Focus October 2020:

Research on Cultural Heritage in Tuscany: areas of research and analysis of skills

Abstract

Research on Cultural Heritage outlines a space of interdisciplinary activities that aims to improve the interpretation, protection and enhancement of cultural heritage, both tangible and intangible. Tuscany is certainly a reference point for research on Cultural Heritage, not only at a national level, but at a European level. For this reason, research skills in this sector appear to be strategic for the development and future positioning of Tuscany. This thematic study shows, through the analysis of research skills on Cultural Heritage, how scientific research is never easily classifiable and definable through a single interpretation, and how the analysis techniques tested within Toscana Open Research allow the research to be represented from different points of view.

In-depth analysis

The European program to support research and innovation in the period 2014-2020 (Horizon 2020, acronym H2020) identified a specific strategy to support research on Cultural Heritage called "Heritage Alive", aimed at exploiting the innovation potential of cultural heritage to protect it and to preserve it and, at the same time, to improve the socio-economic opportunities of the area. Cultural heritage is considered a strategic resource for the society of the future and for the economy, to be considered far beyond a simple *passive asset*[1]. In this perspective, the public administration and public policies in general have made an increasing effort to design tools and actions that are useful for strengthening the links between the world of research, the world of business and the world of cultural operators, considering this link as a possible multiplier of cultural and socio-economic development opportunities.

In order to improve the effectiveness of policies in this area, the Tuscany Region has equipped itself with a new tool that responds to the needs, requests and offers from the cultural world. The **"Technologies-Cultural Heritage and Culture" specialisation platform,** which was intended as an integrated method of coordinating the public system of skills to support businesses, resident communities and operators on transfer and technological innovation and technical, higher and personnel training matters, was established with Regional Council Resolution no. 815 of 24.07.2017,

[1] See Getting Cultural Heritage to work for Europe

referring to the relevant technologies and application areas in the sector of cultural heritage and culture in its broadest sense.

By establishing the platform, the Region intends to focus the strategies for the transfer of knowledge and technologies in the field of Culture and Cultural Heritage on clearly defined application areas that can be traced back to the needs for innovation and research, even potential ones, which emerge from companies and players from the world of culture. In these areas, the platform promotes and facilitates linking actions between research players and operators in the cultural and creative supply chain. In this context, the desire to **create an updated and in-depth catalogue of research and innovation skills in the field of Cultural Heritage** has emerged: Toscana Open Research represented the information base to support this in-depth analysis[2].

The method implemented within Toscana Open Research makes use of text-mining computer techniques that allow you to filter and carry out semantic searches starting from large textual contents[3], in this case scientific publications and research projects[4].

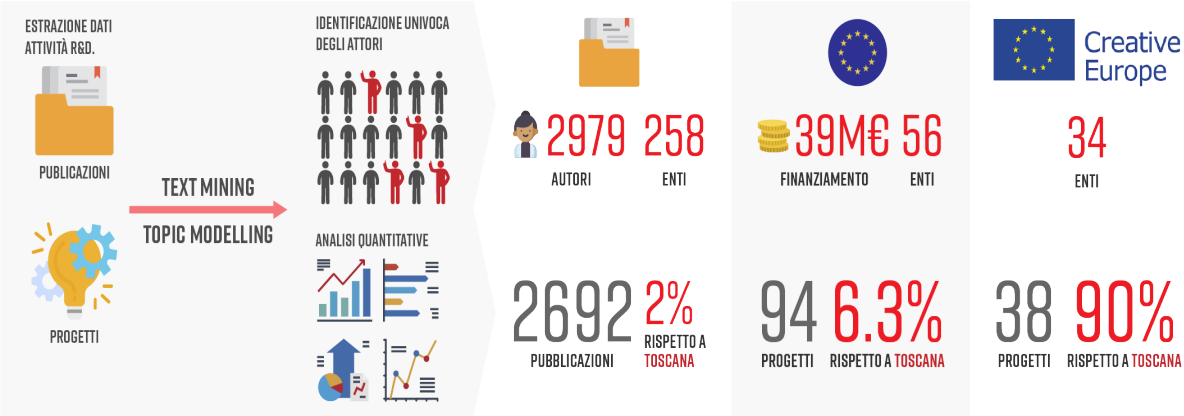


Figure 1. Infographic developed starting from data from ToscanaOpenResearch on the numbers of research on Cultural Heritage in Tuscany.

The main results of this analysis are presented in Figure 1. From the analysis of publications and research projects[5], **258 public and private organizations are active** in Tuscany that carry out excellent research in the context of cultural heritage, with almost **2,700** scientific publications, equal to about 2% of the regional production of scientific articles for the same period and contained in the database used for the analysis. This issue must of course be contextualized: for this study, the documents coming from a bibliographic database were taken into consideration, which mainly collects articles published in bibliometric journals - that is, which apply a selection process - generally in English. This bibliographic database may not be fully representative of the methods of presentation of the research

[2] The results of this study are extensively described in this IRPET study and integrated in the regional platform.

[3] To learn more, click here to view the ToscanaOpenResearch user manual.

[4] Other products such as patents, policy documents, news or other information with textual content can also be analysed.

[5] Data analysed for the decade 2008-2018.

results for some disciplines, such as, in particular, the humanities (certainly a very significant area for Cultural Heritage).

However, if we compare the volume of publications on cultural heritage in Tuscany surveyed by bibliometric journals with respect to all production on cultural heritage in Italy in the same types of journals, it appears that **Tuscan research contributes about 13% of all national production on Cultural heritage**.

The evolution of publications relating to Cultural Heritage in Tuscany, surveyed by bibliometric journals, is presented in Figure 2.

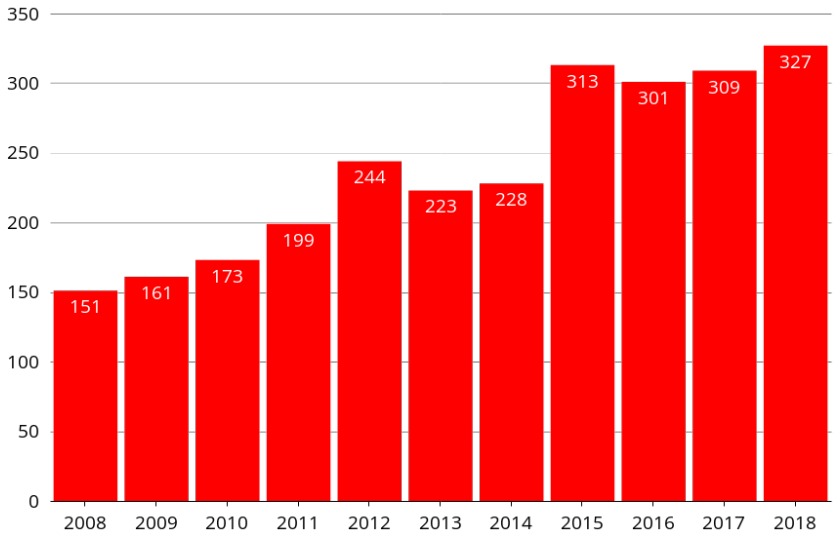


Figure 2. The evolution of publications relating to Cultural Heritage in Tuscany surveyed by bibliometric journals.

Another perspective of analysis is provided by the data on research projects financed by the European Commission through competitive tenders with a European dimension. The analysis of this data therefore allows information to emerge on cutting-edge research in a given field or sector.

Analysing the competitive research projects, we note that **over 6% of all European research projects carried out in Tuscany** (for all scientific fields, between 2008 and 2018) are related to the field of Cultural Heritage. Comparing these results with the national panorama, it is noted that the Tuscan research on Cultural Heritage is even more representative: the European research projects relating to Cultural Heritage carried out in Tuscany represent **19% of the European projects financed in Italy on Cultural Heritage, and funding obtained represent 16% of the funds** obtained in Italy, again in the context of Cultural Heritage.

The number of European projects in which Tuscany participates, by year and by type of program, is presented in Figure 3.

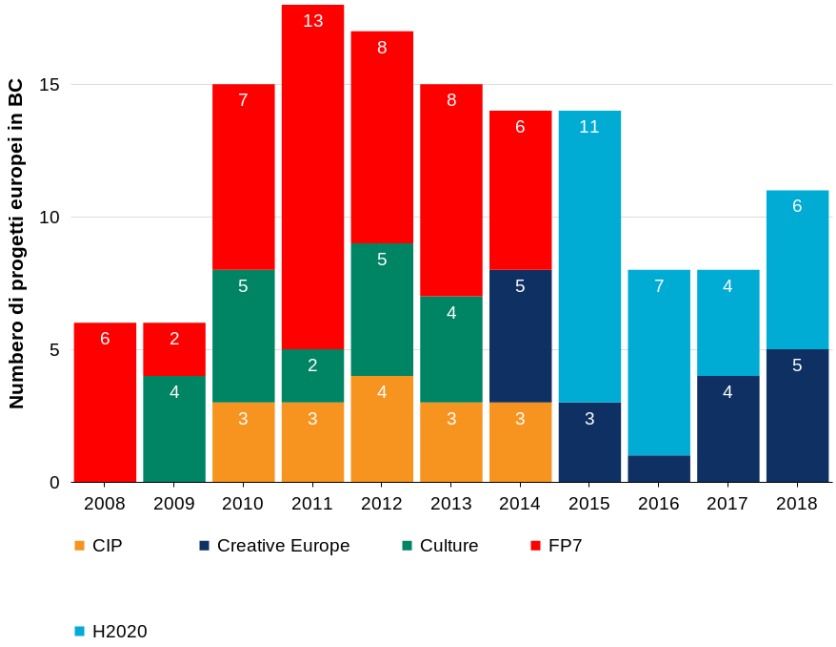


Figure 3. Number of European projects in the field of Cultural Heritage obtained by Tuscany by type of program.

Tuscany therefore ranks as **the third region of Italy** (after Lazio and only one percentage point from Lombardy) in terms of number of projects and quantity of resources intercepted on competitive European programs (Figure 4).

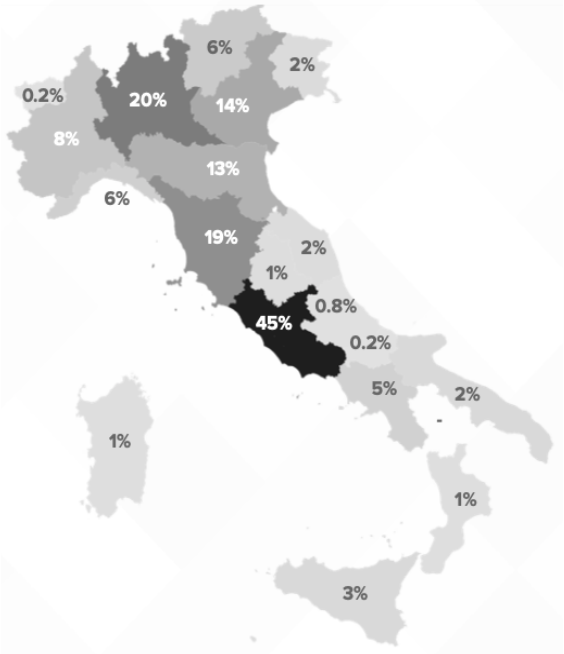


Figure 4. Percentage of European projects in the field of Cultural Heritage in which each region participates compared to the national total. Players from more than one region can participate in a project, so the total is more than 100%.

However, if we consider that the Lazio data also include European research projects in which national research bodies participate (e.g. CNR, INFN, INGV, etc.) which have their headquarters in the Capital (the so-called *headquarters effect*[6]) and that CNR alone represents about 10% of all Italian projects on cultural heritage, we can confirm the relevance of Tuscany at national level in this scientific field.

On the other hand, it is necessary to remember that in Tuscany there are Sections and Institutes of national research bodies that are very active in the cultural heritage sector; the Nello Carrara Institute of Applied Physics and the National Institute of Optics of the CNR, or the INFN LABEC, just to name a few. The numerous research projects carried out by these institutions, often in conjunction with other research centres and regional universities, are attributable to the Tuscan territory.

The excellence of Tuscan research on the cultural heritage front is also confirmed by the presence of the E-RHIS headquarters, the European infrastructure for Heritage Science, in Florence.

Once the perimeter of players, projects and publications relating to Cultural Heritage has been defined, the method developed in Toscana Open Research makes it possible to apply a series of "filters" and thus to analyse research on cultural heritage from different perspectives. The filters are derived from the elaboration of a series of controlled vocabularies, which allow to classify the textual contents of the abstracts of the projects and of the publications according to the needs and interests of the analyses.

[6] Toscana Open Research data refers directly to the European CORDIS database which only provides information on the registered office of the body involved, and not on the office that possibly carries out the project, which could be in another region or province.

For example, one of the classifications often used for the analysis of research skills are the so-called *Key Enabling Technologies* (*KET*). Key Enabling Technologies are considered fundamental for growth and employment since they allow the development of solutions or technological improvements through research experiences capable of feeding the value of the production system chain, through the innovation of processes, products and services.

The identification of Key Enabling Technologies at the service or developed in the field of research in Cultural Heritage therefore allows to highlight the transversal skills related to this research field. In this perspective, the Enabling Technologies used in the research on Cultural Heritage in Tuscany were analysed. The analysis shows that **ICT** technologies are the predominant ones both in publications and in research projects, with particular reference to the use of **artificial intelligence and geographic information systems**; but also **photonics, micro and nano-electric** technologies such as **3D photogrammetry or all diagnostic imaging**, which are very relevant (see Figures 5 and 6).

Figure 5. Classification of publications in Tuscany in the field of Cultural Heritage with respect to Key Enabling Technologies (KET)

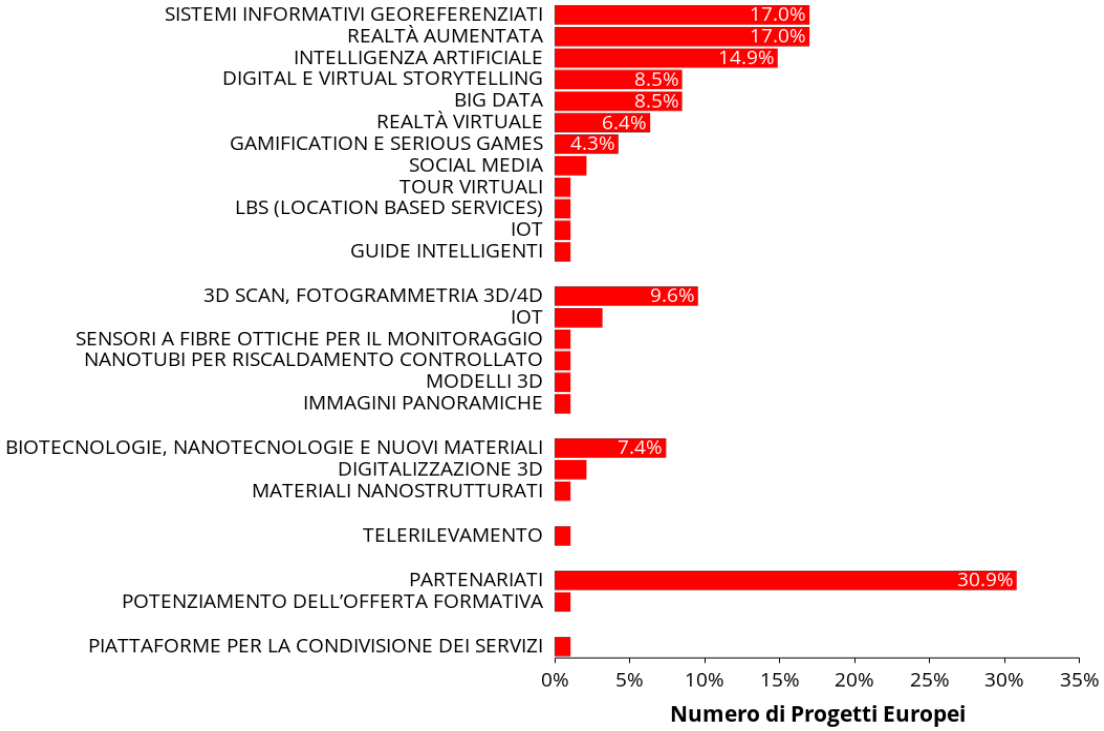


Figure 6. Classification of research projects in Tuscany in the field of Cultural Heritage with respect to Key Enabling Technologies (KET)

Another way of observing (and therefore "filtering") research on Cultural Heritage in Tuscany is with respect to the application areas of cultural heritage management, understood as areas in which research on Cultural Heritage is applied or aimed at. In this case we can observe the distribution of projects and publications (Figure 7) with respect to the different fields.

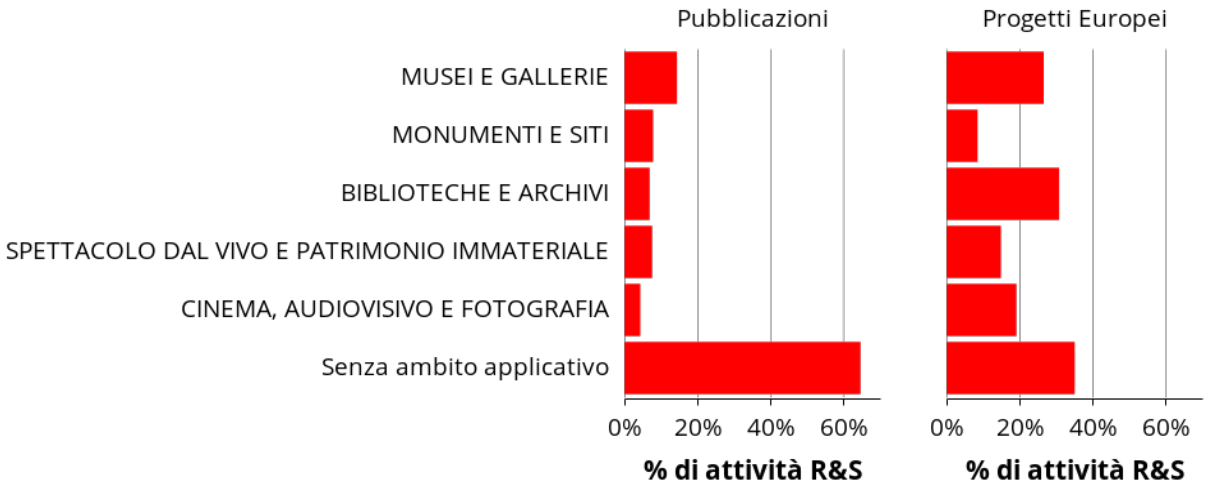
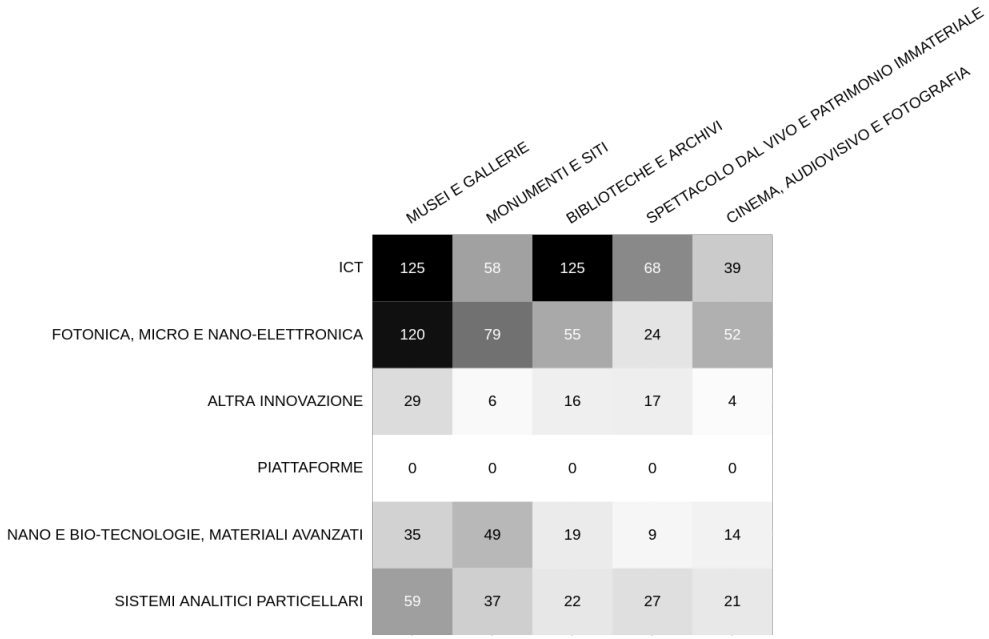


Figure 7: Percentage of research and development activities by application fields

In this case, it is noted that most of the publications relating to research on Cultural Heritage in Tuscany do not have a direct scope of application. This difficulty in associating publications with a specific field[7] is largely due to the fact that the publications of Cultural Heritage are often oriented to research of a theoretical or technical-methodological nature (not necessarily oriented to an area such as a museum or library or specific archive). On the contrary, in the case of research projects, it is noted that these are attributable to a plurality of application fields.

This is due to the very nature of the research projects, which aim to facilitate the application of basic research to specific problems of the management fields of Cultural Heritage. Among the areas of greatest application of research are the Libraries/Archives and Museums/Galleries.

If we compare Key Enabling Technologies with Application Areas, we can see which are the most frequent intersections (Figure 8).



[7] Correlation is derived through probabilistic techniques that analyse the occurrence of words and semantic proximity.

Figure 8. Number of publications with respect to KET and Application Areas

Specifically, the application of ICT technologies to "libraries and archives" and to "museums and galleries" is the most frequent combination. In general, ICT technologies are associated with objectives of digitization of cultural heritage, enhancement, dissemination and expansion of accessibility. In contrast, photonics and micro and nano-electronics, together with nano and bio-technologies and advanced materials, are associated with diagnostic, conservation and restoration objectives.

Finally, if we use the reference to the bibliometric[8] categories to which the scientific publications identified as relating to research on Cultural Heritage in Tuscany belong (Figure 9), we obtain a further representation of the complexity of competences at stake, in this case from the disciplinary perspective.

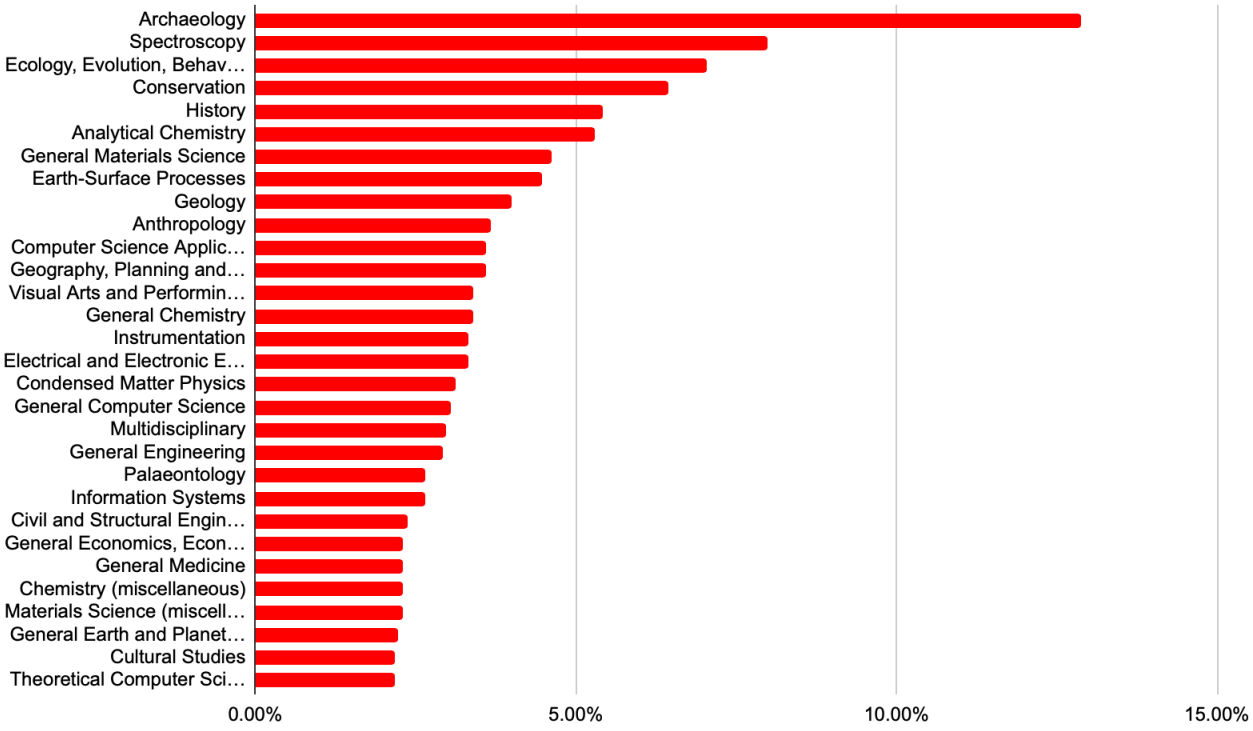


Figure 9. Distribution of scientific publications by bibliometric fields, relating to Cultural Heritage for Tuscany.

This thematic study on the analysis of skills in research on Cultural Heritage shows how scientific research, by its very nature, is never easily classifiable and definable through a single interpretation. Therefore, like any a posteriori classification, what is obtained is a subjective synthesis, aimed at a specific analytical goal.

[8] Each article is classified on the basis of the scientific journal in which it is published. Each scientific journal belongs to one or more bibliometric categories.

The *research portfolio* analysis techniques, tested here, offer great analytical possibilities, allowing to combine selections and filters that help to represent scientific research from different points of view.