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LAM-related research funded under Spain's national research agenda (2010 – 2020)

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ABSTRACT

This study analysed and contextualised research on LAMs (acronym for libraries, archives and museums) funded by the Spanish Ministry of Science and Innovation under competitive calls for projects from 2010 to 2020. The ultimate intention was to verify the existence or otherwise of a national research agenda on these cultural institutions. The initial search and location of Spanish Ministry-funded projects in official sources was followed by data processing and grouping by subject category. A total of 145 projects were analysed. The results showed LAM projects to be scant in number, highly varied in terms of subject matter, poorly funded, widely scattered across a number of areas of knowledge although with a prevalence of the humanities, and highly concentrated in certain institutions and disciplines. The subject-based analysis characterised LAM institutions, from the research perspective, as tools supporting other types of research but not themselves objects of study. None of the nationwide research plans was observed to include LAMs as a line of research. This study has essentially two practical implications. 1. It underscores the need for greater transparency among research project funding agencies; and 2. it defends the inclusion of LAMs among the items on a country's national research agenda deserving of funding to enhance awareness of their value, purpose and projects.

KEYWORDS: LAM, cultural policy, research investment, funding, Spain

1. Introduction

The study/analysis of research funding is instrumental to assessing any country's scientific policy. Such initiatives enhance transparency in public research fund management by determining the areas targeted, the relevance or quality of the subjects researched and the cost-efficiency of research processes (Tuffaha *et al.* 2020). Moreover, improving an understanding of financing patterns in different research domains is a matter of great interest to funders and policy makers (Álvarez Bornstein, Díaz Faes and Bordons 2019). As projects are normally the means through which (basic or applied) research is conducted, studying their characteristics helps identify research trends and opportunities by area and detect gaps in content in essential respects such as gender (Marcos Pablos, García Olgado and García Peñalbo 2018; Travieso Rodríguez and Ríos Hilario 2020; García Holgado *et al.* 2019).

Scientific articles, often the *raison d'être* of project funding, tend to be correlated to the impact of the investment in terms of citations and publication in journals of high standing (Wang and Shapira 2015). Analysing research funding is a complex endeavour that involves more than the analysis of its products (such as papers), given the widespread connotations and social implications of scientific study. As Bloch and Sørensen (2015) note, the rise in the R&D contribution to GDP over the last 25 years has turned political attention not only to improving scientific performance, but to heightening its impact on the public at large.

The growth of funding mechanisms and programmes and the number of actors involved (industry, companies, foundations and other social agents) have placed restrictions on direct governmental funding (Auranen and Nieminen 2010). As early as 2007 Sörlin identified other elements that change the funding paradigm: convergence toward wider-reaching projects in large research institutions and consortia (to the detriment of individual projects), the result being a concentration of research funding. Another outcome is the 'winner takes all' or Matthew effect generated by the interaction with elements such as human resources, scientific impact and collaboration (Álvarez Bornstein and Montesi 2020). That concentration of resources has prompted debate and analysis in the literature around the tendency among public research agencies to award ever fewer projects for ever greater sums (Ma, Mondragón and Latora 2015).

Despite the complexity of the research ecosystem and country development, systematic mapping and identification of the research projects that have been financed over time is a key to detecting where a country's or region's research agenda is headed.

What is and what determines a research agenda? It might be defined as a view of research that identifies knowledge gaps in practice and poses research questions of significance for the progress and influence of an academic field, discipline or area of study (Catelli 2021). Such agendas establish the reach and strategy and even the 'tone' of research and define core concepts irrespective of the subject matter to be addressed in future research and investigation (Miller and Blumstein 2020). They build on the relationship between public policy and research when defining new opportunities and how research needs are perceived in predominant fields (Ryghaug *et al.* 2021).

The object of study described here, the LAM agenda, is polyhedral. Broaching the presence or absence of a research agenda consequently calls for an understanding of its various components. The first, the disciplines covered, are generally labelled library and information science (LIS) or museum science (MS). Both have been pleading for years for research on such institutions, their management, processes and societal vision. In 2007 Goulding called for a national research agenda on LIS in the United Kingdom. The same demands have been made for

museums by a number of authors. Rounds (2007) called for an agenda jointly addressing research and professional practice in pursuit of new ways to study museums as organisations and their role in cultural systems. The literature seldom demands a joint research agenda for the three institutions comprising the LAM universe, however. One of the few examples is associated with the European approach to local cultural institution management defined in the coordinated initiative known as CALIMERA, whose purpose was to guarantee such institutions would benefit from the European Commission's overall objectives on the information society (Brophy and Butter 2007). The primary innovative component was the proposal for all local LAMs to work jointly. After the initiative was in place, Brophy and Butter (2007) proposed an exercise among all participants to identify the innovations introduced in each country. The idea was to create a shared road map on meeting research needs. Although no consensus was reached on the research priorities to be defined, CALIMERA members identified the essential targets as: citizen involvement, support for creative and learning processes, improved communication and more intense participation through interoperable technology development. LAM participation in European projects was also analysed by Van Hooland, Vandooren and Méndez Rodríguez (2011), who viewed it as a promising opportunity to both digitise collections and introduce long-term research strategy and management.

The vision of LAMs in the agenda proposed by Brophy and Butter is particularly relevant, for it focused on them as institutions in their own right rather than on their potential role as an ancillary tool or in digitising their collections (i.e., digital library) (Travieso Rodríguez and Ríos Hilario 2020). That approach was indisputably innovative, inasmuch as LAMs are normally viewed as non-academic partners that support research endeavours, usually participating in projects through informal mechanisms with no formal, open-ended agreements. That in turn has had undeniably adverse implications for assessment (Olmos Peñuela, Molas Gallart and Castro Martínez 2014), while reinforcing their invisibility in projects. Freeman and Soete (2009) discussed that state of affairs, citing by way of example the *Frascati Manual* (OCDE 2015) that excludes 'the preservation, storage and access to knowledge and scientific collections through libraries, databases and repositories' from R&D (241), for it deems such tasks as core responsibilities incumbent upon LAMs as institutions.

Such research invisibility was also detected by Wiegand (2003), who called for broadening and upscaling the LIS agenda through interdisciplinary studies that would strengthen their position in society (more specifically in the United States, through 'American Studies').

LAMs are essential in today's society. Their public status, guarantee of access to information and defence of accurate information to counter falsehoods make them a democratic fortress that rests, as Klinenberg (2018) notes, not only on values but on shared spaces.

The present article analyses and contextualises government-funded research projects addressing Spanish LAMs in 2010-2020, identifying existing trends and subject matters and determining whether there is a 'research agenda' on these cultural institutions. The ultimate goal is to defend LAMs' role as an object of research meriting an agenda for their study and exploration to enhance awareness of their value, tasks and projects while assessing their social implications.

2. Review of the literature

The literature discussed hereunder has been separated into two series to identify the particulars involved in understanding LAM funding in Spain. The first addresses the R&D+I funding

mechanisms in place and the second the LAM acronym and libraries, archives and museums as a joint object of research.

2.1 Research funding in Spain

Nationwide, Spanish research is funded essentially with allocations from the national budget. Consequently, any crisis or recession impacts the country's ability to raise the amounts earmarked for that purpose. Over the last 20 years researchers and national research body managers have engaged in a constant struggle to further and increase national R&D+I funding. The paucity of research investment, with a total of 1.2 % of GDP in 2018, has set Spain at quite a distance from its neighbours: the mean is 2.4 % in the OECD and 2.07 % in the European Union (Mediavilla and Parellada 2021).

The relevance of R&D+I in the political agenda is one determinant of that situation, together with the enactment and implementation of appropriate legislation to ensure coordinated action by the private and public actors comprising the system.

The National Scientific Research and Technological Development (R&D) Plan, umbrella covering the research projects analysed in this article, was created under the 1986 Science Act, one of the first legislative proposals put forward by the Socialist Government elected in 1982. The aim was to define the legal foundations on which to build a new science and technology system. Subsequently, competence in scientific policy was devolved to the autonomous region¹, which have established their own research plans and procedures for attracting and hiring talent.

The national plan has been the 'basic tool for programming, furthering and coordinating Spanish science policy' (Morillo Moreno and Álvarez Álvarez 1998, 71) in the last 40 years and continues to be a key for analysing the concerns addressed in the research conducted.

Developments in scientific realities in Spain have required regulatory changes to respond to the issues listed in Act 14/2011 of 1 June on Science, Technology and Innovation:

- Need for better coordination of regional R&D+I systems and cooperation with the nationwide system
- Adaptation of Spain's legal structures to the construction of a European research space
- Introduction of improvements in research financing and assessment tools
- Furtherance of more adaptable research careers in terms of mobility and international collaboration.

Aforementioned Act 14/2011 also instituted improvements in public-private collaboration in innovation, stressing elements such as the importance of the private sector's role and knowledge transfer. It introduced a landmark in the area of public disclosure and transparency by requiring reports of studies conducted with public funds to be published under open access arrangements.

One of the particulars that distinguishes the act from its predecessor is that, while respecting researcher freedom, it calls upon the national and regional governments to direct and coordinate scientific research policy. In contrast, the 1986 act made no provision for the State to prioritise any given subject matter (Bernardo 2016). Such objectives and priorities match those set out in European research plans (Rodà 2017).

Spain's Science, Technology and Innovation Strategy (EECTI) identifies such priorities, with particular emphasis in its present (2021-2027) edition on the subject groupings set out in Horizon Europe: health; culture, creativity and inclusive society; civil security for society; digital,

industry and space; climate, energy and mobility; and food, bioeconomy, natural resources, agriculture and environment.

A considerable share of the funding offered under the present (2021-2023) National Research, Technology and Innovation Plan is awarded through yearly competitive calls inviting researchers to submit their requests for project funding. Awards are not announced swiftly and once they are, the actual funding may not be forthcoming for up to a further nine months.

The vision conveyed by researchers, some of the prestige of Patricia González-Rodríguez (Batres 2021), is that 'Spain is short on funding and long on bureaucracy: project approvals are late in coming and even later in materialising. That makes research in Spain an obstacle course.' The situation is even more precarious as concerns funding for areas such as the humanities and social sciences. The humanities in particular have been observed to benefit scantily from public research funding. The 2000-2003 National Plan, for instance, allocated just 1.84 % of the total to research in the humanities, although the number of projects accounted for 4.38 % (1068 of the 23 859 approved). That translates into a paucity of human resources devoted to the respective areas in Spain, in practice limiting the field to professionals able to forge a career as university researchers (FECYT 2007, 14-15). That situation has remained unchanged to date,

as corroborated by official statistics. Domestic spending on R&D actually declined relative to the gross domestic product (GDP) after peaking in 2010 at 1.40 % of GDP, steadily dipping to a nadir of 1.19 % in 2016. In 2017 it began to rise slightly (to 1.20 %; ICYD 2018, 180). And in fact by 2020 the percentage had increased to 1.41 % (EPDATA 20219).

Despite that precarious trend, with Spain's mere 1.41 % earning it 25th place worldwide in spending on innovation and development relative to GDP, the country was the eleventh most productive in terms of papers published (over 105 000). Moreover, the findings reported were cited 30 % more frequently than the mean and Spain ranked 21st in terms of the number of patents awarded (Flores 2022). Those data are clearly indicative of good results in quantity and quality, despite the low level of investment in innovation and development compared to other developed countries.

2.2. Libraries, archives and museums: LAMs as object of research

LAM would conceptualise a joint reality referred to the cultural heritage, grouping under a single heading the three institutions that disseminate, preserve and heighten the value of collections for the public at large. Despite their distinct institutional characteristics and singular histories, given their role in disseminating and favouring culture such so-called 'collecting institutions' (Rasmussen and Hjørland 2021) can be suitably deemed a threesome for the purposes of both joint study and inter-comparison.

The acronym, intensely explored in both the scientific literature and in terms of digitisation (Audunson *et al.* 2020), signifies an interdisciplinary field of research that crosses strict institutional boundaries in pursuit of common elements in the cultural heritage, broadly conceived (Davis and Howard 2013). Broaching LAMs jointly, then, affords the three with boundary-spanning institutional status as sites for joint innovation and learning within their respective communities (Williams 2002; Gibson and Hanson Baldauf 2019). They also play a joint and essential role in creating social capital, strengthening democratic values and raising public participation, a feature stressed in research on their role in the public realm in Nordic countries (Larsen 2018; Audunson *et al.* 2019). The decline in the use of physical collections, in combination with the rise in digital resource consumption and virtual visits to their facilities have

contributed to their consideration as low intensive meeting places (Audunson *et al.* 2020). That view of LAMs based on the redefinition of the value of their space is essential to justifying their status as recipients of public funds in countries such as Finland, Sweden and Norway (Audunson *et al.* 2020). Another recent line of research has emphasised the advisability of viewing the threesome jointly when defining new social structures in technological spaces such as smart cities (Taher 2022).

One of the matters that has received particular attention in research on LAMs but for the time being has had fewer practical implications is 'convergence' (Huvila 2016; Warren and Matthews 2019; Tamaro, Madrid and Casarosa 2012; Rasmussen and Hjørland 2021; Askin 2015). The reasons justifying such convergence include the similarity in the primary objective, collection creation, along with potential digitisation, their status as 'memorial institutions', their uncertain conceptualisation by the general public (i.e., failure to distinguish between library and archive) and LIS professionals' ability to serve in any manner of documentary institutions. Another argument in favour of such convergence is economically motivated (Vårheim, Skare and Lenstra 2019). Other convergence drivers are better user service, more effective support for research, the implementation of technological developments and economic and administrative efficiency, as noted by Rasmussen and Hjørland (2021).

Given the sparsity of options for convergence at the management level and the lack of empirical data that might guarantee institutional viability, collaboration and alliance-building appear to be the most suitable approach to enhance the recognition of LAM importance. Such collaboration would involve creating joint digital collections, developing cross-disciplinary professional skills or sharing headquarters buildings. That would explain the growth in the use of the acronym in the context of collection reuse through linked data (Méndez and Bueno de la Fuente 2015; Saorín, Peset Mancebo and Ferrer Sapena 2013) particularly with respect to the roll-out of EUROPEANA, a single website for accessing the digital collections custodied by European cultural institutions, primarily libraries, archives and museums. Studies on the enhancement and improvement of such data as primary support for research on digital humanities are another approach to the joint analysis of LAMs (Zeng 2019).

Even though the abbreviation LAM embraces institutions intensely financed with public funds since European cultural policies were first introduced, their relative presence on national research agendas is in need of analysis. No such analysis has yet been forthcoming in national research projects. The study introduced here, unprecedented in Spain in terms of the objectives pursued and methods employed, aims to reply to the following research questions.

RQ1. How are LAMs viewed and treated in Spain's research agenda?

RQ2. Which disciplines have studied these institutions?

RQ3. What are the prospects for future research on LAMs?

The answers to those questions with data and hard evidence will contribute to the debate on the need to publicly fund LAMs and persuade funding bodies of the legitimacy of such action.

3. Methodology

This paper provides an overview of the research on LAMs funded by the Spanish State under the R&D+I projects approved by the Ministry of Science and Innovation in 2010-2020. The methods deployed to respond to the research questions posed consisted in locating the projects funded and their subsequent processing and division into subject categories.

The scant clarity or ease of locating much of the data required prompted exploration across various official sources of information to contrast its accuracy.

The first step was to locate and select the R&D+I projects funded in the decade analysed under nationwide competitive calls in connection with three programmes: 1. R&D+I Geared to Societal Challenges; 2. Furtherance of Excellence in Scientific and Technological Research; and 3. Knowledge Generation and Fortification of Science and Technology. The Spanish Research Agency's (hereafter referred as AEI, the Spanish initials) search engine was used for that purpose. A total of 162 projects was retrieved when the fields title, keywords and abstract in the 'aid awarded' section were searched for the terms library, archive and museum.

The search engine proved to be particularly useful for locating the projects of interest here. Although the AEI was created in 2015 under Act 14/2011 on Science, Technology and Innovation as the institution accountable for the projects funded, their results and management procedures, it had access to data prior to its creation and consequently on projects approved throughout the period analysed.

Information was also sought on the outcomes of Ministry of Science and Innovation² calls during the same period, although as no data were available for either the last or the earliest years, the inquiry was confined to the period 2013-2019. The outcomes for that period were analysed to verify the information in the AEI database and fill out data where missing. Further verification of the information on projects benefiting from funding was obtained from RECOLECTA (Spanish acronym for 'open science locater'), a nationwide platform compiling national open access repositories. It groups all Spanish digital infrastructures where research results are published and/or deposited. Errors were nonetheless detected in this tool, which listed many projects that had not in fact been funded. Such inconsistencies provide an indication of the complexity of the methodology deployed here, which extended beyond obstacles such as difficult-to-retrieve hidden information on funded projects and the dearth of information on older projects.

The projects retrieved were subsequently analysed and selected. Seventeen of the initial 162 were disregarded, for although at least one of the three search terms (libraries, archives, museums) was present in the title, abstract or keywords, a review of the abstract confirmed their lack of relevance to the subject at hand. The data on the 145 projects selected were then organised into tables with the column headings listed below, the same as the main fields in the AEI database with the exception of the sex of the principal investigator (hereafter PI), which is not provided in that source:

- Project reference
- Year of award
- Subarea (discipline) assigned
- Project title
- Beneficiary institution
- Regional affiliation of beneficiary institution
- Funding awarded
- Keywords
- Principal investigator sex

The AEI does not provide the name of the PI, the person responsible for concluding the project funded and directly accountable to the funding agency. Consequently, researchers had to be located with the Google search engine one by one to substantiate data on gender, using the

project reference and title. Those searches, which also involved querying department and project websites, CVs, and universities' research and professionals' web pages, did not suffice to identify the PIs for all the projects analysed. Similar studies reported the same obstacles when analysing the variable sex, although without furnishing information on the methodology used to locate such information or its source (Olmedilla *et al.* 2013, 716).

The selection of the keywords used to classify LAM-related projects into subject categories was based on the present PI's qualitative analysis of the abstract. The aim was to verify the presence of subjects, words or concepts in the content and their meaning in context (Arbeláez and Onrubia 2014, 19), a procedure in keeping with the methods deployed in other studies involving subject content analysis (Díaz Herrera 2018). The title and keywords selected by the PI were then used to identify the subject area of the respective project. The ultimate purpose was to define labels or dimensions which, once systematised and classified, could identify the subjects generally addressed by the research analysed to subsequently establish trends and shortcomings.

One limitation to this study was the lack of a mandatory thesaurus for standardising the terminology used by project PIs, who on occasion were found to use the terms library and archive inappropriately. That informed the aforementioned withdrawal of projects that while containing references to those terms, had nothing to do with LAMs.

An inductive classification of the 145 projects selected, based on their titles, keywords and abstracts, yielded the three main categories discussed below.

(1) *LAMs as object of research*. LAMs conceived as institutions in their own right constituted the object of research in the projects so listed.

This category included projects researching the features of archives, libraries and museums such as their social value; challenges faced; their role in education; their management, efficacy, innovation and resilience; the applied technologies used; and the conservation and preservation techniques deployed.

(2) *LAM constituent elements*, meaning the study or analysis of the items comprising LAMs. Such projects perceived LAMs as institutions supporting or mediating in other types of research.

The most common example was the study of widely diversified archive, library or museum collections whose organisation, analysis, compilation, classification, digitisation and so on by those institutions made them readily available for use by researchers conducting other studies.

(3) *Creation of new digital information systems* such as digital libraries or archives, databases, corpora and so on. The projects benefiting from funding were deemed to further the preservation and dissemination of and access to data, works and other resources via the establishment of digital resources such as databases and corpora. All afforded free and unrestricted access to a wide variety of materials (photographs, maps, print books, manuscripts and similar), generally on a website designed as a project asset. The projects listed under this category sometimes used LAM nomenclature (i.e., digital archive or library) that differed from the recommendations set out in the professional and academic literature. The variety and casuistic of the names assigned are elements of interest to determine researchers' conception of LAMs as digital information infrastructures.

With a view to verifying the existence of a LAM agenda, the planning and programming documents issued by the ministries responsible for defining Spain's National Science and

Technology System priorities were also consulted and cited in the respective sections of this paper.

4. Results and discussion

The 145 projects analysed were distributed fairly evenly across the three types of institutions: 55 dealt with archives, 45 with libraries, 44 with museums and one with both archives and libraries. Those numbers denote no significant differences, although archives were the institutions that benefited most in general, irrespective of the specific subject addressed.

Analysis of the data processed informed the following discussion of project variables.

4.1 Breakdown by year

The 145 LAM-related projects accounted for 0.40 % of the 36 050 projects funded in all disciplines during the period studied. That number reflects the sum of all projects funded under all the calls included in the three nationwide programmes cited, further to the official AEI statistics available.

The yearly breakdown is graphed in Figure 1. The number of projects peaked in 2011 with 21 and 2012 with 20, and then declined fairly steeply until 2014, when just eight were awarded. Other studies analysing research projects on LIS, for instance, also reported a drastic downturn in the number of projects, attributed to budgetary cost-cutting across the board (Travieso Rodríguez and Ríos Hilario 2020, 5).

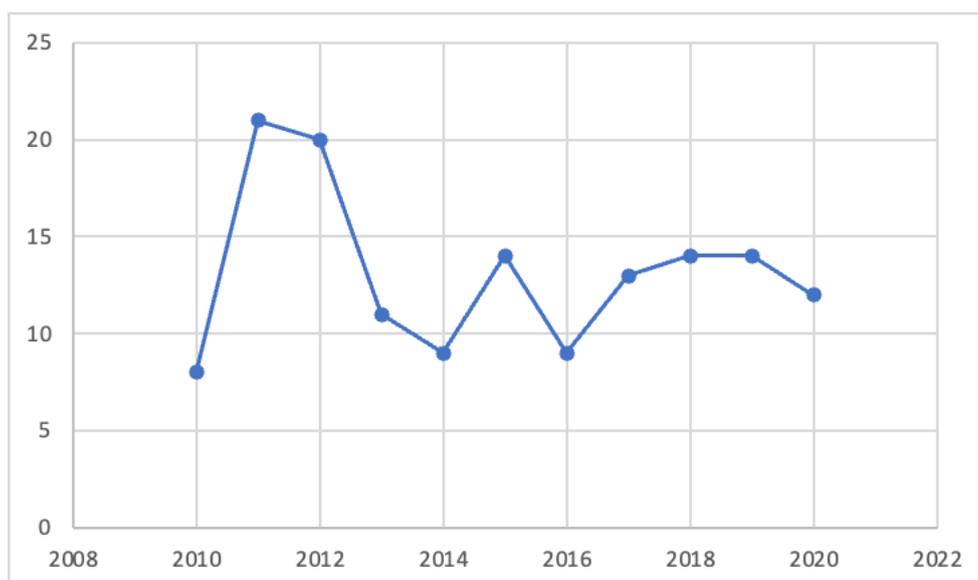


Figure 1. Variation in number of LAM projects, 2010-2020

4.2 Project breakdown by affiliated subarea or discipline

Here the most outstanding feature observed was multi-disciplinarity, particularly in the humanities, which clearly prevailed. Information science is not listed under any of the 53 subareas into which the AEI divides its 19 subject areas (Ministerio de Ciencia, Innovación y Universidades 2015). The AEI's subareas have been regrouped and redefined over time, the tendency being to broaden the base to embrace more subjects. Art, for instance, initially labelled 'Art, plastic arts' was later renamed 'Art, plastic arts and museum science'. PIs are required to

choose the subarea with which their projects are associated. The ones assigned to the 145 LAM projects analysed are graphed in Figure 2.

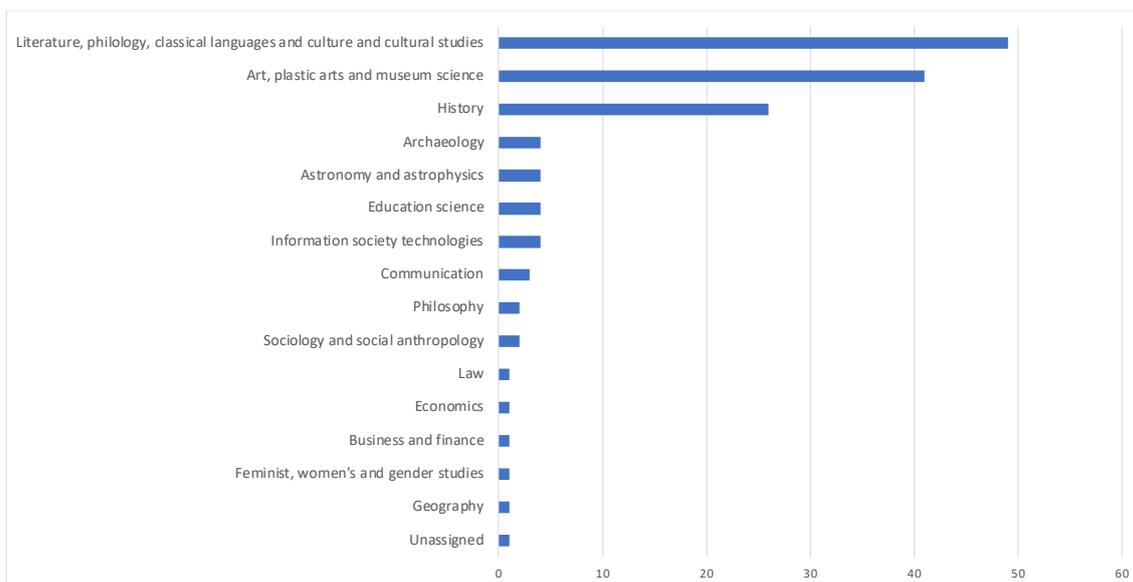


Figure 2. Project breakdown by affiliated subarea or discipline

Further to the graph in Figure 2, LAM projects were associated primarily with the humanities and especially with literature; philology; classical language and culture; and cultural studies; followed by art, plastic arts and museum science; and history. Nonetheless, research was conducted under projects affiliated with a wide variety of other disciplines, including law, economics and sociology to name a few, as well as art history and the plastic arts, the last two in particular in connection with museum science. That relationship was also observed by Travieso Rodríguez and Ríos Hilario (2020) in their analysis of LIS research projects in Spain. Many of the same disciplines were likewise identified in an overview of digital humanities-related research in Spain (Toscano *et al.* 2020, 17). The interest in any event lies not in the disciplines from which LAMs were researched but in the fact that the projects were conducted by researchers and experts from different disciplines. The outcome, genuinely multi-disciplinary teams, is another particular not envisaged in the official sources queried.

The relationship between LAM projects and the LIS area from which these institutions were studied is difficult to determine, given their absence in the AEI database, even though the database description of the social sciences cites library and information science as one of the disciplines to which such research is related. Hence LIS PIs tend to choose communication, listed under the social sciences, as the subarea with which their projects are affiliated, due primarily to the fact that the listing of assessors in that field includes LIS researchers. Communication, in turn, was ranked as under-represented in the research projects awarded, having received only 1 % of the total allocated to the social and legal sciences (Caffarel Serra, Ortega Mohedano and Gaitán Moya 2017, 223). The paucity of LIS projects affiliated with communication has likewise been stressed (Travieso Rodríguez and Ríos Hilario 2020, 9). The present analysis also revealed that only three LAM-related projects were affiliated with communication and therefore with LIS.

4.3 Breakdown by subject category

Further to the project content-based subject classification established, LAM projects were distributed across the three categories discussed below.

Features of LAMs as object of research, 27 projects

This label covered 44 projects on museums, one on archives and one on both libraries and archives. In other words, museums clearly predominated in research focusing on:

- Social, cultural and educational value
- Preservation and conservation
- Education on the heritage and museum science
- Management particulars
- Challenges posed
- Institutional communication
- Technologies and collection virtualisation to enhance access
- Specific institutions such as the National Museum of Natural Science

The sole project on archives revolved around the role of colonial archives in the recreation of history, whilst the one jointly addressing libraries and archives sought a tool to measure the management transparency of those institutions based on information available on their websites.

LAM constituent elements, 64 projects

This was the category with the largest number of research projects dealing with LAMs.

The approach to the collections varied from one project to the next, with the following the most frequently observed:

- Study of collections to recreate a specific historical period or social movement, such as those on feminism, naturalism or the Viceroyalties of the Indies.
- Classification, retrieval or reconstruction of personal information or private archives pertaining to individuals or institutions. Projects related to personal collections included celebrities such as Alfredo Adolfo Camus, Pedro Garhel and writer Emilia Pardo Bazán. Studies on institutions often addressed collections on specific subjects, such as the Spanish National Library's collection of engravings and drawings, the National Archaeological Museum's bronzes or Medieval documents on the Cistercian order.
- Application of new technologies to improve LAM collection queries, visualisation and use. These projects applied 3D technology to visualise and conserve museum collections or instituted new ways to read archive collection documents.
- Other approaches to LAM collections were also observed, albeit more marginally, such as author copyright or the role played by managers responsible for preserving written memory throughout history.

One prominent feature of this subject category was the wide variety of types of documents and museums constituting the object of research, including cuneiform tablets, paintings from different historic periods, musical collections, new artistic media (art media collections), photography, cinema and artistic book binding.

Creation of new digital information systems, with 54 projects

The *ab initio* creation of a digital information system on a subject or historic figure was denominated in a number of ways by researchers. The ones appearing most frequently were

digital library (26), digital archive (20) and database (2). Others such as corpus or virtual museum were also used. These digital products were the same as identified in other studies on digital resources created in the course of digital humanities projects (Toscano *et al.* 2020, 17).

Whilst such digital resources constitute a gateway to the cultural and scientific heritage, as many diverged from the organisational and classificational criteria generally used, they lacked features characteristic of LAMs such as catalogues or document retrieval.

The subjects most prominently addressed in the digitised collections hosted by these new digital information systems included the following:

- Works affiliated with specific literary eras or periods, such as the works dating from the ‘Siglo de Oro’, Ovidian plays or Goldoni theatre performances
- Collections concerned not with periods but with subjects such as Catalan literature, Medieval literature, lexicographic publications essential to Spanish philology, texts on the Indies, Avestan writing or the heritage of the exile following the Spanish Civil War
- Systems affording access to other types of collections such as astronomic data, artistic practice, artistic heritage scale models or even documents on sherry wine.

The last two categories covered a total of eight projects whose PIs chose ‘digital humanities’ as one of the keywords. Indeed, technology and humanistic knowledge converged in such projects, as in many others characterised by similar circumstances but not so classified. That was so despite their general conformity with what Hall (2011, 1) understood to fall under this new dimension, i.e., studies that ‘involve [...] being engaged in digital media production, practice and analysis. Such activities may include developing new media theory, creating interactive electronic archives and literature, building online databases and wikis, producing virtual art galleries and museums or exploring how various technologies reshape teaching and research’. Whether researchers did not feel they were working in that field or whether they bore in mind the significance that, according to other authors, should be afforded what is labelled ‘digital humanities’ could not be determined. In addition to the relationship of such studies to technology, the inference is that they pursue new interpretative models or new disruptive paradigms for understanding culture and the world (Rodríguez Ortega 2014, 13). Cuartas Restrepo (2017, 72), also referring to the plurality of definitions currently in place, noted that digital humanities ‘merge the knowledge-related purposes sought through the mediation of information technologies. The result has been a diversity storage procedures, comparisons and knowledge transfer’.

The short number of projects located here as identified by the respective PI with the digital humanities is not consistent with reports such as authored by Hernández Lorenzo (2020), who detected a long list of such projects in Spain, particularly in connection with Spanish literature. The possible explanation for the discrepancy may lie in the fact referred to earlier whereby not all communities of academics working in this discipline identify with that label or that its use is relatively recent (Toscano *et al.* 2020, 2 and 20). In the projects analysed here, the term was first used in 2015.

Significantly, one of these projects is a meta-search engine that attempts to retrieve individual digital collections in libraries and archives. It aimed to counter the reality observed by authors such as Franssen (2020) regarding the traditional epistemological fragmentation in the humanities that denotes the need for greater partnering and interdisciplinarity among the various research agendas in place in humanities subdisciplines.

4.4 Investment

The total invested in the 145 projects analysed, dating from 2010 to 2020, amounted to €6 427 797. The breakdown by amount awarded is given in Table I. Over half the projects (79) lay in the €20 000 to €50 000 bracket, a range typically observed in LIS projects in a similar period of time (Travieso Rodríguez and Ríos Hilario 2020, 7). The €10 000 to €20 000 and €50 000 to €100 000 brackets accounted for 26 projects each. Only nine were awarded the highest amount (over €100 000) and just five the lowest (€10 000). Astronomy was the subarea with the greatest number of projects benefiting from the largest sum, followed by history, philology and technologies.

Table I. Research projects by amount of funding awarded

Amount funded (€)	No. of projects (n=145)	%
>100 000	9	6.16
50 000 - 100 000	26	17.8
20 000 - 50 000	79	54.1
10 000 - 20 000	26	17.8
<10 000	5	3.42

Hardly any of the AIE's reports on results contained yearly statistics on the breakdown of funding by the agency's own subject areas and subareas. The exception was the report for 2018, which carried information indicative of the lower investment in humanities- and social science-related areas, mentioning the short number of applications received from those areas. The facts and figures on the Spanish university system (from 2011 to 2020), in turn, stated that the lowest sums awarded under national R&D+I programmes were recorded for the 'management area' humanities and social sciences. The sums involved nonetheless rose once the programmes geared to societal challenges and knowledge creation were implemented, although such increases were consistently narrower than in all other areas.

In other words, although these data were drawn from information on LAM research funding, investment intensity could not be judged, for no similar studies were identified with which to compare data on funding by subject area or draw the respective inferences. Clearly, however, at 0.44 % the percentage of overall funding hosted by these projects was negligible, mirroring the low investment scenario generally applicable to the humanities and social sciences as reported for other countries (García 2004; Enago Academy 2019). Complaints have therefore been consistently levelled against the scant financing received by the 'liberal arts' (defined to mean the humanities and social sciences) relative to hard science and technology, while demands for more generous resourcing for these disciplines have been made in a number of countries. By way of example, the social sciences and the humanities each accounted for approximately 1 % of all research spending at the University of Boston in 2019. Non-scientific disciplines, including business administration or communication and law, among others, received 4 % (Jahnke 2020). According to a paper by Toscano *et al.* (2020), the interest in digital humanities seems to have given rise to a variety of funding agencies, some in the private sector, willing to invest in related research.

4.5 The gender perspective in LAM project leadership

The data on gender in project leadership drawn from a variety of sources revealed that more men (73) than women (52) headed LAM projects. Although less prevalent, co-leadership

exhibited the same pattern: five projects were co-headed by men and two by women. Mixed co-leadership was also observed, with five projects headed by a man and a woman. Due to the difficulties involved in finding the relevant data, the PI could not be identified in eight projects, for which the leaders' gender could not be defined.

The uneven distribution of LAM project leadership by gender observed here is consistent with earlier findings (Olmedilla *et al.* 2013, 721). Women submitted and were awarded fewer research projects for structural reasons. Their projects were also funded less generously and their success rates relative to the number of applications was lower than in men (Cruz Castro 2021, 6 and 16). Further to the report entitled 'Científicas en cifras' [female scientists, facts and figures], 'although the proportion of female researchers submitting proposals in calls for R&D projects has risen, they are less successful than men (43 % vs 48 % in 2019) and receive proportionally less funding'. Whether or not that is applicable to LAMs was difficult to determine, for no information could be located on the number submitted per call, although the values for project leadership clearly revealed differences. A number of recommendations have been made to elude this situation, such as the appointment of more women to assessment committees (Tarrach 2003, 95), and echoed in official documents such as the guidelines for conducting gender-sensitive research (Comisión Europea 2009). The AIE's (2021, 1) First Gender Equality Plan, designed to enhance equality, suggests 'furthering the balanced presence of men and women in decision-making bodies and processes related to R&D+I activity funding'. Nonetheless, such proposals are either not being conscientiously applied or are not as effective as assumed. The causes of gender imbalance must consequently be explored and attempts made to reduce their impact.

4.6 Institutions benefiting from LAM project funding

The primary beneficiaries of LAM project funding were universities and National Research Council bodies, to which the largest number of projects were awarded. Mention must also be made in this regard, however, of other institutions such as royal academies, institutes, foundations, specialised bodies and private companies. The institutions whose projects were approved and funded in the period analysed are listed in Table II. The three universities that ranked highest in this respect were UCM (Complutense University of Madrid), UB (University of Barcelona) and USC (University of Santiago de Compostela). In the context of the link between LAMs and LIS, both the UCM and the UB offer degrees in library and information science applied to cultural institutions, particularly archives and libraries, and to a lesser extent, museums. Other universities where such degrees are also on offer are listed among the most favoured institutions: Carlos III, Granada, Salamanca, León, Valencia, Zaragoza and Corunna (Table II). A possible inference is that LIS researchers and educators found the procedures for obtaining resources more accessible when studying LAM-related issues.

Traditionally, museum science was a requisite in the curriculum for a Spanish BA in the plastic arts, humanities, art history, social and cultural anthropology and occasionally in LIS (Carrión Santafé 2006, 39). With the redefinition of degrees, however, it has been repositioned as part of the MA programme.

The non-existence of any relationship between LIS and museum science (MS) can be deduced from the separation of training in the two areas and the scant interdepartmental collaboration. It is likewise inferred by the near absence of jointly authored papers and event organisation or journals explicitly covering both fields of knowledge. A study by Hider and Kennan (2020) on the actual situation in the United States, Canada, United Kingdom, Australia and New Zealand revealed a similar pattern.

Table II. LAM project funding beneficiaries, 2010-2020 [shading denotes universities offering degrees in LIS]

Institution	No. projects	Autonomous Region
UNIVERSIDAD COMPLUTENSE DE MADRID	23	Madrid
NATIONAL RESEARCH COUNCIL (CSIC)	13	Nationwide
UNIVERSITY OF BARCELONA	11	Catalonia
UNIVERSITY OF SANTIAGO DE COMPOSTELA	11	Galicia
CARLOS III UNIVERSITY OF MADRID	6	Madrid
UNIVERSITY OF SALAMANCA	5	Castile-León
AUTONOMOUS UNIVERSITY OF BARCELONA	5	Catalonia
UNIVERSITY OF ALCALÁ	5	Madrid
UNIVERSITY OF CORUNNA	5	Galicia
AUTONOMOUS UNIVERSITY OF MADRID	4	Madrid
UNIVERSITY OF CASTILE-LA MANCHA	4	Castile-La Mancha
TECHNICAL UNIVERSITY OF VALENCIA	5	Valencia
COMPUTER VISION CENTER	3	Catalonia
ESTEBAN TERRADAS NATIONAL AEROSPACE TECHNOLOGY INSTITUTE (INTA)	3	Nationwide
UNIVERSITY OF CADIZ	3	Andalusia
UNIVERSITY OF CORDOBA	3	Andalusia
UNIVERSITY OF GRANADA	3	Andalusia
UNIVERSITY OF VALLADOLID	3	Castile-León
UNIVERSITY OF ZARAGOZA	3	Aragón
UNIVERSITY OF OVIEDO	2	Asturias
UNIVERSITY OF SEVILLE	2	Andalusia
TECHNICAL UNIVERSITY OF MADRID	2	Madrid
UNIVERSITY OF GIRONA	2	Catalonia
TECHNICAL UNIVERSITY OF CATALONIA	2	Catalonia
AIGUES DE BARCELONA EMPRESA METROPOLITANA DE GESTIO DEL CICLE INTEGRAL DE L AIGUA, S.A.	1	Catalonia
OPEN UNIVERSITY OF CATALONIA FOUNDATION	1	Catalonia
FUNDACIO PRIVADA JOAN BOSCH	1	Catalonia
VALENCIAN INSTITUTE OF CONSERVATION AND RESTORATION OF CULTURAL ASSETS	1	Valencia
SAN FERNANDO ROYAL ACADEMY OF FINE ARTS	1	Madrid
UNIVERSITY OF ALICANTE	1	Valencia
UNIVERSITY OF HUELVA	1	Andalusia
UNIVERSITY OF JAEN	1	Andalusia
[CATHOLIC] UNIVERSITY OF DEUSTO	1	Basque Country
UNIVERSITY OF LEÓN	1	Castile-León
UNIVERSITY OF LLEIDA	1	Catalonia
UNIVERSITY OF NAVARRE	1	Navarre
UNIVERSITY OF VALENCIA	1	Valencia
UNIVERSIDAD INTERNACIONAL DE LA RIOJA SA	1	La Rioja
NATIONAL DISTANCE UNIVERSITY	1	Madrid
JAUME I UNIVERSITY OF CASTELLÓ	1	Valencia
ROVIRA I VIRGILI UNIVERSITY	1	Catalonia

Another matter of interest is the distribution of project approvals by institution location in Spanish autonomous regions. Further to the data found, the three regions benefiting the most were Madrid (58 projects), Catalonia (28) and Galicia (16), whilst the following three were Andalusia (13), Castile-León (10) and Valencia (8). All other regions were awarded from one to four projects. A review of the AEI reports showed that the regions benefiting from the largest number of awards (AEI, 2008-12; AEI, 2013-16; AEI, 2017-20) were Madrid, Catalonia and Andalusia in that order, with the exception of the final period when Catalonia ranked first ahead of Madrid. That pattern was largely consistent with the territorial distribution of LAM project approvals.

4.7 Presence of LAMs in ministerial plans

The documents on planning and programming issued by the ministries vested with defining Spanish National Science and Technology System priorities make no specific reference to subject areas, but rather focus on the lines of action to be adopted to face the challenges posed. That constitutes an obstacle to establishing any relationship to the LAM agenda. Two documents were issued in the period addressed hereunder. The first defined the strategy for two four-year plans (2008-2011 and 2012-2015), identifying six objectives (FECYT 2007, 5-7) that made no mention of areas of knowledge or preferred subject matters:

- To position Spain in the knowledge avant-garde
- To further a highly competitive business fabric
- To integrate national domains in the Science and Technology System
- To heighten the Science and Technology System's international dimension
- To create an environment favourable to R&D+I investment
- To establish suitable conditions for scientific and technological dissemination

The second, Spanish Science, Technology and Innovation Strategy in 2013-2020, instituted the following strategic pillars (Ministerio de Economía y Competitividad 2012, 32):

- Development of an environment favourable to R&D+I
- Knowledge and talent aggregation and specialisation
- Knowledge transfer and management
- Internationalisation of Spain's science, technology and innovation system and its agents
- Regional specialisation and development of innovative and competitive regions
- Generation of an innovative and enterprising scientific culture

This second document defined research in the social sciences and humanities to be cross-disciplinary, stating that 'it will form an essential part of scientific-technical research and the innovations to be developed in pursuit of solutions to the challenges facing society' (Ministerio de Economía y Competitividad, s.f., 27). Many of the proposals were expected to be disruptive, with significant effects on consumption habits, community living, behaviour, leadership and socio-political relations.

Unlike these two planning documents, the one following them in time for the period 2021-2027 (Secretaría General Técnica del Ministerio de Ciencia e Innovación 2021, 128-130) clusters prospective action into six subject areas:

- Health
- Culture, creativity and inclusive society
- Civil security for society
- Digital, industry and defence
- Climate, energy and mobility
- Food, bioeconomy, natural resources and the environment

Three lines of research are proposed under the second cluster (culture): human evolution, anthropology and archaeology; cognition, linguistics and psychology; and Spanish philology and literature. Further to Spanish Act 16/1985 of 25 June on Spanish historic heritage, LAMs are listed under the heading heritage, which lies under the third of those lines.

An analysis of LAM projects furnished the replies to the research questions posed. The answer to *RQ1* was that LAMs were scantily represented in the research funding on offer in the period studied. Since these institutions were not included in ministerial planning documents, they had

no agenda. By identifying key subject area, funding and institutional dimensions, the findings provided a snapshot of LAM research in Spain. The results also showed that judging from the two subject categories most frequently addressed, LAMs were treated as tools ancillary to other types of research. Projects on LAMs as an object of research per se, the first subject category, was the one with the sparsest presence. Moreover, museums were the institutions most intensely studied and deemed as distinct from the other two both by researchers and society in its perception of their importance in the social and economic fabric. That distinction was observed in projects conducted from areas such as economics, sociology or education. Such treatment was not afforded libraries or archives, even though the social value of the former has been clearly substantiated (Romero Sánchez, Hernández Pedreño and Gómez Hernández 2021).

The ancillary nature of these projects can be clearly deduced from the answer to *RQ2*, according to which philology was the most prominent area, in connection with the creation of digital libraries, archives, databases and corpora designed to facilitate researcher and other interested party access to certain essential documents and sources. A similar connection was observed by Travieso Rodríguez and Rodríguez Hilario (2020). Sparse LIS participation in this type of research underscores the need to broaden and strengthen the alliances between these research teams in a variety of subject areas.

As these findings show, particularly relative to subject category 3, LAM collection digitisation has afforded an opportunity for and driven project approvals. Nonetheless, the digital products forthcoming are at times at risk of disappearance due to scant long-term sustainability and preservation planning (Kretzschmar and Gray Potter 2010; Edmond and Morselli 2020). Consequently, in reply to *RQ3*, LIS professional participation in the design, detailing and implementation of these projects is deemed essential. In addition, the present authors support Rasmussen and Hjørland's (2021) contention that digitisation is not the sole point where such institutions might converge. Theoretical studies and proposals are needed that delve more deeply into their social value, beyond the merely instrumental view depicted by the present findings.

5. Conclusions

The first conclusion drawn from this study is that LAMs have benefited only sparingly from yearly competitive public funding. No nationwide planned agenda with LAMs as a line of research is in place. Rather, it is the researchers themselves, interested in conducting specific studies, who determine the agenda after their projects are approved for funding. Given that LAMs form part of a country's cultural heritage, a clearly cohesive element, and that the findings of research focusing on these institutions are potentially applicable to other fields (such as protection of the environment, the pharmaceutical industry or quality control), the significant technology transfer involved (Criado Boado 2008, 10-11) should be an additional incentive for policy makers to further research along those lines from any standpoint or discipline. Studying such institutions from the social sciences and the humanities is valuable and such research has been shown to play a role in health, demographic, cultural and climate change, as well as in resource efficiency and green and comprehensive transport, for it entails analysing socio-economic issues, prospective studies and prospective technology.

As revealed by the subjects observed here to be addressed in the projects analysed, LAMs are viewed primarily as research-related tools. Their status as social tools able to offer all citizens a service that contributes to social well-being and personal as well as sustainable development has been insufficiently studied. Their inclusion in the SDGs nonetheless stands as proof of that

status. They should form part of scientific strategies and cultural public policies to rise to post-pandemic challenges such as climate change and environmental deterioration, migration, epidemics and gender issues, among others.

One improvement that could be made to encourage studies similar to the one described here would be to afford readier access to project information by the funding institution, in this case the ministry. The absence of information on their implementation and results needed by systems implemented to enhance transparency and accountability, stressed in other papers (Pacios, Vianello and Rodríguez Bravo 2016), is a failing that obliges researchers to undertake tedious searches that do not always yield results.

Despite the prevalence of the humanities in studies of LAMs as an object of research, judging from the full listing of the disciplines engaging in that endeavour they are a field of interest to many others, a fact that favours inter-disciplinary exchange. Such interdisciplinarity, while initially beneficial, may also translate into fragmented research. That, Toscano *et al.* (2020) contend, can be attributed in part to the organisational rigidities in place in Spanish universities that foster such silos. Those authors also identify a need to create ad hoc research structures that interconnect these disciplines and guarantee genuine convergence in long-term research on LAMs.

Notes

¹ In Spain an autonomous region, of which there are 17, is an entity comprising one or several provinces characterised by specific territorial boundaries, legislative autonomy and executive competence in all matters not common to the country as a whole.

² This is the ministry's current name, which has changed under successive administrations. The denominations found throughout the text are drawn from the source cited in each case.

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