

# Chapter 6

## Research Support at University of Porto Libraries

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### **EXECUTIVE SUMMARY**

*This case study describes the research support services provided by the libraries of the University of Porto (U.Porto). The university is composed of 14 teaching units (each with its faculty library), and each faculty has a wide range of research units. U.Porto has a high research activity, which compels libraries to keep pace with the evolving researcher needs, adapting and creating new services that respond to those requirements. From a global perspective, the overall mission of these libraries is to ensure and promote access to information resources made available by U.Porto to the academic and scientific community, both in physical and electronic supports. More specifically, this case will detail the services already provided in the context of research support, ranging from specialized training sessions in scientific publishing, reference management software, or search in bibliographic databases to the creation of thematic guides, support on the publication of scientific journals from within the university, and bibliometric studies.*

### **INTRODUCTION**

With more than one hundred years of history, the University of Porto (U.Porto) is one of the largest universities in Portugal, covering teaching and research in all areas of knowledge (social sciences, humanities, applied sciences, natural sciences, and arts). Starting with two faculties (Science and Medicine), and growing especially after the Portuguese revolution in April 1974, the University increased the number of

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faculties to fourteen. Considering the historical and structural evolution of the University, faculties have a significant management autonomy, and libraries depend almost exclusively on the faculty director and the faculty budget (which results in very different size faculty libraries).

Despite the distributed management approach of the libraries, which promotes the proximity to each community by its specialized library, the development of information technologies and communication infrastructures, the institutional participation in consortia (as a whole and not only as single faculties), and the proximity of processes with the development of joint programs, all resulted in the creation of central services at the Rectorate (implemented in a shared services approach). For the libraries, this rationale allowed the collective acquisition of information resources and the share of systems: ALEPH is the management system used by all libraries; DSPACE is the shared institutional repository; and participation on B-On national consortium is managed by central services.

This case study aims to describe the Research Support Services provided by the Libraries of the U.Porto and how they contribute to the research output and success of the University. Following the evolution of U.Porto from a teaching school to a research orientation university, libraries are adapting their services to the development of the needs of their users: from centrality in management of local spaces to study and collection development oriented by scholar curricula, libraries implemented services to support online identity, research results publication geared by Open Access policies, and management of new electronic systems to support the evolving research processes.

To compile information from the different U.Porto Libraries, an online questionnaire was developed and sent to each library director. The survey starts with a brief characterization of the library including data about the collection, the spaces, and the staff. Next, it requests information on the services provided to support research, organized in services oriented to the research processes, then services adapted to the researcher and finally services oriented to the science communication and publication. Two additional sections, considering the specificity and current relevance, were added: research data management and infrastructures.

The questionnaire analysis confirms the perceived libraries' orientation of the services to support the publication process, clearly contributing to the growth of the number of published papers in international journals with top relevance in each research area, and the leading position of the U.Porto as a science producer in Portugal. Another result of the analysis of the questionnaire is the evidence of the evolution of library spaces to adapt to the new needs of the users is already in place or being planned by most of the libraries. Also, it is observed that collection development processes are adapting to the research needs involving researchers and research structures in the selection processes (more and more in electronic supports).

A set of new services to support research data management is required in the libraries' services portfolio, and should be developed as a common service from all U.Porto Libraries with centralized services, but also a manifest local faculty presence to manage the direct researcher and research groups' proximity should be considered. Online presence is referenced as an issue, and communication with the community has to be improved: both the university libraries' website and each library's one should be improved with a clearer presentation of the services to support the research processes (none of the sites has a research specific access point).

This case study is organized in three sections: the first section briefly presents the University of Porto and its organization, with particular focus on research and innovation infrastructures; the second section characterizes the U.Porto Libraries, their information resources, and information professionals; and the third section presents the research support services reported by libraries directors in the online

questionnaire; libraries websites information and other promotion materials, and the personal knowledge of the authors. In each section, a brief literature review provides the context for the subsequent analysis developed.

The case concludes that the U.Porto Libraries are evolving from an organization centered on the teaching and learning processes to an organization more focused on research processes. Support for publication and online curricula management are the most implemented services, and research data management is the most required service by users (not yet formally implemented in none of the libraries). Communication with the users, especially with researchers, is seen by librarians as an urgent improvement issue, resulting in the lack of knowledge of the services already provided.

## **ORGANIZATION BACKGROUND: UNIVERSITY OF PORTO**

With more than one hundred years, the U.Porto was formally founded on 22nd March 1911, immediately after the Portuguese Republic was established. However, the roots of the institution date back to 1762, when D. José I created the Nautical Class. This school, along with subsequent schools also created (Sketching and Drawing Class, established in 1779; Royal Academy of Maritime and Trade Affairs, in 1803; Polytechnic Academy, in 1837), were to be responsible for training students in Porto over the course of the eighteenth and nineteenth centuries, responding to the need for qualified staff in the fields of naval affairs, trade, industry, and the arts.

U.Porto was initially structured around two faculties (Science and Medicine). Over the course of the twentieth century, diversification of knowledge arose, and schools gained autonomy. Even during the 1st Republic, in 1915, the Technical Faculty was born (renamed the Faculty of Engineering in 1926), along with the Faculty of Arts in 1919 and the Faculty of Pharmacy in 1921.

After the revolution in April 1974, and until the end of the century, the University of Porto finally began to expand. The six existing faculties at the time were completed by a further eight: the Abel Salazar Institute of Biomedical Sciences (1975), the Faculty of Sport (1975), the Faculty of Psychology and Education Science (1977), Faculty of Architecture (1979), Faculty of Dental Medicine (1989), Faculty of Nutritional and Food Science (1992), Faculty of Fine Arts (1992) and Faculty of Law (1994). Today, the University of Porto has fourteen faculties and one post-graduate school, the Porto Management School, created in 1988 and whose name changed to University of Porto Business School in 2008 (University of Porto, 2014).

U.Porto is located in the city of Porto, north of Portugal, and is one of the largest universities in the country. The mission of the U.Porto is to create scientific, cultural and artistic knowledge, to provide higher education that is firmly rooted in research, to valorize knowledge both socially and economically, and to actively participate in the progress of the communities in which we are involved (University of Porto, 2020d).

U.Porto vision reinforces sustainable and transforming research, with growing influence and recognition at regional, national, and international levels, as the first pillar; the ability to provide students with an educational experience capable of promoting their capacities as the second pillar; and, as the third pillar. The current strategic plan enunciates as activities in the three main strategic areas:

- Teaching and training – with pedagogical innovation approaches contribute to the integral development of students and develop the best conditions to a full expression of their full potential; hav-

ing internationalization as a transversal goal to all activities, both reinforcing European leadership position and strengthening relations to Latin America, Asia, and Africa.

- Research – the European Research Space in development imposes internationalization as a need and a demand, requiring human and material resources and the adoption of international quality criteria; the internal organization needs to clarify current research structures that result from 30 years of strong but unstructured growth.
- Third mission – it is urgent to promote the robust growth of UPTEC (Science and Technology Park of University of Porto) and continue to develop initiatives that promote proximity to the society, contribute to the economic valorization of knowledge and promote social responsibility (University of Porto, 2019).

The university is organized in three main campuses around the city (Polo I, City Center; Polo II, Asprela Area – extreme north of the town; and Polo III, Campo Alegre Area – western bank of the Douro River), and totally merged with the local community. Providing training in all knowledge areas, U.Porto is organized in fourteen faculties (Table 1) and one business school, The Porto Business School. These faculties offer 34 bachelor’s degree programs, 142 master’s degree programs, and 84 doctoral degree programs to the approximately 30.000 students at the university.

Just like the world’s best universities, the U.Porto combines teaching with top scientific research. Indeed, it is the umbilical relationship between these two dimensions, creating knowledge and sharing it, that justifies its classification as a Research University (University of Porto, 2020b).

Research and Development (R&D) centers at U.Porto are part of the organic structures of the University or the interface associations that involve<sup>1</sup>. Besides the University, different public and private entities (industries, government agencies, etc.) also integrate these centers (University of Porto, 2020c). As a result of the efforts led by 51 research units evaluated by the Foundation for Science and Technology (FCT), the U.Porto is an essential producer of science in the country, responsible for over 23% of the Portuguese scientific articles indexed in the ISI Web of Science. From the 51 Research and Development Centres in the university, 30 have been rated as “Exceptional,” “Excellent,” or “Very Good,” according to the last evaluation promoted by the FCT.

As the seat of learning that trained some of Portugal’s leading scientists and entrepreneurs, the U.Porto also combines high levels of scientific production with a relentless commitment to the economic exploitation of its research activities. Research, Development, and Innovation (R&D+i) follow the strategy designed by the U.Porto to promote the socio-economic development of the city, the North region, and the country as a whole, a core concern of the University’s Third Mission (University of Porto, 2020a). Innovation at U.Porto is regulated by the principles of intellectual property created in 2005 (University of Porto, 2005). Currently, U.Porto has 242 active patents, 31 communications of inventions processed, and 245 spin-off or start-ups companies under the Science and Technology Park of the University of Porto. U.Porto was the second Latin American university with more international patents registered between 2007 and 2010.

Research and learning activities at U.Porto are supported by Information and Communication Technologies (ICTs) and physical structures with services for students and staff. Libraries, Archives, Repositories, journals, and other materials to support research can be accessed through Documentation and Information Resources Portal<sup>2</sup>:

## Research Support at University of Porto Libraries

Table 1. U.Porto Faculties and Internal Communities (Source: the authors, 2020)

	Students	Academic staff	Researchers
<b>Polo I: City Center Campus</b>			
Faculty of Fine Arts (Faculdade de Belas Artes, FBAUP) <a href="https://sdi.fba.up.pt">https://sdi.fba.up.pt</a>	1417	76	4
Faculty of Law (Faculdade de Direito, FDUP) <a href="https://sigarra.up.pt/fdup/pt/web_base.gera_pagina?p_pagina=2306">https://sigarra.up.pt/fdup/pt/web_base.gera_pagina?p_pagina=2306</a>	1565	63	2
Institute of Biomedical Sciences Abel Salazar (Instituto de Ciências Biomédicas Abel Salazar, ICBAS) Faculty of Pharmacy (Faculdade de Farmácia, FFUP) <a href="https://icbas-ff.up.pt/biblioteca/index.php/pt/">https://icbas-ff.up.pt/biblioteca/index.php/pt/</a>	2435 1270	562 81	22 1
<b>Polo II: Asprela Campus</b>			
Faculty of Dental Medicine (Faculdade de Medicina Dentária, FMDUP) <a href="https://sigarra.up.pt/fmdup/pt/uni_geral.unidade_view?pv_unidade=39">https://sigarra.up.pt/fmdup/pt/uni_geral.unidade_view?pv_unidade=39</a>	583	77	0
Faculty of Economics (Faculdade de Economia, FEP) <a href="https://www.fep.up.pt/servicos/sdi">https://www.fep.up.pt/servicos/sdi</a>	3144	160	15
Faculty of Engineering (Faculdade de Engenharia, FEUP) <a href="https://biblioteca.fe.up.pt">https://biblioteca.fe.up.pt</a>	8394	675	228
Faculty of Medicine (Faculdade de Medicina, FMUP) <a href="https://biblioteca.med.up.pt">https://biblioteca.med.up.pt</a>	4051	931	38
Faculty of Nutrition and Food Science (Faculdade de Ciências da Nutrição e Alimentação, FCNAUP) <a href="https://sigarra.up.pt/fcnaup/pt/web_base.gera_pagina?P_pagina=1024990">https://sigarra.up.pt/fcnaup/pt/web_base.gera_pagina?P_pagina=1024990</a>	670	42	3
Faculty of Psychology and Education Science (Faculdade de Psicologia e Ciências da Educação, FPCEUP) <a href="https://sigarra.up.pt/fpceup/pt/web_base.gera_pagina?p_pagina=BIBLIOTECA_HOME">https://sigarra.up.pt/fpceup/pt/web_base.gera_pagina?p_pagina=BIBLIOTECA_HOME</a>	1945	105	73
Faculty of Sports (Faculdade de Desporto, FADEUP) <a href="https://biblioteca.fade.up.pt">https://biblioteca.fade.up.pt</a>	1464	84	18
<b>Polo III: Campo Alegre Campus</b>			
Faculty of Architecture (Faculdade de Arquitetura, FAUP) <a href="https://sigarra.up.pt/faup/pt/web_base.gera_pagina?p_pagina=18183">https://sigarra.up.pt/faup/pt/web_base.gera_pagina?p_pagina=18183</a>	1229	94	177
Faculty of Arts and Humanities (Faculdade de Letras, FLUP) <a href="https://sdi.letras.up.pt">https://sdi.letras.up.pt</a>	6160	201	61
Faculty of Sciences (Faculdade de Ciências, FCUP) <a href="https://sigarra.up.pt/fcup/pt/uni_geral.unidade_view?pv_unidade=252">https://sigarra.up.pt/fcup/pt/uni_geral.unidade_view?pv_unidade=252</a>	4320	384	131

- The eighteen libraries of the university are structured as a network of services on the campus and occupy an area of more than 20.000 m<sup>2</sup> providing access to more than 800.000 publications in paper, training facilities, and research support, improving the quality of the processes in teaching and learning.
- The archive services and documentation centers aim<sup>3</sup> to collect, acquire, and to store materials of documental value according to the institution's mission. A large part of these spaces is open to the academic community after prior authorization. The services provided are the consultation and research of information, as well as document reproduction. Historical and special collections can also be accessed in digital format.
- The Open Repository<sup>4</sup> is a service that provides a technological structure to collect, store and preserve intellectual production, in full text and most of the documents in Open Access, of the academic community of U.Porto.
- A wide range of scientific and educational materials, such as scientific magazines, books, and reference works in electronic format, databases from the most referenced publishers in the world can be accessed by all university community. The selection of the resources is made with the support of librarians, researchers, and all community in general.

U.Porto also provides Information and Communication Technologies (ICTs) for teaching and learning activities, with an e-learning platform (based in the open-source software Moodle) to complement or replace in-person classes. This e-learning platform is also used to provide Massive Open Online Courses (MOOC) to increase research skills (named AcademiaUP). These systems and services are all supported by the Information System for the Aggregated Management of Resources and Academic Records (SIGARRA). SIGARRA offers the academic community a set of digital resources to support their daily activities (access to the personal page and Institutional email account; information about timetables, classes, and rooms where courses are held, among other features).

## **U.PORTO LIBRARIES**

U.Porto Libraries are today a vast universe, resultant of an evolution driven by many technological changes. Technological development led to a joint effort to standardize policies and integrate resources, and it has made Libraries broaden their scope, resulting in varied and multifaceted functions and activities.

The University has eighteen libraries:

- one for each teaching unit, with two of them sharing the same space and staff - ICBAS and Pharmacy, organized into the three geographical polos in the city;
- one from a research institute (Institute for Research and Innovation in Health – I3S Consortium);
- one for the Porto Business School;
- two libraries part of foundations (Instituto Marques da Silva e Casa Museu Abel Salazar), not considered in this case; and
- the old collection preserved at the Rectorate.

## Study Areas

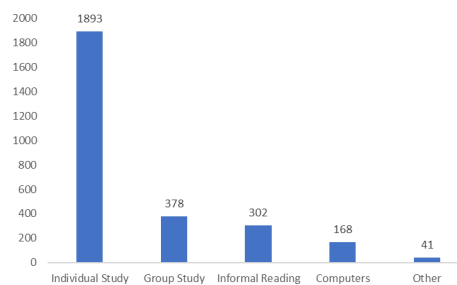
The academic environment is in continuous evolution. Academic libraries, in their role of serving students and faculty, have been following this evolution and trends. They are developing and redesigning services and library areas to make them more suited to the needs of their community in its academic activities.

At U.Porto, academic libraries have been transforming their study areas to the possible extent, adopting a more user-centered perspective. They are trying to accommodate what can be summed up as “a range of environments aimed at catering for both group and individual study, as well as a variety of learning styles; more space for social interaction; (...) good Wi-Fi connectivity and computer availability” (El-lison, 2016). All faculty libraries are open to the public, which means they can be used by any member of the U.Porto community, or even by users from other schools.

Overall, the spaces can be categorized into individual study and group study, the latter currently being one of the most sought by students to be able to do group work at the library, without disturbing those who study individually. Gayton (2008) adds the concept of communal use of library spaces: communal activities are understood as solitary and quiet but with the presence of others studying the same disciplines. The use of library spaces tends to evolve to be communal at most of U.Porto Libraries.

A factor that must be considered is that users go to the library not only for academic purposes but also for personal and social reasons (Trembach, Blodgett, Epperson & Floersch, 2019). As such, almost all libraries have been investing in the creation of informal reading areas, where users can relax, read literature, or the daily newspaper, for instance. Figure 1 presents the total number of seats available at all U.Porto Libraries.

Figure 1. Number of Seats Available (Source: the authors, 2020)



One point that cannot be overlooked is the fact that academic libraries are making the definitive transition from being only information providers to becoming also service providers. This development results from the ability to develop and deliver services that support faculty, especially researchers, in the creation of new knowledge (Sewell & Kingsley, 2017). Thus, several services have gradually been incorporated into library spaces, to which users can have access. As examples, we can refer to the Library of Engineering and the Library of Arts and Humanities, since both have a booking service for individual and group study rooms respectively, which are restricted to the community of each school only.

Other more common complimentary services are available to users. For instance, all libraries provide access to the Eduroam Wi-Fi network, accessible to the entire U.Porto community (and most academic institutions all over the world). All of them also have computers, mostly desktop ones, as well as print-

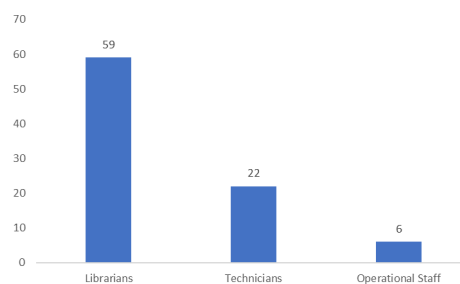
ing and digitization devices that work on a self-service basis. The Faculty of Arts and Humanities and the Faculty of Sports have laptops to lend for use in the library only. Also, the Library of the Faculty of Arts and Humanities has a loan service for other portable equipment for use in the library (ipads, kindles, and iriScans).

## Information Professionals

A widely discussed topic is the profile of the information professional, that has been reinventing itself over time, evolving to meet users' needs. It is currently acknowledged that, in an academic environment, information professionals need to have a multifaceted profile, with skills and knowledge suited to the reality of its context. The American Library Association (ALA) defined the Core Competencies of Librarianship, centered on height areas of expertise: foundations of the profession; information resources; organization of recorded knowledge and information; technological knowledge and skills; reference and user services; research; continuing education and lifelong learning; and administration and management (American Library Association, 2009). This diversity of roles strengthens the theory that information professionals can perform different activities, from operational tasks to management positions, according to their level of specialization, and reflects the current situation of the U.Porto Libraries.

At U.Porto, from an organizational point of view, each library presents a similar structure, with a service director and technicians of different categories that ensure the services provided (Figure 2). Considering what was previously mentioned, it can be verified that the U.Porto Libraries have a highly specialized team of technicians, namely the superior technicians. These are required to have a degree (or higher), and their degree of specialization ranges from library science and information science to engineering and management. The combination of these areas of knowledge, and such multifaceted profile of the technical staff makes it possible to ensure traditional services across all libraries, but also to expand the libraries services portfolio with innovative methodologies, and thus, provide new services, namely those related to research support. In changing contexts (as in the pandemic context of the COVID-19 outbreak), this multifaceted profile stands out, showing the quick adaptation of all teams to remote work, and, more importantly, to remotely support users and develop support services and contents, up against the clock.

Figure 2. U.Porto Libraries Staff (Source: the authors, 2020)





## **Information Resources**

Whenever U.Porto students, researchers, or faculty need information for their academic assignments or scientific projects, they are likely to find it in the network of libraries existing in the University's schools, both in physical and electronic formats. Overall, the University's libraries occupy an area of more than 20 thousand square meters and have their physical collections distributed by free access shelves and closed or restricted access deposits (Universidade do Porto, 2018). Most deposit documents can be consulted or even borrowed on request.

A critical step that academic libraries are taking is to strengthen their strategic position on the challenges their institutions are facing and provide the informational resources their community deems necessary (Si, Zeng, Guo & Zhuang, 2019). Covering all areas of knowledge taught in U.Porto, it's possible to consult about 800 thousand titles of publications (Universidade do Porto, 2018), which cover books (technical and literature) and scientific journals from different thematic areas, but also the thesis and dissertations published by each faculty. There are also other types of information sources, namely multimedia, such as CDs and DVDs which are made available in several libraries.

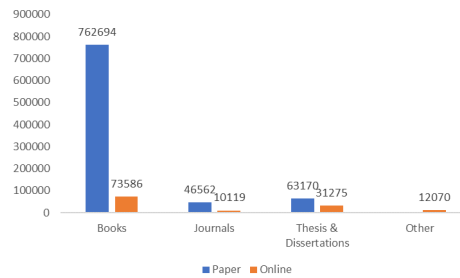
However, technological development has largely reshaped how information is accessed and disseminated, which increased the available online information sources. All libraries provide a comprehensive set of electronic resources that can be accessed locally or remotely. As part of the B-On consortium (Online Knowledge Library), U.Porto has been experiencing a gradual expansion of access to shared electronic content, particularly, multidisciplinary subjects. However, the specificity of each thematic area and the needs of each school require local licenses in several areas.

For scientific journals, the transition to online dictated that, within the scope of the U.Porto research activities, the acquisition of titles in paper support decreased and almost disappeared. Mainly since 2007, the phase in which there was a significant transition to the online subscription's models, this revolution of the access translates in an easier way to find more information, more quickly and more up to date. However, scientific journals in paper still represent a significant and valuable volume of information that libraries keep for the sake of scientific knowledge preservation and for the usefulness they still represent, and also by considering the investment made over the years on their acquisition. Some of these titles are accessible to the public for consultation and, in other cases, due to their historical value and antiquity, are in restricted access.

As for books, U.Porto Libraries have the mission of providing the titles that are part of the mandatory bibliography of the courses, making efforts to strengthen the engagement with the academic staff to keep these resources as up to date as possible. As a Research University, part of its book collection is acquired for research projects, and, after its completion, these return to the library shelves, and can be used by the rest of the community. Having already been mentioned that libraries have informal reading places (even though no distinction is made here), a part of this number of books also refers to literature and other similar collections. The books available in U.Porto Libraries can be borrowed by users from different schools of the U.Porto University.

Thesis and dissertations are the concrete results of research carried out by students of different degrees. At U.Porto, libraries always followed the established policy of making these resources available, initially, on paper, but gradually on electronic format, since submission on this support became a requirement (Figure 3). So, the public dissemination of this type of documents has adopted new standards through the years, being made available through the individual catalogs of each of the libraries, and, also, through the integration in the University Institutional Repository (which will be presented ahead in more detail).

Figure 3. Number of Available Documents in Paper and Online



Considering the different access levels of online information (B-On at a national level and U.Porto central services) mostly centered in journals, collection development at U.Porto Libraries is mainly oriented to books. Whenever possible and suitable to the users' needs, the acquisition choices tend to evolve to digital formats.

## RESEARCH SUPPORT SERVICES

The universities are increasingly evaluated by the research developed and its impact (Parker, 2012), so the libraries as support services must engage more with research support. The position of the universities and faculties at international rankings (which mostly use research results as indicators) decides how their quality and prestige are perceived, and research support becomes a central area to libraries that add value to the community they serve (Pritchard, 1996).

Also, U.Porto Libraries are investing time and resources to engage in the research support at the different U.Porto Faculties, after redesign and consolidation (with the Bologna Process and consequent changes to curricula) of support to teaching and learning activities and information literacy training. For convenience, we define research support services as all the activities developed by academic libraries with the objective of supporting the research activities and scientific production contributing to the improvement of their results and impact (González-Solar, 2016).

One of the first pieces of evidence of the importance of the research support services is the highlight they receive at libraries' websites, being the easy access one of the most relevant keys to their success (González-Solar, 2016). None of the eighteen U.Porto Libraries websites has a section oriented to research support. All websites (excluding the Biblioteca Alberto Saavedra da Casa-Museu Abel Salazar and the Biblioteca da Fundação Instituto Marques da Silva, which have different purposes) are organized around the information resources and the general services provided. One particular case is the I3S Library, being part of a research institute, it only provides resources or services to research activities, and its presentation reflects this unique profile at U.Porto Libraries.

For this analysis, we mostly follow the organization of the research support at libraries presented by González-Solar (2016): services to support the research process, services to support the identity management and services to support the publication and evaluation of the results. But considering the current relevance and the U.Porto institutional organization, we added three distinctive categories: evaluation and bibliometrics, research data management, and infrastructures management.

## **Support for the Research Process**

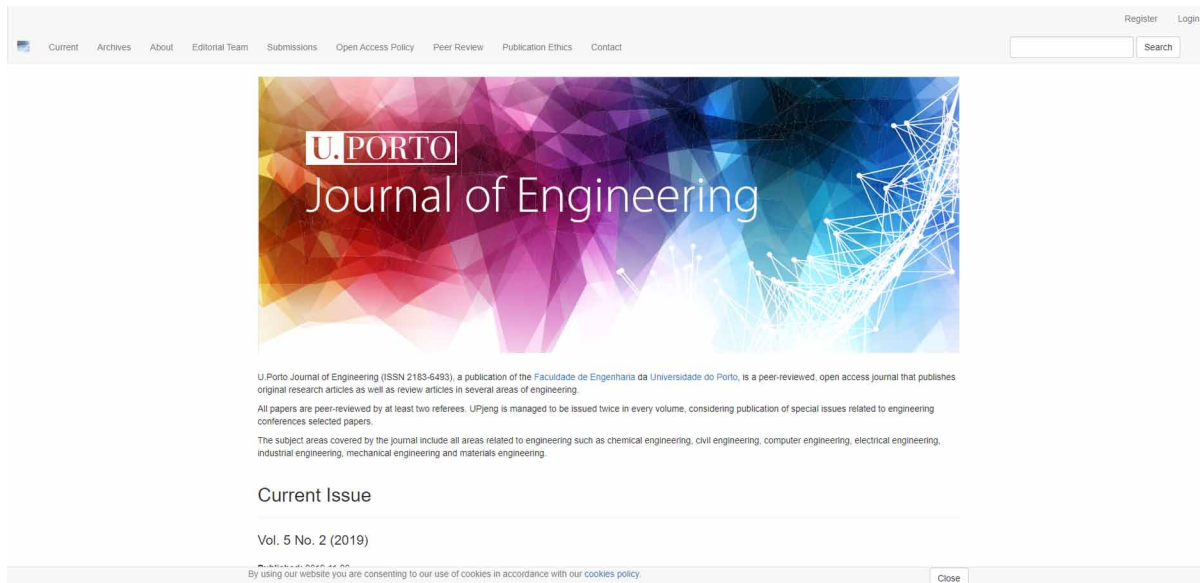
This category includes a set of services mostly oriented to support the process of knowledge creation and construction. We can identify some traditional library services that are provided by all U.Porto Libraries:

- Access to the document, including both the collection development, considering not only the teaching and learning but also the researchers' needs, and conducting the bureaucratic administrative process of documents acquisition on behalf of the researcher or the research units and projects. Interlibrary loan complements the library collection, and all libraries provide it.
- Availability of spaces, none of the U.Porto Libraries reports to provide library spaces oriented to the research, and they are mostly used by degree students (and the exams period corresponds to the top usage). Still, they give especially priority to younger researchers in the use of individual cabinets or access to meeting and group study rooms. Some Libraries identify the need for spaces to research and are redesigning their spaces to accommodate those unique needs.
- Reference service, reference is provided as an essential service, and special care is dedicated to the academic staff and researchers (including by email and online chat), mostly supporting the particular needs of each research project, but also supporting and conducting bibliographic searches. It is also essential to refer that as most of the libraries are associated with a faculty or research unit, the librarians are specialized in the research areas of the faculty and naturally constitute subject librarians.

Information literacy training was one of the most relevant investments by all libraries in the last years. Mostly oriented to introductory competences of the degree students, but several are already providing training sessions oriented to the research process. Advanced use of bibliographic management software (EndNote and Mendeley), databases search (WoS and Scopus), and ethical use of information are the most frequent topics.

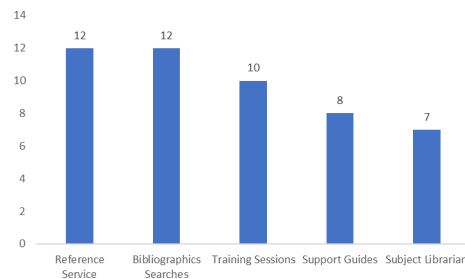
A training course developed by the Faculty of Engineering (FEUP) Library with two academics deserves a special mention: Publishing and Scientific Writing (PEC). This course is a 3 ECTS program planned for early career researchers or first-year PhD students. It has a theoretical component presented by the library staff and one of the involved academics which covers an introduction to the scientific publication process, the main information literacy competencies, and the scientific writing specificities. This theoretical part is complemented by a practical component of writing, publishing, and reviewing a paper, providing the students with a first experience of the complete process of a journal paper publication. As a result, FEUP Library started the edition of the U.Porto Journal of Engineering (Figure 4)

Figure 4. U.Porto Journal of Engineering (Source: Website of the U.Porto Journal of Engineering)



Complementing the training sessions, several of the U.Porto Libraries are developing self-learning guides, mostly oriented to reference software management, citation styles, bibliographical databases search tutorials. FEUP Library also developed two special guides, one about scientific publication and another specific to the selection of a journal for publication(Figure 5).

Figure 5. Services to Support the Research Process at U.Porto Libraries (Source: the authors, 2020)



The answers to the questionnaire confirm the reference service and the specialized bibliographic searches as the most common services provided by U.Porto Libraries to researchers. Despite the resulting specialization of the organization as faculty libraries, only a fraction (43%) of the librarians see themselves as subject librarians. This perception may result from the growing interdisciplinarity that obliges librarians to support different areas of research and from the support to the faculty services and teaching and learning processes, much more generic than usual research requests. None of the libraries reports acting as embedded librarians, which demonstrates that the proximity to the research processes is distant and by individual request.

## **Support to the Online Identity and Curriculum Vitae Management**

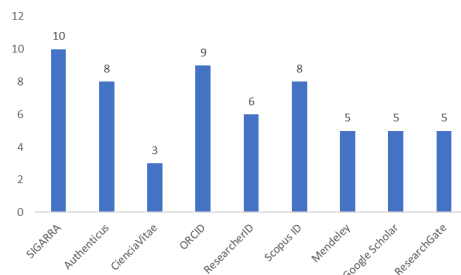
The growth of scientific publishing created an issue with the unique identification of authors, resulting in the need for the development of disambiguation services. ORCID is the most spread service, but many others are used in different contexts. This “personal identification codes” area associated with curricula management platforms, and researchers must use all of them to assure the correct attribution of their publications or projects and their visibility in the research community.

The role of academic libraries supporting online identity management has three main areas: promote the use of the most relevant online identification codes in the context of the institution, develop training materials (both training sessions and self-learning guides), and personal support to researchers (González-Solar, 2016). Other ways to promote the use of the online identification codes is to use them in the systems the libraries manage, such as the library catalog, the institutional repository, or the publication systems, and enrich the system’s data with linked data available through those identification codes.

U.Porto Libraries are supporting researchers in the most relevant systems, even supporting the curricula development at social networks like ResearchGate, LinkedIn, or Academia.edu. This support is provided mostly by individual request as academics and researchers have no availability to complete training sessions or follow instructional guides. It is possible to identify as supported systems U.Porto Libraries (Figure 6):

- SIGARRA<sup>5</sup> which stands for “Sistema de Informação para a Gestão Agregada dos Recursos e dos Registos Académicos”, is the U.Porto internal information system and also the CRIS system (Current Research Information Systems), registering more than 180.000 publications from U.Porto authors and almost 7.500 projects;
- Authenticus<sup>6</sup> is a project developed at the University of Porto and CRACS/INESC TEC, co-funded by FCT, that aims to build a national repository of publications metadata authored by researchers of Portuguese institutions;
- CienciaVitae<sup>7</sup> is the Portuguese scientific curriculum management system developed and managed by Fundação para a Ciência e Tecnologia, and in combination with the Ciência ID constitutes the central system to support the modernization of the science administrative processes supported by a CV;
- ORCID promotes transparent and trustworthy connections between researchers, their contributions, and affiliations by providing an identifier for individuals to use with their name as they engage in research, scholarship, and innovation activities;
- ResearcherID, Web of Science ResearcherID integrates Publons, an environment where authors can add their publications, track citations, and manage their Web of Science record;
- Scopus Author ID, authors with publications indexed in Scopus are automatically assigned a Scopus Author ID and an author’s profile, which includes the identifier, references, citations of work, h-index, and subject areas;
- Mendeley (started as a reference management software but rapidly evolved to a researchers network system with the option to claim personal publications with their statistics when integrated with Scopus);
- Google Scholar Profile allows authors to identify their publications with the usage statistics and citations so that others can find them and often find an available copy that they can read.

Figure 6. Online Identity Management and Curriculum Vitae Support Services at U.Porto Libraries (Source: Rthe authors, 2020)



Almost all libraries report supporting the management of SIGARRA authors' publications information, as the system constitutes the CRIS system to the U.Porto; as well as Authentificus that integrates directly with SIGARRA to import metadata from international databases (SCOPUS, Web of Science and Crossref). CienciaVitae is a new Portuguese service, researchers are starting to use it so support from libraries will be more requested with the spread of the usage. ORCID is (not surprisingly) the most supported international service, as FCT requires it to all researchers in any supported research project. Scopus Author Identifier is more supported than Researcher ID, probably explained by the more complete publication's coverage by the Scopus database when compared to Web of Science.

## Science and Researcher Evaluation

Directly connected to the (online) identity of the researcher and its affiliation is the concept of prestige and reputation, a result of the quality, visibility, and impact of the publications. The institutional reputation is mostly measured by international rankings (like ARWU, Times Higher Education, or CWTS Leiden Ranking). Personal researcher indexes are evolving from the traditional bibliometrics of blind citation to new indexes of productivity and social impact (usually designated as altmetrics). At U.Porto, the institutional international rankings presence is followed and managed by the Evaluation and Quality Service at Rectorate, which spreads to all faculties and research institutes the indexes and evaluation information. Most of the faculties have internal services to manage and evaluate more detailed data.

U.Porto Libraries are progressively getting more involved in the institutional evaluation, supporting the evaluation processes of academics and researchers (career progression contest, merit awards), and providing individual citation reports by request (productivity and citation indexes). The Answers from the libraries confirm the relation established is more with individual researchers than institutional: the services related to science evaluation mostly provided are citation reports and productivity indexes, typically requested by individual researchers.

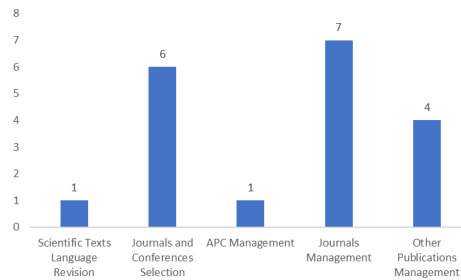
## Services to Support Research Results Publication

The involvement of academic libraries with scientific communication processes has always been a reality, contributing to the visibility and impact of the research results. In this sense, the Publication services develop different services as shown in Figure 7. U.Porto Libraries are committed with authors, constituting the support to the selection of journals or conferences to submit the papers as an extension

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of the current reference service. A frequent requirement from academics and researchers is the identification of predatory journals and publishers and the review of the publishing agreements, recognizing the experience with Open Access and the knowledge about licenses and copyright.

Figure 7. Publication Support Services (Source: the authors, 2020)



Open Access is a long-time commitment to the University of Porto and its Libraries. The U.Porto Repository was publicly presented in 2006 and is organized in two platforms: Open Repository, which collects, preserves and provides the intellectual production, in full text and open access, of the academic community of U.Porto; and Thematic Repository, which stores, preserves and provides informational resources produced by U.Porto in specific areas or for particular audiences. The Open Repository (the Institutional Repository for the Open Access Green Route), with more than 84000 digital objects, is the largest Open Access repository in Portugal. The infrastructure is managed by UP digital and the contents deposited by authors, in close integration with SIGARRA. The U.Porto Libraries intervention consists mainly of mediating the authors' auto-deposits and validating the data submitted, assuring (as possible) data quality and consistency.

Complementing the U.Porto Edições<sup>8</sup> role, several of the U.Porto Libraries contribute to the publication of books, journals, and conference proceedings, both in traditional support and online. It is possible to identify different approaches, for example: the Faculty of Sport (FADEUP) Library manages the Edições FADEUP, publishing exclusively in paper; and the Faculty of Arts and Humanities (FLUP) Library, that has a long tradition of publishing for the Faculty and developed an open access online publishing system and also supports the publishing of almost 30 current journals in Open Access

Several of the U.Porto Libraries identify as a service the attribution of publication identifiers (mostly ISBN and DOI). As important as the unique identification of authors is the unique ID of publication, assuring the quality of citation data. Handles are used by the Open Repository, being automatically attributed to the deposited publications. This unique identification is especially relevant to the thesis and dissertations that do not have another unique identifier.

The APCs (Article Processing Charges) management complements the support to publish in Open Access. Only two U.Porto Libraries are at the moment supporting the APC management: I3S Library and Faculty of Medicine Library. This is one of the areas U.Porto University needs to establish a clear policy, integrating the APC possibilities resulting from the B-On national consortium for electronic journals negotiations.

## **Research Data Management Support**

The research data management support is not yet a current service at U.Porto Libraries. Only the I3S Library reports supporting the publication of research data. Occasionally libraries are required to help in the definition of research data management plans for projects, as they become mandatory; however, they are not yet considered as partners either by researchers or Research and Projects Service. U.Porto is currently developing a research data management strategy combining UP digital, U.Porto Libraries, and InfoLab, the Information Systems Laboratory from FEUP and Institute for Systems and Computer Engineering, Technology and Science (INESCTEC)<sup>9</sup> The vision is to have DENDRO<sup>10</sup>, an open-source platform designed to help researchers describe their datasets, entirely built on Linked Open Data and ontologies, to manage the research data inside project teams with an internal curator (a researcher from the group). The curator assures the description of research data as long as they are produced to have FAIR data at the end of the project. At the U.Porto ecosystem, UP digital will manage the DENDRO infrastructure, and Libraries will support metadata generation. People from the InfoLab research team should integrate the new service team.

## **Infrastructures Management**

U.Porto Libraries don't report to manage physical infrastructures or spaces directly related to research support. Computer infrastructures or systems are managed by UP digital that support the informatics at all University. Examples are ALEPH, the integrated library system used, DSpace, the system used by Open Repository (U.Porto Institutional Repository), and EndNote, the reference management software, all managed by UP digital but supported by U.Porto Libraries.

To develop online publication services, FEUP and FLUP Libraries are managing systems by themselves: the PKP publication solutions (OJS, OCS, and OMP) and a locally developed system to publish non-journal documents (at FLUP Library). With the consolidation of these services, centralization (and rationalization) tends to occur, assuming UP digital the management of the systems and libraries the support.

FEUP Library reports acquiring to the FEUP community some Grammarly accounts, to help improve the quality of the English used in documents. Grammarly is an English grammar and spelling checker with some plagiarism detector functionalities.

One particular reference must be acknowledged to the digital preservation system that is being implemented at U.Porto (Libsafe). The system is managed by UP digital and intends to serve as a backend for all electronic systems at U.Porto, but the implementation started integrating libraries, archives, and repository systems. This new "hidden" layer provides additional functionalities to these management systems, assuring the long-term preservation of the documents.

## **CONCLUSION**

As a conclusion, we can observe that in general, U.Porto Libraries present visible developments in terms of service provision regarding research support. In contrast, traditional services are not neglected and are ensured across all libraries. However, it is still necessary to go that extra mile and build on what is



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already on offer, being essential to introduce models in the libraries' organizational structures to enhance service innovation.

From a research point of view, universities are facing several challenges, specifically concerning research requirements. The new research challenges drive the need for academic libraries to innovate, providing more support to research activities, in such a way that allows them to integrate with its institutions at a strategic level (Si et al., 2019). As stated previously, U.Porto is classified as a Research University; thus, the U.Porto Libraries are compelled to follow this vision. This context creates an opportunity for them to show their relevance and to pursue a more strategic alignment with institutional objectives related to research. And can work as a catalyst for U.Porto Libraries to restructure themselves, and emerge in a new context, providing services more aligned with institutional policies and adjusted to their users' needs (Fernandez-Marcial, Costa & González-Solar, 2016).

To achieve this level of restructuring, it is urgent to rethink and renew several aspects of their structural foundations: invest in the renewal of human resources and broad even more their areas of competences and specialization (which are intended to be increasingly varied and multifaceted, to allow for an out of the box vision). The number of senior technicians in the different libraries of U.Porto is a good indicator of the level of competence of their human resources staff. However, it is necessary to invest even more in the renewal of these skills, so that libraries can be prepared to provide new and differentiated services, focused on the needs of those who do research. The absence of embedded librarians still represents a gap, which, in addition to the renewal of personnel, will require a more significant investment in hiring and training. But the recruitment of new personnel with specialized competencies will also translate into a higher level of expertise, and in creating a greater connection to faculty and students, which is something urgent to develop, particularly in the larger faculties.

Greater cooperation with other university and faculty services, such as project offices, IT units, and accounting services, is also needed so that libraries are aware of what is going on, and somehow integrate that vital part of the research life cycle. Update of U.Porto policies regarding Open Access publishing and APC (Article Processing Charges) management support must be developed in a combination of the different services supporting research activities. The revision of the Open Access policy must also include the research data publishing to adapt to most science funders' requirements.

The libraries' spaces themselves, despite having already undergone some changes, still lack specific areas for research work (rooms that allow discussion and realization of interactive sessions, spaces to create, build, and construct projects, makerspaces, presentation training rooms, 3D printers). Libraries are not always perceived by faculty administrations as the local to manage these services, but removing unused documents (as old paper journals) can create opportunities for spaces renovation and reposition libraries' perceptions.

A very crucial aspect that also needs to be worked on is building a closer relationship with researchers. A marketing approach can help libraries in the design of products and services directed to this target audience. In this context, this concept must be applied, since it is urgent to go beyond what librarians think is ideal for researchers, but tailor libraries' offer to their needs (Atkinson, 2016). For that, it is necessary to build bridges and establish relationships with them, to get to know their real needs and pain points, and co-develop services, counting on their contribution.

U.Porto Libraries already provide a consistent offer of services regarding research activities but centered in traditional library services. A new strategy, developed by all faculty libraries in cooperation with the other university and faculty services also supporting research, has to be designed to create the basis for the development of the new services required by researchers.

Evidence of the impact of the services already provided by U.Porto Libraries to research emerges especially in publication processes, with growth both in quantity and in quality:

- This is clear in the evolution of annual publications registered in SIGARRA, with a registered growth of one thousand new publications per year from 2000 to 2010 and five hundred per year from 2010 to 2019. This growth directly results from U.Porto Libraries' contribution to the Institutional Repository investment and academic staff's evaluation support.
- Also, it is reflected in the increment of the quality of the papers published, with evidence in the number of annual papers included in Web of Science, evolving from 2.950 in 2010 to 4.881 in 2015 and 5.684 in 2019. InCites analysis also confirms this quality evolution, reporting total citations per paper of 6,10 in 2010-2014 and 9,80 in 2015-2019.

Considering the evolution of provided information resources to U.Porto users, it is also possible to infer the quality of libraries collections with the growth of citations of top documents reported in InCites, evolving from 39.672 in 2010-2014 to 57.94 in 2015-2019.

Future directions of the research support services point to the development of the communication with researchers and partnership with research project infrastructures, especially with the creation of specific areas at libraries websites. Also, the introduction of a specific service for research data management is required by the users and essential for the continuous internationalization of U.Porto research.

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## KEY TERMS AND DEFINITIONS

**Authenticus:** Is a project developed at the University of Porto and CRACS/INESC TEC, co-funded by FCT, that aims to build a national repository of publications metadata authored by researchers of Portuguese institutions.

**B-On:** The Biblioteca do Conhecimento Online (Online Knowledge Library) is a Portuguese national consortium that makes unlimited and permanent access available, within the research and higher education institutions, to full texts from over 16.750 scientific international publications from 16 publishers, through subscriptions negotiated on a national basis with these publishers.

**CienciaVitae:** Is the Portuguese scientific curriculum management system developed and managed by Fundação para a Ciência e Tecnologia, and in combination with the Ciência constitutes the central system to support the modernization of the science administrative processes supported by a CV.

**DENDRO:** An open-source platform designed to help researchers describe their datasets, entirely built on Linked Open Data and ontologies, and to manage the research data inside project teams.

**OMP:** Open Monograph Press is an open source software platform for managing and publishing scholarly books. It can be used for managing the editorial workflow required to see monographs, edited volumes and scholarly editions, through internal and external review, editing, cataloguing, production, and publication (<https://pkp.sfu.ca/omp/>).

**Open Repository:** Is the U.Porto Institutional Repository for the Open Access Green Route. With more than 84.000 digital objects, is the largest Open Access repository in Portugal.

**PEC:** Publishing and Scientific Writing is a training course developed by the FEUP Library with two professors. This course is a 3 ECTS program planned for early career researchers or first-year PhD students.

**SIGARRA:** The System for the Aggregated Management of Resources and Academic Records is the integrated information system used by all Organic Units of the U.PORTO to facilitate access to information relevant to the institution, of a pedagogical, scientific, technical and administrative nature, and to streamline internal cooperation and cooperation with the academic and business communities outside the U.Porto.

**U.Porto Journal of Engineering:** Is an Open Access journal published by FEUP Library developed to support the practical training of young researchers, providing a first experience of the complete process of a journal paper publication.

## ENDNOTES

- <sup>1</sup> U.Porto R&D Units can be consulted in <https://id.up.pt/eng/index.html>
- <sup>2</sup> U.Porto Documentation and Information Resources Portal accessible in <https://srdi.up.pt>
- <sup>3</sup> U. Porto Archive services and documentation centers accessible in <https://arquivo.up.pt>
- <sup>4</sup> The U.Porto Open Repository (<https://repositorio-aberto.up.pt>) and the Thematic Repository (<https://repositorio-tematico.up.pt>) are the two repositories included in the service named U.Porto Repository (<http://repositorio.up.pt>)
- <sup>5</sup> SIGARRA can be consulted in <https://sigarra.up.pt>
- <sup>6</sup> Authenticus is accessible in <https://www.authenticus.pt>
- <sup>7</sup> The system CienciaVitae is accessible in <https://cienciavitae.pt>

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<sup>8</sup> U.Porto Edições can be visited in <https://edicoes.up.pt>

<sup>9</sup> The main page of the INESC TEC can be accessed in <https://www.inesctec.pt/en/laboratories/information-systems-laboratory>

<sup>10</sup> The space for DENDRO in GitHub is accessible in <https://github.com/feup-infolab/dendro>