



The impact of digital geo-iconography. Limits and potentialities of the use of online sources for the history of cartography

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Abstract

This paper is a step of a research project aiming at analyzing in an empirical, user-oriented perspective the perception of how online geographical tools impact on geographical research. In details, the article focuses on recently developed web tools in the field of history of cartography and outlines the implications, in terms of limits and potentialities, of digital cartography at an academical level. In such analysis, the paper also dwells on participatory tools and digital earth models as tools for history of cartography. For this purpose, the paper analyses the results of a survey conducted by asking academic scholars in history of cartography their perception of the limits and potentialities of recently developed tools. What emerges from the research is a widespread perception of a series of potentialities and at the same time a consciousness of many critical issues, especially for what concerns participative tools and GeoWeb resources. Digital tools have profoundly modified academic research, becoming in some aspects tools for its enhancement. Nevertheless, their undisputed merit is that they have drawn the attention of a wider public, albeit through messages that are sometimes misleading, to the map as a means of communication.

Keywords: Academic Research, Digital Resources, GeoWeb, Historical Maps, User Perception, Volunteered Mapping

1. Introduction

The developments and changes that have been registered since the 90s of the last century in the availability of digital data sources is unprecedented. In general, such a diffusion, concerning also the field of geo-historical-data, occurred simultaneously as the spread of Semantic Web technologies (Berners-Lee et al.,

2001; Meroño-Peñuela et al., 2014). Online cartographic resources for the study of the image of the territory are currently significant (and in some cases essential) tools used by researchers in several geography research foci, i.e. cartography, history of territory, landscape and urban studies, etc. At present, digital sources are perceived as fundamental instruments for sol-

ving geographical and historiographical problems concerning, among others, map epistemology, map functions and mapmaking techniques, the evolution of the territory, the evolution of organization and function of urban space, place names. Traditionally conducted *de visu* by directly searching and analyzing maps in libraries and archives, academic research has been progressively substituted by new web tools. The availability of digitized historic cartographies accessible on web portals – national, academic and civil libraries, etc. – has drastically changed a consolidated way of approaching maps, traditionally based on material links, to new ways of organizing, finding, and analyzing documents (Azzari, 2010).

Within the enormous, partially analyzed theme of the impact that recent web innovations have on scientific production in historical geography and history of cartography (Gregory and Healey, 2007; Ash, Kitchin and Leszczynski, 2018 among others), we have chosen to dwell on the tools providing free access online digital sources for history of cartography academic research. In fact, the last decades experienced both an exponentially growing effort to make high resolution digital cartographies available on web portals and innovative ways to organize the geographic digital knowledge have been registered in many countries and contexts. The evolution has represented an important challenge and opportunity for scholars and libraries, but it involved a series of changes (Boria, 2013; Goldberg et al., 2014). Such effort of mass digitization provides innovative ways for scholars to approach an enormous number of sources for studying maps, especially when these materials are fully distributed into the public domain. This process is bringing new developments in spatial analysis with their use in historical GIS projects (Gregory and Geddes, 2014). Furthermore, recent developments in mass digitization of old maps seem to have expanded the possibility of carrying out researches and finding unexpected relations among documents and inside the document. Finally, such evolution probably has a significant intellectual value in the sense of an idea generator for human geographers, “providing inspiration for what is map-able and

ways to represent space more creatively” (Dodge, 2017, p. 11).

Mass digitization has been accompanied by the spread of volunteered geographic information (VGI) (Goodchild, 2007) and GeoWeb (Elwood, 2010). In recent years, in fact, many kinds of sources for geo-historical information have been offered in the form of user-generated content in the context of the Web 2.0. In details, crowdsourced strategies have often been used for improving both information about available data – i.e. metadata – and getting available new geo-iconographical documents. The trend towards a “neogeography” – i.e. the attitude of non-specialized people creating maps and information about maps (Turner, 2006) – notwithstanding an uncertainty regarding the quality and accuracy of the VGI data, especially in remote contexts and less studied topics (Giles, 2005) – is nowadays a consolidated phenomenon, especially for geo-referencing (Borruso, 2010; Fleet, Kowal and Pridal, 2012).

At this point, the passage from a traditional search based on a logical taxonomy proposing a traditional index is progressively giving way to a relatively new model to find sources (Favretto, 2016). As far as organization of knowledge is concerned, it can be defined according to Kant, as an alternative to logical classification as those of Linnaeus, based on space and time. The former, linked to geography, classifying things according to the principle of closeness and proximity, showing us things that are placed the one next to the other, as they really are in nature, the latter being the telling of human actions determined by the laws of nature and orienting our intellect according to a substantial interpretation of the world leading to an objective reality (Kant, 1968; Farinelli, 2003). The impact of such a new organization of geo-historic online information based on a chrono-spatial interface on the research in history of cartography is still a scarcely attended field of study.

This essay follows a first study published in 2004 (Petrella and Santini, 2004) focused on the diffusion of internet resources in a geo-historical context. Focusing on the wide range of new possibilities and unexpected applications of innovative technologies concerning the study of the representation of the city, the former essay

proposed some criteria for a critical evaluation of the resources available on the net by analyzing a sample of web projects containing a wide range of maps. Most of these activities were pioneer enterprises promoted by both public and private universities, libraries, research bodies and other subjects whose main aim was to make reproductions of digitalized iconographic documents, particularly maps, accessible online. The first work has been re-elaborated a few years ago, inspired by a changed scenario of the potentialities of online resources in recent years: it seemed important a goal to reflect on the deep transformations that have been taking place in the last ten years (Petrella, 2014).

The present research aims both to analyze the perception of potentialities and limits by scholars of free online iconographic resources and to explain how scholars, at present use and conceive online resources for the history of cartography.

2. Tradition and innovation. Searching, connecting and analyzing iconographic sources in the participatory web

The transition from a traditional way of using the Internet – characterized by a substantial reproduction of traditional models and publishing techniques to new practices of creation and fruition of content in education, library and research domains – has been the object of many studies (Andersen, 2007; Goodchild 2007; O’Reilly, 2009 among others)¹.

¹ In this context, according to the current computer sciences literature, Web 1.0 age, we mean the traditional model of communication based on a one-way information structure (from the content generator to the user) while Web 2.0, that appeared between 2000 and 2009 is considered the first attempt to create user-generated contents: blogs, forums, first forms of social networks, etc. With Web 3.0, characterising the present age, we refer to the moment of a massive presence of active users into media. Web 3.0 tries to organize the way content is searched and viewed, by the user. The goal is to customize and optimize the online search by achieving the Semantic Web. Finally, Web 4.0 features a strong interaction between humans and machines. It is characterised mainly by the presence of massive data sets, augmented reality and infinite creative space (Chondhury, 2014; Noh 2015; Tripathi and Khumar, 2010). We use this ter-

Referring in detail to Web 2.0 technologies, Dan Cohen and Roy Rosenzweig provided a useful summary of what are commonly considered the positive and negative aspects of the Internet applied to geo-historical studies (Cohen and Rosenzweig, 2006). According to the authors, new perspectives in online sources are able to create connections among different people regardless of where they are located: thanks to user generated content, post Web 1.0 strategies in particular facilitate collaboration and interactivity among people and enable the development of augmented knowledge and learning; nevertheless many disadvantages and problems are obviously due to a certain insecurity and instability of the information and the limited time span of the contents, which become quickly unobtainable. Another critical issue lies in the quality of the resources. This problem is perceived as particularly important because of the intrinsic lack of editorial authoritativeness promoted by the recent developments on the web: its “democratic” and participative logic is antithetic to the principles of the academic research (Holman Rector, 2008).

Also in traditional contexts, the application of user-generated contents may activate processes that proves to be unable to guarantee the credibility of the source (Metitieri, 2009). Nevertheless, it is especially on the web that the crowdsourcing validating the most popular content would be totally illusory because a large majority of people are not able to track down the best contents, but only the most popular, that are selected by the number of inbound links (Lanier, 2010; Lovink, 2012; Turkle, 2011). Darnton also points out how the communication circle running from the author to the reader can be hardly transferred to Internet resources. It is particularly in the lack of warranty offered by an explicit point of view, the author, that we can find the greatest obstacle to an academic use of most of user generated sources (Darnton, 2009). What evidently appears in the literature on the subject is a systematic fluctuation between an enthusiastic approach to current trends, inter-

minology with the consciousness that as explained by Barassy and Treré (2012) at a level of lived experience of technologies, such a linear, theoretical periodization may prove to be overly simplistic.

preted as a progress factor, an attempt to solve the problems and limits affecting the traditional publishing, and a critical approach stigmatizing the new tendencies as dangerous in cultural and social terms (Noiret, 2011a).

The same, dualistic scheme may be applied when considering the operating criteria of a search engine like Google. Notwithstanding the enormous progress in its application, Tim Berners-Lee's idea of Semantic Web, a web context that is supposed to offer the concrete possibility of most advanced and refined researches (Berners-Lee, Hendler and Lassila, 2001; Shadbolt, Hall and Berners-Lee, 2006 among others) still seems to be utopian in its accomplishment at present. The sense of frustration when looking at the abundance of answers for queries in the field of geo-iconographic sources still causes an attitude of resignation and passive acceptance of the results placed at the highest hierarchical level, mostly far from being the most pertinent ones (Brophy and Bawden, 2005). The idea that the results presented as the most important are objectively the most pertinent for our research, for example, can be a real risk for those people less devoted to online historiographic search (Minuti, 2008), especially in didactic activity. And though some studies have showed that open participatory sources like Wikipedia could indicate a certain accuracy, especially in the case of most known and long articles (Blumenstock, 2008) the problem of the difficult search through an automated tool in the horde of online information still exists. The aforesaid problem is only partially solved by the continuous development of searching algorithms employed by Google and other search engines. These tools, in fact, pose some critical issues related to the way search engine selections and hierarchization of data is conducted (Brin and Page, 2012; Campbell Halavais, 2018).

As a consequence of the further confusion generated by the evolution of the web and the tendency to crowdsourcing, it is generally perceived that a partial solution lies in the education to the proper use of the network for academic purposes. As pointed out by Serge Noiret, competence in the use of digital sources, at least in Europe, should result in a widespread Information and Communication Technology (ICT) training system (Noiret, 2008).

3. Digital geo-iconography tools: analytical examples of a mostly non-academic context

The great transformations occurred during the transition from the era of Web 2.0 to that of Web 3.0 have been accompanied by a growing number of researchers using specialized, thematic Internet tools to find and analyze geo-historical sources (Crampton, 2009). That was the result of a strong diffusion of a variety of virtual tools ranging from meta-catalogs to GeoWeb and geo-collaboration tools compared to the situation in the past, a remarkable evolution in fact can be found in the number of sites whose resources are indexed in metasearch engines (Lynch, 1997), allowing the simultaneous query of several catalogs. Also in the geo-iconographical field, the most used are probably the KVK (Karlsruhe Virtual Catalogue [KVK] hosted by the Institute of Technology in Karlsruhe) and WorldCat – the global catalog of the Online Computer Library Center (OCLC).

In this context the specific field of history of cartography experienced a great development of old consolidated projects aiming at clustering for a wide coverage search of the maps, whose complex articulation is well outlined by Joel Kovarsky (Kovarsky, 2012). One of the oldest is certainly the IKAR Database of Old maps [<http://ikar.staatsbibliothek-berlin.de/allgemeines/english.html>], a collaborative project of several German libraries launched in 1985, containing over 250000 cartographic records; around 4500 digitalized maps are available for consultation.

One more important project is “The European Library” [<http://www.theeuropeanlibrary.org/>], an independent not-for-profit library services organization whose mission is to strengthen libraries across the continent and to be a benchmark for library data in Europe. However, the most representative for the exploitation of the potentiality of the Internet is probably Old maps online [<http://www.oldmapsonline.org/>], a transnational project indexing over 400000 online maps coming from 35 different institutions.

Another relevant phenomenon emerging in recent years is the increasing role played by open digital libraries collecting materials coming from a growing number of digital tools. They

ensure a connection among various virtual libraries, enabling researchers – as metasearch engines do – to find the required sources. In this field, the example of Europeana, an open digital collection containing materials from all over Europe [<http://www.europeana.eu/portal/>], is representative of the new tendencies linked to Web 2.0. In fact, Europeana is characterized by an open storage and fruition process concerning artistic works and heritage objects from 27 countries. On this website, users can find images, maps and manuscripts that can be visualized in different ways (following a chronological order, a place index, a map) and organized in an hypertextual structure that allows users different surfing options.

The multitude of online projects providing free online sources for humanistic research at present covers a vast subject area and offers an ever increase quantity of contents. The continuous growth of thematic repertoires such as Tony Campbell's Map History (www.maphistory.info), that can be considered a milestone for the scholars in history of cartography, witnesses the ongoing transformation taking place in the cartographic historical resources context². Such evolution of Internet databases and digital libraries in recent years has generally amplified and transformed the possibilities to conduct academic and non-academic research. The availability of a massive number of digitized documents in fact has increased the potential audience for the study of library collections: such tendency has made possible the creation of online structured catalogs that endeavored to combine the needs of researchers with those of a wider audience. Especially projects with a long tradition (at this level it is noteworthy that our analysis shows that more than 80% of the virtual libraries surveyed in our study carried out in 2004 are still active, despite the alleged fragility of the virtual content) are characterized both by an intensive activity of digitalization and a constant review of

the paratextual information related to documents (i.e. technical and scientific metadata).

What occurred to the well-known French digital Library Gallica (<http://gallica.bnf.fr/>) is symbolic for that purpose. This project, in fact, contributed to the digitalization of an enormous corpus of cartographic material preserved in the *Département de Cartes et Plans* of the French National Library. Furthermore, it has given the opportunity to launch a correction procedure of numerous author attributions and catalog data, most of them dating back to the first half of the last century. It is consequently remarkable that digitalization projects can be conceived also as a global intervention restructuring the entire process of map conservation, preservation and study.

The experience of the David Rumsey Historical Map Collection [www.davidrumsey.com], recently donated to the Stanford University Library, containing more than 150000 maps from 16th to 21st century is representative at that level. Allowing users to consult maps using a variety of advanced and intuitive tools, ranging from Google Earth to Second Life and the Luna Imaging viewer, (Jones, 2017), the David Rumsey Map Collection witnesses a certain tendency to elaborate advanced systems for the management of big data and at the same time visualization tools even for non-professional users (Figure 1).

At this level the development of advanced projects born with the aim of both preserving and promoting the fruition of their map collections and the knowledge of cartographic cultures for primary and secondary school students is noteworthy. It is the case, for instance, of the initiatives led by the Leventhal Map Center and the Smith Center for Cartographic Education, the former established at the Boston Public Library the latter at the Osher Map Library of the University of Southern Maine (<https://usm.maine.edu/osher-map-library>). Both the centers were conceived to promote academic and educational use of their cartographic heritage, collecting and preserving maps and atlases (Theunissen, 2007; Thonberry, 2017).

A further category of resources witnessing the development of free access quality images and inventory for the study of history of cartography is represented by some active projects carried out by map dealers. It is the case

² Created in 2001 as a section of the WWW Virtual Library (VL) project and regularly updated since then, Map History index is a thematic, analytical repertoire organized both by regions, themes and typology of resources, counting more than two thousand and five hundred links to cartographic resources described in their key features.

of the site www.raremaps.com owned by Barry Lawrence Ruderman Antique Maps collectors who started and crafted their collections, a commercial experience playing an important role in the diffusion of free high quality digital copies of antique maps (Figure 2).

The use of participatory web tools for georeferencing documents is progressively developing in virtual archives and libraries thus some well-known projects such as the David Rumsey collection seem to confirm that tendency also in the history of cartography field. The availability of easy-to-use applications such as Georeferencer for example, has allowed the David Rumsey project to have around 20% of its cartographic database georeferenced. This tool also provides a virtual *mappamundi* enabling the user to search the document on a cartographic interface. An analog example is the experience of the *Cartoteca Digital* of the *Institut Cartogràfic i Geològic de Catalunya* (Figure 3).

The aforementioned experiences outline how the issue of spatial data quality is an encouraging challenge in the field of volunteered geographical information. Nevertheless, the lack of quality assurance procedures and the lack of central coordination might represent a strong limit of these growing processes where, because of the lack of a significant number of volunteers involved, the so called “Linus Law” cannot be applied (Haklay, Basiouka, Antoniou and Ather, 2013).

The interest in cartographic documents by a wide public allowed the development of complex projects, whose advancements had an immediate impact on the research in history of cartography. Such an impact can be traced first of all, in the increase in the quality and quantity of available resources (with strong repercussions on the quality and quantity of research in the history of cartography) and, secondly, in the development of software and interfaces for viewing and analysing maps. The perception of the limits and evolution of such a digital world by history of cartography scholars is a focus of the following part of the article where the results of the empiric survey are shown.

4. The empiric research: methodology

One of the key elements that inspired this research was the attempt to understand how online resources containing free access maps are perceived by academic researchers; in particular, the research aimed to understand how the search of online sources is carried out in the digital world, the perception of the potential of online tools and, finally, the way those tools changed the way scholars conduct research. Consequently, a semi-structured questionnaire was submitted to a sample of history of cartography scholars.

The aim of the survey was to obtain a realistic picture of the world of contemporary history of cartography scholars. For this reason, the questionnaire was sent to all the 89 authors who wrote an article on the scientific journal *Imago Mundi* in the last eight years³.

³ In details, the questionnaire was sent by email using the Google Form tool. It was sent to the following scholars: M.O. Ahrens, James R. Akerman, Isabella Alexander, Mirela Altic, Joaquim Alves Gaspar, John H. Andrews, Pnina Arad, Peter Barber, C. Cody Bar-teet, Robert Batchelor, Luca Berardi, Stéphane J. L. Blond, David I. Bower, Catherine E. Burdick, Mario Cams, Genevieve Carlton, Mariarosa Cesari, Ian Chambers, Pilar Chías Navarro, Edward Collins, Delia Cosentino, Antonio Crespo Sanz, Marie Cronier, John E. Crowley, Gyuri Danku, Stephen Davies, Catherine Delano Smith, Veronica della Dora, Joost Depuydt, Catherine T. Dunlop, Thomas de Wes-selow, Martin Dodge, Matthew H. Edney, Patrick Ellis, Anders Engberg-Pedersen, Josipo Faricic, Junia Ferreira Furtado, Gabriel Granado-Castro, Federico Ferretti, Dori Griffin, John Walter Hawkins, Michael Heffernan, Rachel Hewitt, Hirotada Kawamura, Dirk Imhof Kimberly C. Kowal, James Krokhar, Morgane Labbé, Martin Lehmann, Laura Lehua Yim, Henrique Leitão, Denis Longchamps, Pedro Luengo, Annaleigh Margey, Julie McDougall Waters, Michael Martin, Sergio Mejía, Lena Mirosevic, Carme Montaner, Frederik Muller, Lory L. Murray, Alastair W. Pearson, Jonathan Pepler, Sandra Pinto, Antonio Sánchez, Ian James Saunders, Dmitry A. Schlegov, Zef Segal, Vera Segre, William D. Shannon, T. M. Smallwood, Richard H. P. Smith, Elizabeth Solopova, Stig Svenningsen, Dan Terkla, Luis Urteaga, Rafael Valdares, Marcel van den Broecke, Chet Van Duzer, Soetkin Vervust, María Isabel Vicente Maroto, Armin Wolf.

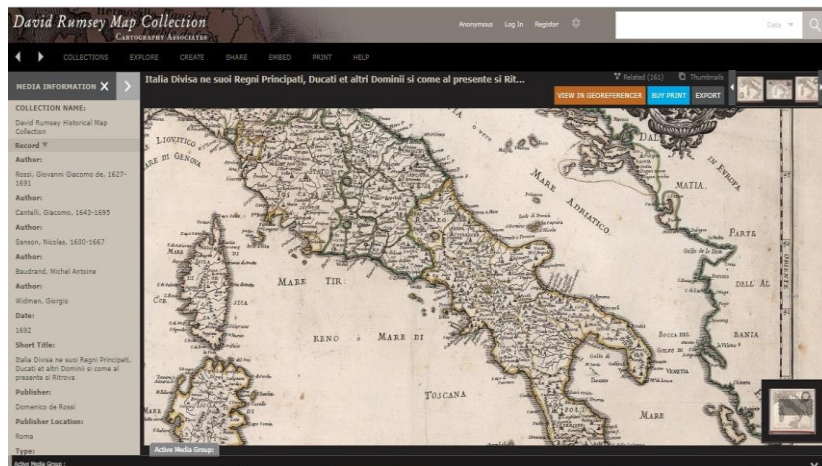


Figure 1. A Luna Browser visualization of the “Italia Divisa ne suoi Regni Principati, Ducati et altri Dominii si come al presente si Ritrova” by Giovanni Giacomo de Rossi. Source: David Rumsey Map Collection.



Figure 2. A detail of the satirical map “Carriers of the New Black Plague”, Baltimore, 1938. Source: www.raremaps.com.

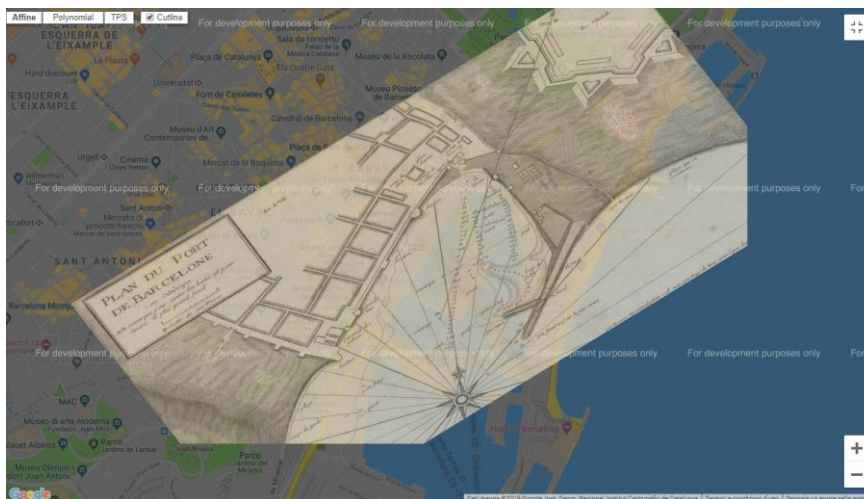


Figure 3. A georeferenced “Plan du port de Barcelone” by Jaques Ayrouard. Source: Cartoteca Digital of the Institut Cartogràfic i Geològic de Catalunya.

Imago Mundi was chosen as the only journal with a ranked impact factor dedicated exclusively to the history of cartography. The choice of *Imago mundi* has made it possible to select, among the various profiles of scholars who use maps for their research and didactics activity, those whose object of study focuses specifically on the map as a medium. The choice of this sampling methodology has allowed the identification of a small but highly representative sample of experts, that resulted to be varied in terms of age, nationality, scientific field of study and academic background⁴. This approach obtained the answers of 22 scholars.

In this first stage of empirical research, the number of interviews collected was considered congruous in order to proceed, parallel with an early, partial, quantitative analysis of the results, with the identification of a series of critical issues and with a first evaluation of the potentials of online resources. For this purpose, respondents were asked essay questions.

The questionnaire was divided into four parts: the first one, the personal data section, was notably used for a preliminary understanding and analysis of the characteristics of the sample (heterogeneity, representativeness, etc.); the second part, "Current use of online tools providing online sources" had a significant role in understanding the overall impact of online tools and sources in research activity; the third section, "Searching digital documents" was conceived with the aim of making an analysis of the most used tools to search for documents and of the perception of efficiency, limits and added values of these tools; finally, the fourth section, "Digital contexts and documents", the most extensive section and core of the research, was structured with essay questions. It attempted at evaluating the perception of current limits and potentialities of online tools with free access

⁴ In fact, despite a certain prevalence of responses from the 35-44 age group, there is an almost equal response among the other ages groups (25-34, 45-54, 55-64, 65+). The interviewees are 62% male and 38% female and come from 12 different countries: from the United States to Russia, from Chile to Australia. Their study interests, as well as academic background, vary widely; however, there is a certain prevalence of geographers and a strong prevalence of researchers from academic contexts.

iconographic sources, Digital Earth and participative tools. Quantitative data, in fact, were used to describe the overall trend of transformations taking place in the use of online sources.

5. Results

As expected, the "Current use of online tools" section has shown an overall trend towards the constant use of online tools for research: more than 40% of the sample declares that they always use online sources in their research activities; another 40%, instead, uses them very often. Very few interviewees, however, admit using them only sometimes. Confirming the importance of free online sources in research, 41% of respondents say online sources play a key role in the research profession, while more than 45% of respondents say they are very important.

The second part of the survey, on the other hand, deals with the problem of finding sources. Despite a clear majority of respondents who not surprisingly admit using always Google as a tool for the initial search of geo-iconographic sources, what is significant is the relevant role of digital collections and libraries search tools that are commonly used as a starting point for sources' research by 43% of the respondents. It is probably the sign of a perception of a trust in these resources by scholars. The finding of the queried source by using a search engine, in fact, is not always fully satisfying: in a scale ranging from 1 to 5, most of the interviewees (38%) choose 3. That is probably why the most reported feelings when searching online sources on a search engine are not optimistic: 36% of interviewees admit doubting about the efficiency of Internet tools for their research and 18% declare finding difficulties because the searched object is often hard to find in the sorted list. On the other hand, a positive perception is witnessed by 18% of interviewees who are satisfied with their online search engine researches (Figure 4). Moreover, the last question of the section, "How important are online search tools for discovering iconographic sources in your research experience?" reveals an important function of online search tools: its fundamental role in discovering documents whose existence was ignored.

The first question of the fourth section, “What kind of online resources do you use more frequently?”, witnesses a significant trust in digital map collections (86% of the answers) and in digital libraries (73%); on the contrary, the same question shows a fruitful but less developed exploitation of meta-digital library (32%). Finally, none of the interviewees declares to rely on virtual globe tools frequently. That could be interpreted as a clue of a relatively important perception of the use of such instruments for history of cartography research (Figure 5).

Dealing with the pervasiveness of online digital resources in research, what is notable is that only one of the interviewees think that the possibility to carry out a research in their field of studies without consulting traditional archives or libraries is possible; for 63% of the respondents, in fact, consulting material archives is still

fundamental. That seems to happen mainly as a result of the quantity of materials scanned in digital libraries and archives: about the quantity of sources available on digital tools, in fact, 48% of the respondents, in a scale ranging from 1 to 5, choose 3 as indicator of the level of satisfaction. On the contrary, other questions led to the understanding that respondents don’t seem to experience problems with the quality of online sources. 50% of the sample, in fact, prefers digital sources. This happens notwithstanding the intrinsic limits of digital analysis (i.e. lack of tactility, no possibility to see the document from a point of view, no possibility to do sensorial analysis of the materials, etc). Nevertheless, a certain number of scholars (32%) are still linked to the traditional fruition into the archives, still preferring material sources (Figure 6).

C3. What are the most important feelings when searching online geo- iconographic sources by a search engine?

22 responses



Figure 4. The perception of the utility of search engines when looking for iconographic sources.

D1. What kind of online resources do you use more frequently?

22 responses

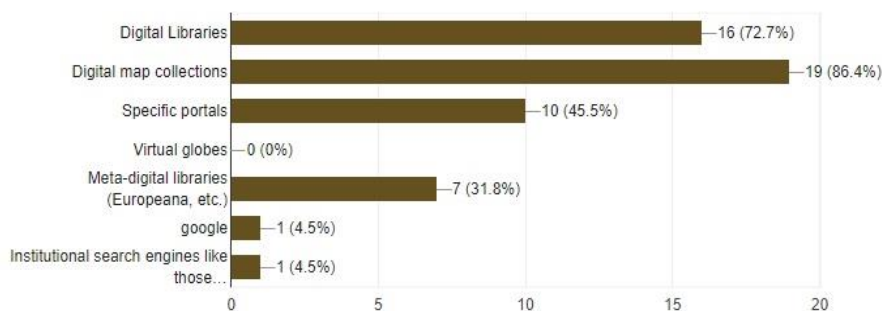


Figure 5. The most used kinds of resources.

D4. What do you think of the overall quality of online sources you find in your research experience in terms of fruition in comparison to material sources?

22 responses

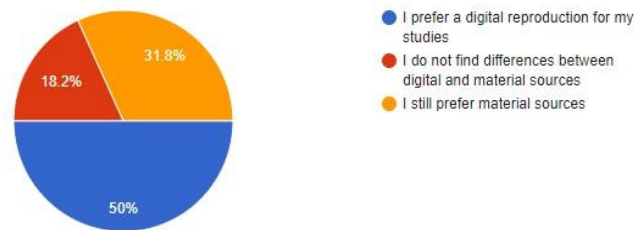


Figure 6. The fruition of digital sources in comparison to material ones.

The limits that the respondents detect in online digital sources are mostly due to the availability of documents: it has been often noticed, for instance, that the amount of available digital documents is still greatly reduced compared to the quantity of material ones. Other limits are linked to the quality of the tools: paywalls, copyright restrictions, low resolution, lack of information regarding such aspects as minute detail, accurate colour, lack of information about the reverse side of the document, and lack of sufficiently high quality metadata/cataloguing to allow a fruitful analysis and a contextualization of the document (the version of the image, whether it is contained in a book or not, the attribution of the authors in case of maps without names on it, etc). Finally, other restrictions are attributable to the intrinsic limits of digital maps: digital documents do not allow a full analysis of the physical features of the maps (quality of paper, paper treatment, watermarks, information about their use). Moreover, there are some basic risks connected to carrying out a research using digital: their availability might be dangerous in the sense that it could entail some “laziness” in searching primary sources with the risk of scholar abandoning material archives.

Nonetheless, many important values can be attributed to digital sources compared to material ones. They are related not only to the possibilities of immediate availability and an easier research, but also to the potential of these resources in making comparisons among documents and, above all, in finding unexpected

connections among various sources: this possibility is very important for 43% of the sample. In addition, online sources seem to be increasingly crucial as interactive tools for geographical and historical high education.

A question of the questionnaire also tries to make an overall assessment of the perception of restrictions of online tools. When asked “What would you suggest to make the quality of online iconographic resources more suitable for history of cartography research?” heterogeneous answers emerged. If a part of the interviewees reasserted that a major quantity and quality of scans are needed, another part focused on qualitative aspects of the tools to be improved: more contextual information is needed to ensure that maps are not analysed only as single documents and extensive meta-data on how the maps were produced (cartographer, illustrator, author, if there’s text, corporate sponsor, publisher, materials).

Also, the survey analysed the scholar’s perception of the impact of GeoWeb tools (digital earth models) on their research and teaching activity and, more broadly, on the spread of historical and cultural aspects of cartography. This aspect, in fact, has been considered particularly interesting in being applied to a context in which the sense and the analysis of the representation often prevails over the geographical-territorial datum. Although most answers show a tendency to perceive a certain importance of such tools in the history of

cartography fields, the reasons behind the answers tend to highlight both limitations and potentialities. Many answers tend to indicate that GeoWeb tools are important for spreading historic cartography culture as they help to understand that maps are more than simplistic images and, consequently, they help to spread disciplinary advancements. Their usefulness lies, moreover, in the possibility of displaying and analysing multiple sources without needing specific software. However, GeoWeb tools tend to be intellectually unproductive when the research is concentrated on map languages rather than in the historical evolution of territories. In fact, when analysing the effectiveness of GeoWeb tools for the history of cartography research, most of the interviewees avow not to be interested in those kinds of resources, often seen as dangerous. “Such interfaces – affirms one of the interviewees – seem to be useful when trying to find detailed images of a particular region, otherwise they could be misleading for several reasons:

1. Promotion of the spatial extent of early maps as their most important aspect, which is historically naïve.
2. Establishment of a modern spatial context for each map, denying the historically contemporary context.
3. Imposition of a metric of geometrical accuracy, which is generally irrelevant to understanding early maps (it may be relevant, but usually it is not)”.

Another perception analysed, focused on participatory resources. In details, the importance of crowdsourced resources as tools for history of cartography research was enquired. User-generated contents have been seen as not relevant tools for research. In fact, 44% of the respondents asserted that they are not important at all or of little use for research. Nevertheless, when asking to list the benefits of those kinds of sources, a series of important potentialities have been listed. It is the case, for example, of their ability to get society more involved with cartography and, above all, the possibility to find fascinating, intuitive tools and a significant amount of material for teaching. Moreover, it emphasises how crowdsourcing seems to speed up the timeline to get materials,

their role in identifying ephemeral materials that are not part of special collections. Therefore, although participative tools do not seem to be frequently used in academic research, their role becomes important when shifting the attention on “non-official” cartographies and when considering their impact on the spread of cartographic knowledge in the field of public geography.

6. Conclusions

The present work attempts to help bridge a gap in the present literature regarding the analysis of the impacts that the dissemination of online digital sources has on research in the history of cartography. The understanding of this phenomenon, in fact, is particularly useful on the one hand to establish guidelines, adapted to the context of digital repositories in general, on how they could be organized and structured to the best as tools for research and teaching, on the other hand the study helps to understand the impacts that the availability of free online sources has on academic activity. Finally, the study analysed the ways scholars approach and interpret resources that are in part alien to the academic context – i.e. participatory tools and the new forms of organization of geo-historical data that flow into the so-called GeoWeb or digital earth models. In order to interpret the phenomenon according to a user-oriented approach, the study involved interviewing 22 scholars who were asked to respond to a questionnaire aimed at understanding the perception of how online resources providing free cartographic material have changed the way they carry out their research. It was the first step of a study aimed to analyse the impact of web technologies on history of cartography. Further developments of the research will be carried out by focusing on the theme of metadata, participative tools and GeoWeb with the involvement of a larger sample of interviews, including other categories of specialists (librarians, web-projects managers, etc.). That approach could be useful to analyse the problem on a wider scale and at the same time to propose solutions to the critical issues that the present work has brought to light, especially for what

concerns metadata, participative tools and GeoWeb resources.

The present paper shows that the development of digital instruments for history of cartography does not have as sole consequence the immediate availability of the sources. The diffusion of these tools, in fact, used by a very high percentage of the sample, has first profoundly changed the way sources are searched. The research confirms that Internet is the first place where scholars search for cartographic sources. At this level it is important to note that the efficiency of research tools appear to be one of the major weaknesses identified by respondents, or at least one of the tools for which functional optimization to academic research seems necessary. Evidence of this is the fact that there is no search instrument considered authoritative for a satisfying research. Searching for a document implies both consulting search engines, specialized portals, digital libraries and meta-digital libraries tools. Nevertheless, the relevant role of digital collections and libraries search tools, commonly used as a starting point for sources' research, denotes a perception of a certain scepticism towards the most popular search engines by scholars.

However, the fundamental role of search tools in tracing sources whose existence was unknown emerges. This potential has, in some respects, profoundly improved the chances of fulfilling research activity.

Although scholars strongly point out the general scarcity of high quality metadata on how the maps were produced that would allow a more profitable and conscious use of digital resources (cartographer, illustrator, author, and if there is text, corporate sponsor, publisher, materials), the survey does not reveal a preference by academic scholars for the analysis of material documents but rather a tendency towards a use of both digital and material source for research. Exceptions are research in which the assessment of paper type, use, stains, etc., is relevant. For this reason, the digitisation of materials appears, despite the intrinsic limitations of digital copies, to be an important contribution to research. However, its limitation is identified by the fact that it induces scholars

not to attend traditional archives and libraries. As a result, scholars often end up giving priority to what is online and they tend to forget that the search for visuals in archives could lead to the discovery of new documents and to new paths of research.

The study also evaluated the perception of some types of resources traditionally associated with mass culture rather than the world of academic research: GeoWeb and participatory tools. GeoWeb models are thought to be of little use to academic research in the field of history of cartography. Though fascinating for teaching and for divulgation and important for the spread of cartographical culture in society, they are often seen as intellectually unproductive and misleading when researching and teaching focus on map languages because they place their attention mostly on geometrical accuracy and metric aspects of relative importance in history of cartography.

As far as participatory tools, despite a certain scepticism by scholars, considering these tools of not relevant role for research activity, they are considered useful and efficient for a series of possibilities that they offer: they turn out to be useful to find out a significant, although sometimes qualitatively inadequate, amount of material for didactical purposes and they play an important role in identifying ephemeral, previously unknown materials that are not part of special collections. Furthermore, such tools play a crucial role in getting society more involved with cartography. In this sense, GeoWeb and participatory tools represent a relevant, changing scenario for an open, public, history of cartography. The relationship between these tools and the scientific community represents in that sense an intriguing scenario.

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