2007; Boyer 1990; Weller 2011), since they were highly cited by the 45 papers. Furthermore, these books were perceived to be relevant to define the background and hence the relationships between the views.

3. Results

3.1. First phase: ‘characterising disciplinary contributions to Digital Scholarship’

This section presents the results of the first phase of work, the systematic review. Figure 1 shows that Digital Scholarship appears to be a fairly recent field of research, dating back to 2004 (although rooted in previous literature on scholarship), featuring a significant increase in papers on scientific productivity in the years 2013 and 2014 (the yearly number of papers almost doubled between 2012 and 2013 and doubled again in 2014); this highlights a fast emerging field of research. In addition, the papers are well distributed amongst several journals belonging to different subject areas, which confirm the relevance of the topic for different disciplines.

Figure 2 shows the distribution of research topics as they emerged from the ‘thematic analysis’ procedure described in the Methodological Approach section. We note the prevalence (46%) of the group of papers dealing with the issue of (academic) professional practices tightly connected to educational research; these papers deal with research in the field of higher education and focus on Digital Scholarship as a problem of professional learning and innovation. This is followed by a number of papers (16%) concerning the themes of ‘openness, democratisation of education’ and the ‘participatory culture’ of the web. Less represented is the topic of ‘digital identity, interaction, Social Networks (SNs) and social media’. Besides, ‘e-publishing and

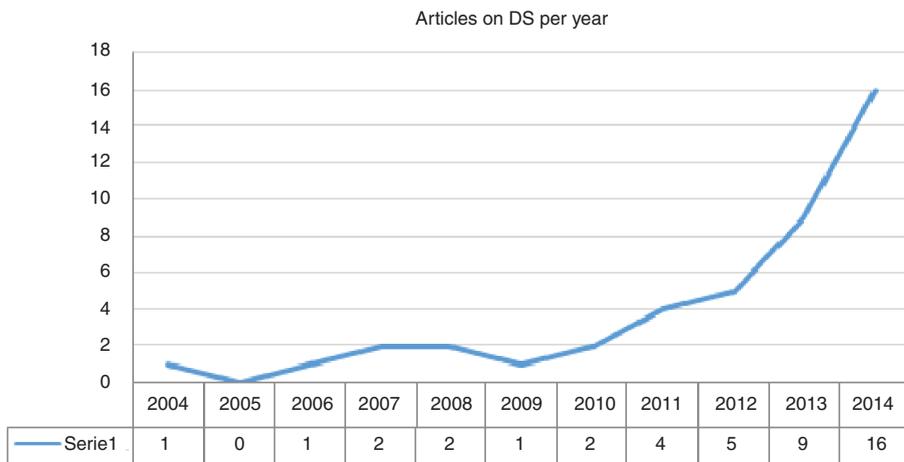


Figure 1. Evolution of scientific production in the field (2015 is excluded because data were collected only for the first semester).

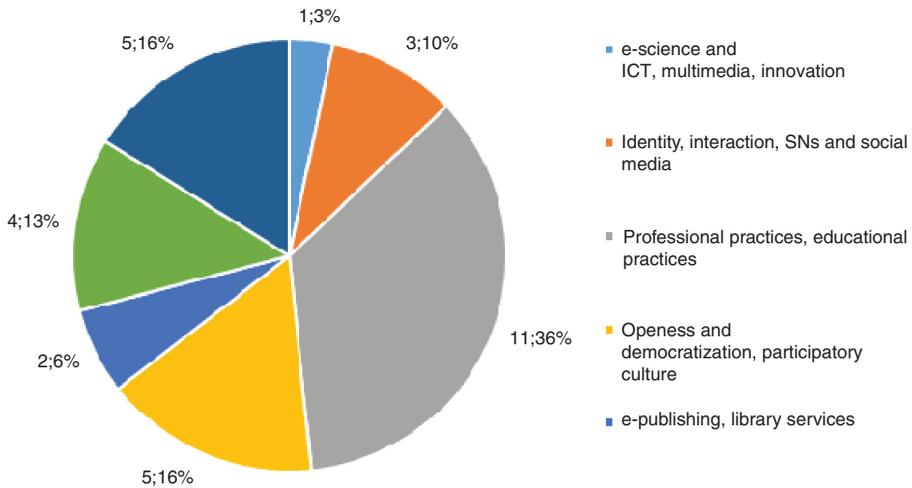


Figure 2. Topics of research.

library services’ (16%), as well as ‘digital art and history’ (13%) deserve interest. The least represented topics are ‘e-science and Information and Communion Technologies (ICT)’ and ‘multimedia and innovation’ (3%).

During this process of analysis, the researchers observed co-occurrences of keywords between papers dealing with the topics: “professional practices, educational practices”; “openness and democratisation, participatory culture”; and “digital identity, interaction, SNs and social media”. These three topics together, represent 62% of the sample. Besides, the topics of “e-publishing, library services” shared several keywords with “e-science and ICT, multimedia, innovation”, representing together 19% of the sample. Lastly, the topic of *digital art and history* appeared to be a stand-alone category.

The above situation relating to research areas as well as research topics revealed that the expected three main views were present in the sample: the view of Digital Scholarship as a *networked* process of collaboration on the open Web connected to the

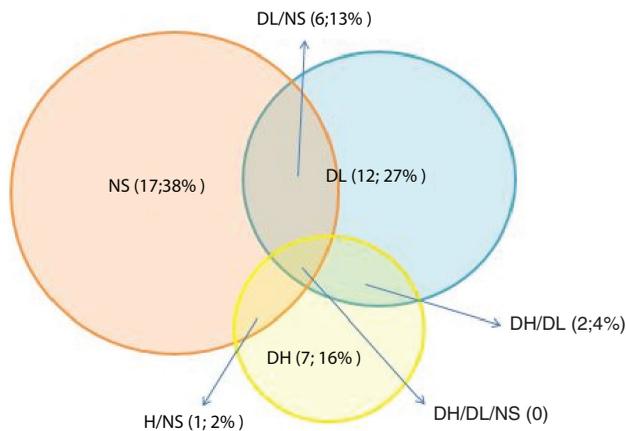


Figure 3. Views on Digital Scholarship.

scholars' endeavour to transform their own practices with a new deontology of scholarship; the view of *digital infrastructures (libraries)* leading researchers to adopt new affordances to do their work and hence requiring professional interventions to organise new, complex technological contexts; and the view of *Digital Humanities* as a strand of research focused on technological settings and objects supporting research in the humanities, but also transforming it. It was observed that most papers falling in the research area of 'Social Sciences' belonged to the first group; that in the case of the second group, the papers could be placed amongst the two research areas 'information sciences' and 'computer sciences'; and in the third case, the papers were distributed between 'computer sciences' and 'humanities', showing the separations in the disciplines contributing to the 'views on Digital Scholarship'. Figure 2 illustrates the distribution of papers per 'View', including papers with overlapping or 'mixed' visions.

According to Figure 3, most papers in our sample are distributed between the dominant visions of *Networked Scholarship* (38%) and *Digital Libraries* (27%), with less presence of the *Digital Humanities* (16%). Only 20% of the examined papers are 'hybrids' and simultaneously belong to two visions. No paper belongs to the interception of the three visions. The set of papers belonging to the field of *Digital Humanities*, besides being smaller, is also more isolated than the other two (6% of overlapping with the other two).

3.2. Second phase: 'exploring disciplinary relationships within Digital Scholarship'

3.2.1. The map of keywords co-occurrences

The map of co-occurrences of keywords is a representation based on the number of occurrences of keywords within the 'corpus' of terms extracted from all the titles, keywords and abstracts of the articles within the sample. The software VOSViewer extracts all the 'noun-phrases' from the corpus; therefore, the terms are organised by *topics* automatically generated by the software, namely the keywords. In this case, from the original corpus, the software extracted 1,198 relevant keywords from a sample of 6,898 terms. A total number of 73 nodes emerged; however, only 44 (60%) of these keywords are considered by the software for representational purposes. Moreover, the authors removed irrelevant or ambiguous keywords from the representation such as too general terms (e.g. issue, author, purpose, role, publishing, scholar, academic, survey) or terms which conditioned the visualisation of a cluster, such as teaching, publication, implication, challenge and collaboration. The final representation, composed of 35 keywords/nodes, is shown in Figure 4), where three bigger clusters and two smaller clusters are identifiable. Table 2 introduces the details of keywords for each cluster, while in the second column, we have associated each cluster with the relevant perspective. Cluster 1 (in red at the top of Figure 5), contains eight nodes, with 'Library' as its main node, and was connected semantically with the view of Digital Libraries research, focusing on the role of infrastructures allowing new ways of scientific production, the problem of preserving and using content, and the role of Libraries and librarians in scientific information. On the right-hand side in Figure 5 (in green), cluster 2, with the central word 'Network', contains eight nodes. This cluster appears to be semantically connected with the perspective of 'networked (and open) scholarship' seen as scholars' endeavour to embrace the social web with all its affordances to promote new practices (such as opening up education and research) in line with a new deontology of Public Engagement. Cluster 5 (in purple), in between

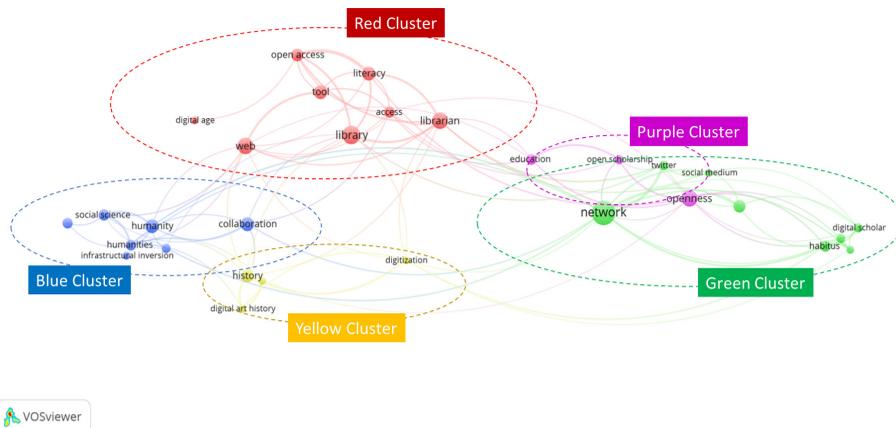


Figure 4. Bibliometric map of keywords (colours are attributed to nodes by VOSviewer to highlight clusters).

clusters 1 and 2, features ‘Openness’ as the main node, relates to the issue of open access to content and to open scholarship as professional practice. Hence, this small cluster brings some evidence of the existence of contaminations between the Digital Libraries and the Networked Scholarship perspectives. The third biggest cluster, cluster 3 (in blue), at the bottom-right of the map, is composed by seven nodes, and its main nodes are ‘humanities’ and ‘collaboration’. We can assume that this cluster aligns with the perspective of Digital Humanities, dealing with how researchers interact with new digitised objects within the humanities as well as how the field evolves as an interdisciplinary field, between computer science and the humanities. Cluster 4 (in yellow), a small cluster whose main node is ‘history’; is tightly connected with the Digital Humanities perspective. In Figure 5, this cluster is rather isolated, and specifically there are no nodes that can be attributed to the view Networked Scholarship/Digital Humanities, which seems to be in line with the very small overlapping between these two perspectives already shown in Figure 3.

The clusters described above can be clearly put in relation with the ‘Views’ on Digital Scholarship identified in the first phase of the study. One question that could be raised is whether the mere existence of clusters 1, 2 and 4 as separate clusters reflects little mutual awareness deriving from the respective disciplinary viewpoints; and whether the connections observed (cluster 3 and 5) can be regarded as a sort

Table 2. Clusters of keywords and connected perspectives on Digital Scholarship.

Cluster	Keywords	Connected perspective
1-Red	Access, digital age, librarian, library, literacy, open access, tool, web	DL
2-Green	Digital scholar, engagement, habitus, network, participatory web, scholarly practice, social medium, twitter	NS
3-Blue	Collaboration, Digital Humanity, humanities, humanity, infrastructural inversion, social science, visualisation	DH/DL
4-Yellow	Digital art history, digitalisation, discipline, history	DH
5-Purple	Education, open scholarship, openness	NS/DL

DH, Digital Humanities; DL, Digital Libraries; DS, Digital Scholarship; NS, Networked Scholarship.

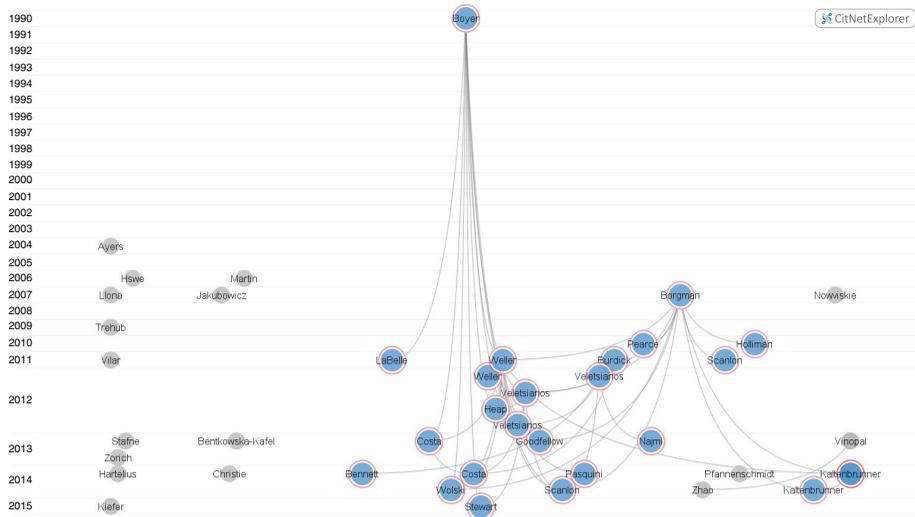


Figure 5. Bibliometric map of cross-citations. Multiple papers with the same first author can be distinguished by the year, that is, the position along the Y axes. No couples of papers/books with the same first author in the same year are present in the sample.

of starting point for interdisciplinary analysis of the topic of Digital Scholarship. Clearly, the keywords map is not informative enough to answer this question, while the cross-citation bimap described in the next section can shed more light on it.

3.2.2. Cross-citations bibliometric map

Across-citation bibliometric map was built to understand the relationships between cited and citing papers, that is, to understand whether the authors built upon the work of each other. More in general, this type of map allowed us to focus on the extent to which each research strand is aware of the work of the others. The software used for this purpose (CitNetExplorer) visualises the relevant publications of our sample as well as their citational relationships across a time span. In our case, the time span (1990–2015) is the one covered by our sample, consisting of 45 papers plus three highly cited books (Borgman 2007; Boyer 1990; Weller 2011). Figure 5 shows the bi-dimensional representation of the citation network per year, organised in clusters of publications based on their citational relationships. In Figure 5, a cluster is identified and its nodes highlighted.

The parameter ‘minimum number of citation links’ was set at 3, which means that documents receiving less than three citations from other documents of the sample are not visualised in the map. This is a low value in typical bibliometric problems, but adequate for this small set of documents; in any case, the situation observed is typical of very specific research fields, as well as of the application of bibliometric indicators in the Humanities and in Educational Research (Hammarfelt 2014).

In Figure 5, it is possible to observe one main cluster of 25 publications, and some isolated nodes. The main cluster corresponds to papers belonging to the Networked Scholarship group, which are at the centre of the cluster (i.e. LaBelle, Weller, Veletsianos, Costa, Goodfellow), but it also includes publications belonging to ‘hybrid’ categories (i.e. Wolski & Richardson, Pasquini, Holliman from Digital Libraries/

Networked Scholarship; Najmi from Digital Humanities/Networked Scholarship). In this cluster, the only publication which was classified as Digital Humanities is that by Kaltenbrunner. However, it is crucial to highlight that all of these articles cite two core books in the cluster: Boyer (1990) and Borgman (2007). While the first author pioneered the debate on the need for revolutionising the academic profession in the very early nineties, the second has become a crucial landmark in the research about the changing cyber infrastructures supporting (and questioning) scholarship. Boyer's work is particularly considered as a model to understand academics' professional practices. Instead, Borgman's book is a pillar of the debate about the scholarly communication paradigms that the academics have to face. Indeed, an analysis performed removing these two books shows a cluster of authors mainly belonging to the Networked Scholarship view (17), and the rest of publications completely scattered and isolated. Another important book for the scientific community exploring the topic of Digital Scholarship is Weller (2011) that can be seen at the centre of the cluster, with less cross-citations due to the fact that it is more recent than the other two.

Besides, there are very few cross-citations (lateral lines) between authors within the network. This emerges from the identification of the core publications (12 in total); these are publications that have at least a certain minimum number of citation relations with other core publications, taking into account that incoming and outgoing citation relations are treated identically. The 12 publications identified mainly coincide with the Networked Scholarship perspective identified in the prior phase.

With regard to the isolated publications (20), the situation is mixed between Digital Libraries and Digital Humanities, which means that there are little citations between these perspectives, and the work considering the construct of digital scholarship in these two areas is not cohesive.

To wrap up this part of the analysis, one could have expected a citation map clearly showing the three clusters Networked Scholarship, Digital Libraries and Digital Humanities consisting of publications reciprocally citing each other inside each view and with fewer citations across clusters. This does not seem to be the case. However, this analysis brings to light issues that are consistent with the prior analysis. The first is the low number of cross-citations, supporting the idea that the field of research is rather fragmented, which highlights that most contributions do not take into account the three disciplinary perspectives. The exception to the above consideration is provided by the publications belonging to the Networked Scholarship perspective, that is, those that explore academic professional practices and scholars. The existence of this cluster seems to confirm that scholars who study Networked Scholarship are actually more 'networked' than the others, and the identity of this field of research should and perhaps could be built on their shoulders. However, the weak connection with the other perspectives allows us to suppose that this group could be rather unaware of the contributions coming from the other two perspectives, their problems and their research agenda; as a result, we can conclude that interdisciplinary collaboration in this area is not strong enough.

4. Discussion and conclusions

This study was aimed at exploring and mapping a set of 45 selected papers on Digital Scholarship. Most of these articles aimed to define the concept and to study related phenomena ('in the wild'), that is, the academics' practices and the supporting infrastructures in a digital, open and networked context of activity. At first sight,

the authors observed the coexistence of several interpretations of the term, each reflecting different disciplinary research perspectives on the construct. Consequently, the whole study was set up to investigate Digital Scholarship by identifying the main research strands involved and their relationships, including common epistemological roots, reciprocal awareness, as well as key topics and concerns of the strands and their overlapping.

The results of the study show not only the fragmentation of research efforts across three main disciplinary strands of research but also a relatively low degree of cohesion inside each strand, which might be due to the early stage of development of this research field (even if the first paper dates back to 2004, the field actually took off around 2010). The three main strands, Networked Scholarship, Digital Libraries and Digital Humanities, seem to differ as to the disciplinary background (respectively, social sciences, information sciences and humanities). In spite of the isolation observed, our exploration revealed some partial overlapping through the thematic analysis of keywords, as well as the bibliometric maps of keywords. This probably indicates that research problems and discourses are connected to some extent. In fact, Networked Scholarship is connected with some of the assumptions of Digital Libraries, while Digital Humanities seems loosely connected to Digital Libraries and Networked Scholarship. The authors could not classify any paper at the interception of the three. The cross-citation map shows a rather fragmented panorama, rooted in some previous seminal books, with more citations between publications of the 'Networked Scholarship' strand and a few cross-citations between publications of the other two. Besides, there are a few citations between strands and very few citations between Digital Libraries and Digital Humanities. In this regard, the cross-citation map was not completely convergent with the researchers' manual classification and the thematic analysis: the isolation observed was even higher than expected.

The above considerations confirm that the construct of Digital Scholarship encompasses three strands of research with a rather clear focus and raises the question of whether there is a lack of reciprocal awareness, possibly preventing scholars to build on prior efforts, towards an interdisciplinary collaboration.

The division between the disciplinary fields contributing to the topic of digital scholarship hereby presented is not new in the literature and has been pointed at by several authors (Goodfellow 2014; Quan-Haase, Suarez, and Brown 2014; Scanlon 2011). However, this analysis contributes to the discourse by highlighting both the forms of fragmentation assumed by the literature and the existing attempts to overcome this fragmentation. Above all, the problem of coexistence of different Digital Scholarship definitions and the field conceptual fragmentation causes an entropic situation hindering further empirical research. For example, it makes it difficult to identify what is innovative and to put forward recommendations for practice (e.g. proposals for the training of scholars) and for policy-making (e.g. prioritising efforts of investment in scholars' career development, in supporting infrastructures and in the evaluation systems based on scientific productivity).

Another important issue relates to the values attached to the research undertaken across the three 'views' of Digital Scholarship. While many studies, particularly within the Networked Scholarship perspective, focus on the positive ethical value of open scholarship, based on avant-garde practices and pioneering scholars, other studies bring to light the lack of participation of scholars to innovative practices, emphasising the limited concern about the need for changing the practices of

scholarship as well as the attritions between innovation and tradition in academic research and teaching (Costa 2014).

Solving these issues requires an increase in the level of awareness among scholars, the adoption of convergent research methods and visions of the field and more interdisciplinary dialogue between researchers.

Notes

1. <http://www.vosviewer.com/>
2. <http://www.citnetexplorer.nl/>

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ANNEX 1 – references used for the literature review

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