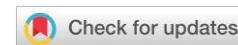




ORIGINAL ARTICLE

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Classification systems and content management in institutional repositories. Case study of a public university in Paraguay

Sistemas de clasificación y gestión de contenidos en repositorios institucionales. Estudio de caso de una Universidad pública de Paraguay

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Abstract

A previous study at the university, which is the subject of this research, revealed a significant unawareness among participants about organizational strategies, incentives, knowledge management and treatment of academic productions. In response, this research aimed to describe the classification system of publications linked to the institutional repository of the university, from the perception of teachers and the analysis of institutional documents during the year 2024. The study adopted a descriptive, cross-sectional, non-experimental design, with a mixed approach, a survey was applied as a data collection technique, using a questionnaire as the main instrument, complemented with the analysis of secondary sources. The sample consisted of 300 teachers. The results revealed that, although the institutional repository classification system is well defined in documents, the existence of multiple repositories with dissimilar criteria generates confusion; the teachers indicated a lack of training and socialization of the institutional repository, in addition to revealing points of consensus and divergences. The limitations encountered, such as restricted access to documentation, underscore the need for more effective communication and dissemination of institutional repository policies and guidelines, besides greater clarity and unification of criteria at the institutional level.

Keywords: Access to information, Digital Preservation, Information Dissemination, Scientific information.

Resumen

Un estudio previo en la universidad, que es objeto de esta investigación, reveló un desconocimiento significativo entre los participantes sobre estrategias organizacionales, incentivos, gestión del conocimiento y tratamiento de las producciones académicas. En respuesta, esta investigación tuvo como objetivo describir el sistema de clasificación de las publicaciones vinculadas al repositorio institucional de la universidad, desde la percepción de los docentes y el análisis de documentos institucionales durante el año 2024. El estudio adoptó un diseño descriptivo de corte transversal, no experimental, con un enfoque mixto, se aplicó una encuesta como técnica de recolección de datos, utilizando un cuestionario como instrumento principal, complementado con el análisis de fuentes secundarias. La muestra estuvo conformada por 300 docentes. Los resultados revelaron que, aunque el sistema de clasificación del repositorio institucional está bien definido documentalmente, la existencia de múltiples repositorios con criterios disímiles genera confusión; los docentes señalaron una falta de capacitación y socialización del repositorio institucional, además de revelar puntos de consenso y divergencias. Las limitaciones encontradas como el acceso restringido a la documentación, subrayan la necesidad de una comunicación y divulgación más efectiva de las políticas y directrices sobre el repositorio institucional, además de una mayor claridad y unificación de criterios a nivel institucional.

Palabras clave: Acceso a la información, preservación digital, difusión de la información, información científica.

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Introducción

At universities, the use of Information and Communication Technologies (ICT) is becoming increasingly common. These tools are becoming firmly established within the educational sphere, transforming the way information is shared and retrieved, and enabling both collaborative and individual activities.

Ayala Perdomo (2015) had already pointed out this transformation:

Never in the history of humankind have the inhabitants of the planet had such broad possibilities to communicate, to share and give common meaning to their experiences and knowledge, to their perceptions, to the images of themselves and what surrounds them. And this moment, which is at once action and awareness of living in one of the eras of greatest reflexivity and knowledge production, is accompanied by a technological capacity that seems inexhaustible. (p. 238)

The crisis caused by COVID-19 marked the beginning of digital transformation, where ICT played a key role in the evolution of operational activities, as ICT made it possible for both small and large companies to operate without the need for physical contact. This phenomenon was also seen in the educational field, where institutions faced the dilemma of either completely halting academic activity or using tools that would allow classes to continue without physical contact between teachers and students. Some institutions chose to suspend all activity, while others adjusted their working methods. The shift allowed teachers and students to explore a new sphere of information and new teaching methodologies without physical interaction, and it undoubtedly transformed the way data is used, shared, stored, and retrieved in the educational sphere. This new paradigm, driven by the use of ICT, completely transforms the ways in which knowledge is shared through a wide range of media and tools.

Institutional repositories (IR) are among the elements that have gained great relevance in educational

institutions: they are tools designed to digitally manage all the academic and scientific output of one or more institutions, as well as its dissemination, storage, and retrieval, under policies that give them shape and ensure their availability at all times, without geographical or access-account limitations (Crown, 2002; De Volder, 2008; Paradelo Luque, 2009; Mendoza Vázquez, 2017).

Within this framework of open science, IRs take on special significance, as they enable the dissemination of scientific output through an alternative route to the payment required by the so-called gold route (García Peñalvo, 2017).

However, for repositories to be truly effective, it is essential to have well-defined policies and guidelines. These must guide readers and authors regarding the storage, preservation, visibility, classification, and accessibility of content. Policies must state how the repository will be managed and on what basis; who will have access; what costs will apply to authors or readers; etc., thus determining the working framework and the long-term sustainability of the IR.

A key aspect of the effective organization of IRs is the classification and management of contents. The way these criteria are established, and teachers' perceptions of their application, represent a central focus of this research. The study covers three key dimensions: the institution's academic and scientific output, institutional regulations and documentation, and the perceptions of the university's teaching staff. As Morales Benítez and Álvarez (2023) point out, "Institutional repositories may be a suitable means to gather in a single place the intellectual output of the academic community of an institution and to facilitate access to such works" (p. 5). Therefore, sound content organization and management that allows all this output to be readily available is essential.

In the specific context of the university examined in this study, research conducted in 2019 on "Knowledge management at the university in relation to undergraduate final projects, postgraduate theses, and research papers" revealed that although some policies exist, they require greater clarity and dissemination regarding guidelines for publishing academic output. It was found that students, teachers,

and researchers were not always aware of the destination of their work, which generated distrust concerning the knowledge produced. In addition, a lack of communication was noted regarding the handling of academic and scientific work, access mechanisms, and selection and publication criteria (González Valdez & Molinas de Santana, 2020a, 2020b, 2021, 2022; González Valdez & Molinas Santana, 2019).

These observations are consistent with what Díaz Rodríguez and Sánchez Tarragó (2010) stated:

However, theses have generally been scarcely accessible and frequently fall into the category traditionally known as grey literature, whose main characteristic is that it lies outside commercial publishing channels. (p. 284)

To explore this situation further and contribute to improving the institution's IR, this study sought to answer the following question: What is the classification system for publications linked to the university's repository? Accordingly, the following research objective was defined: To describe the classification system for publications linked to the university's repository, based on teachers' perceptions and a review of institutional documents during the year 2024.

The purpose of this research is to provide an overall view of how publications are organized in the institutional repository and how they are perceived based on academics' experience. The research aims to identify areas for improvement in the development of policies that support academic knowledge management within the institution.

Methodology

This research used a mixed-methods paradigm (qualitative and quantitative), in line with the stated objective. The study was predominantly quantitative, non-experimental, cross-sectional, and descriptive in scope. A triangulation technique was also applied, whereby the results obtained through both approaches were complemented with theory in order to discuss the research findings and thus present an

approximation to the object of study and the current situation of the topic within the institution.

The population consisted of 1,298 teachers from the university's different academic units. The sample was non-probabilistic and obtained through convenience sampling (Campoy Aranda, 2019). The following data were used to calculate the sample size:

- Z , score associated with the adopted confidence level, 95% (Z-value: 1.96)
- e , margin of error: 5%
- N , population size (1,298)
- p , positive variability: 0.5
- q , negative variability: 0.5
- Formula used: $n = \frac{Z^2 * p * q *}{e^2 * (N-1) + Z^2 * p * q}$

Calculation:

$$n = \frac{(1.96)^2 * 0.5 * 0.5 * 1298}{(0.05)^2 * (1298 - 1) + (1.96)^2 * 0.5 * 0.5}$$

$$n = \frac{1247}{4} = 296,4$$

The resulting sample size was 296.4 teachers; however, the instrument was administered to 300 teachers.

For the document analysis, the unit of analysis consisted of regulations, statutes, reports, repositories, meeting minutes, and published documents available on the official websites of the academic units involved in the study. Inclusion criteria were: public access, belonging to the institutions under study, and relevance to the research objectives. A questionnaire was designed for teachers in the different academic units, based on the instrument used by Casate Fernández (2017) in her research on a management model for Cuban scientific and technological output. The questionnaire was adapted to the university's context and the research objectives.

Likert-type scales were chosen for the variables and their indicators, as these allow the identification of scales of attitudes and opinions and are widely used in research (Campoy Aranda, 2019). The questionnaire items were drafted following the guidelines indicated by Campoy Aranda (2019). For the document analysis, a document sheet was developed to identify the classification systems used

in the university's institutional repository for the purpose of triangulation with teachers' responses.

Before administering the questionnaire, a two-stage validation process was carried out: first, expert analysis and evaluation of the instrument by three specialists, and then a pilot test with 20 teachers who had characteristics similar to the study population.

The experts used the scale and indicators mentioned by Campoy Aranda (2019) to assess each section of the questionnaire. Items with comprehension and relevance scores of 5 or higher were accepted. Table 1 presents the observations made by the three experts who evaluated the instrument.

Table 1. Expert evaluation.

Sections	Evaluators	Observations
Sociodemographic Data / Classification System	Evaluator 1	Provided observations and recommendations regarding items with technical content, suggesting adjustments for better comprehension.
	Evaluator 2	Provided observations and recommendations on the wording of some items, suggesting adjustments for improved clarity and measurement.
	Evaluator 3	Provided observations and recommendations on the wording of some items, suggesting adjustments for better comprehension.

All expert recommendations were incorporated into the final version of the instrument, which consisted of 9 sociodemographic questions with nominal and scale variables and 39 questions on the classification system and content management in IRs, all measured with Likert-type scales. The scale used for ordinal variables was: 1-Strongly disagree, 2-Disagree, 3-Neither agree nor disagree, 4-Agree, 5-Strongly agree.

For validation, a pilot test was conducted with 20 teachers selected through convenience sampling. Data were tabulated and analyzed using JASP (version 0.18.3). The results yielded a McDonald's ω reliability index of 0.96 and a Cronbach's α of 0.96, indicating high reliability.

For fieldwork, collaboration was first requested from one academic unit, along with the research proposal and reference to the educational cooperation agreement within which the study was conducted. The objective was to involve students from the master's programs in scientific research and in education with an emphasis on higher-education management, forming a research team. This collaboration allowed 9 students to integrate theory and practice through various research-related activities.

Permission was obtained from 8 academic units to administer the survey. A total of 300 questionnaires were distributed.

Document analysis was conducted in parallel, gathering information from all academic units. ATLAS.ti version 9 was used for qualitative data analysis, while PSPP version 2.0.0 and JASP version 0.18.3 were used for quantitative analysis. From these analyses, frequency tables and measures of central tendency and dispersion were generated, forming the basis for the results section.

Results and Discussion

The sociodemographic identification variables and their codifications are presented in table 2. This table includes the variables used for an initial sociodemographic identification of the instructors and for understanding the realities related to institutional repositories.

Tabla 1. Sociodemographic identification variables and their codifications.

No.	Variables	Coded variable
1	Instructor's sex – nominal	DS1_Sexo
2	Instructor's age – scale (recoded to nominal)	DS2_Edad – (DS2_Redad)
3	Teaching seniority – scale	DS3_Anti
4	Highest teaching category – nominal	DS4_CatDoc
5	Highest academic degree – nominal	DS5_GraAca
6	Reality regarding the IR in the academic unit – nominal	DS6_ReaRi
7	Reality regarding the dissemination of the IR – nominal	DS7_SocRi
8	Reality regarding the use of the IR with students – nominal	DS8_UtiRi
9	Reality regarding training in the use of the IR – nominal	DS9_CapRi

The sociodemographic data show a predominance of female participants (60%), compared with 40% male.

Most of the instructors surveyed fall within the 35–44 age range (44.3%), while only 4% are over 65. In terms of seniority, instructors have a mean of 10.09 years, a median of 9 years, and a mode of 12 years. The most common teaching category is “course instructor” (39%). The predominant academic degree is “specialist” (39%).

Regarding the variable “reality regarding the IR” (DS6_ReaRi), instructors were asked: “Select the option that best reflects your reality regarding the institutional repository (IR) in the academic unit where you work as an instructor.” The results are shown in figure 1. This figure presents the results obtained from the questionnaire administered to instructors during 2024. It shows that 37.33% of instructors have only heard about it through informal comments, while 3.33% do not know it and 1% state that the institution does not have this resource.

Regarding the variable reality of RI socialization (DS7_SocRi), teachers were asked: “Select the option that best reflects the reality of RI socialization in the academic unit where you work as a teacher.” The results are shown in figure 2. This figure presents the results obtained from the questionnaire administered to teachers during 2024. It is evident that the lack of RI socialization is recurrent, with 39.67% of respondents stating that “the institution has not socialized it yet.” Regarding the use of the RI, 62% have not used it with their students, although 38% have. Moreover, 55.67% indicate that the institution has not provided training on the RI, reinforcing the lack of socialization and training.

Regarding the classification and management systems contained in the RI, the analysis categories and the documentation used can be seen in figure 3.

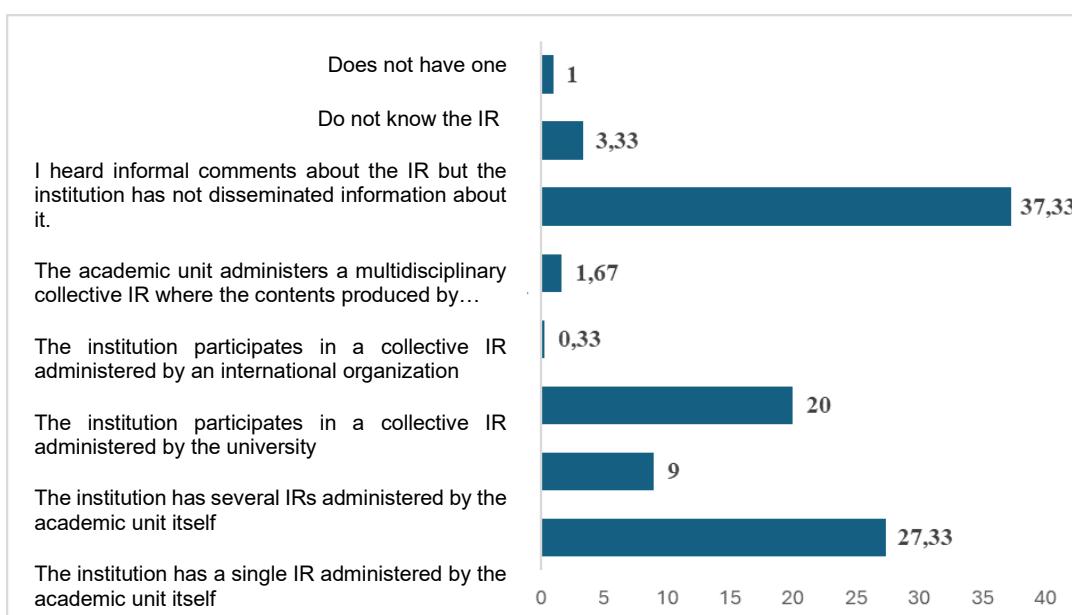


Figure 1. Knowledge and reality of the RI in the teacher's unit.

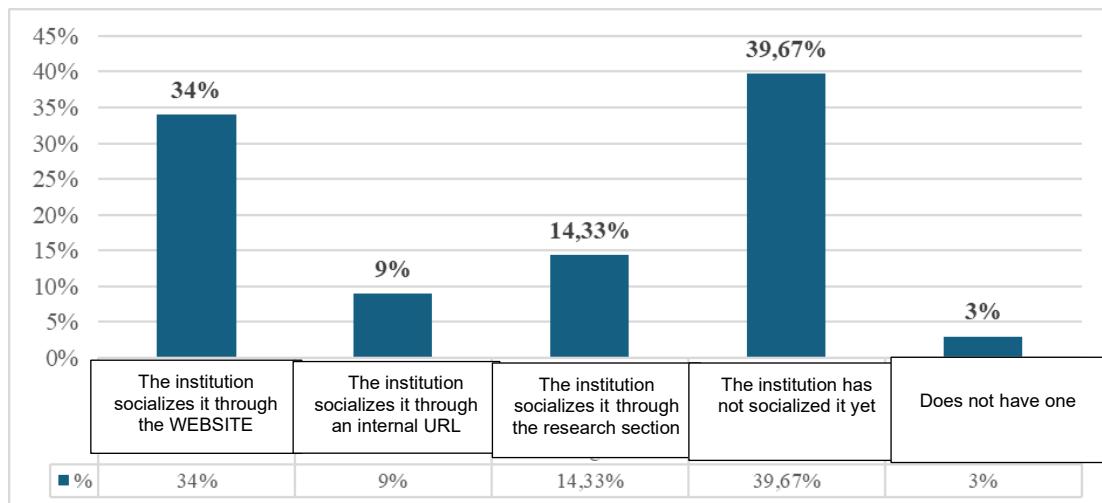


Figure 2. Reality of RI socialization in the teacher's unit.

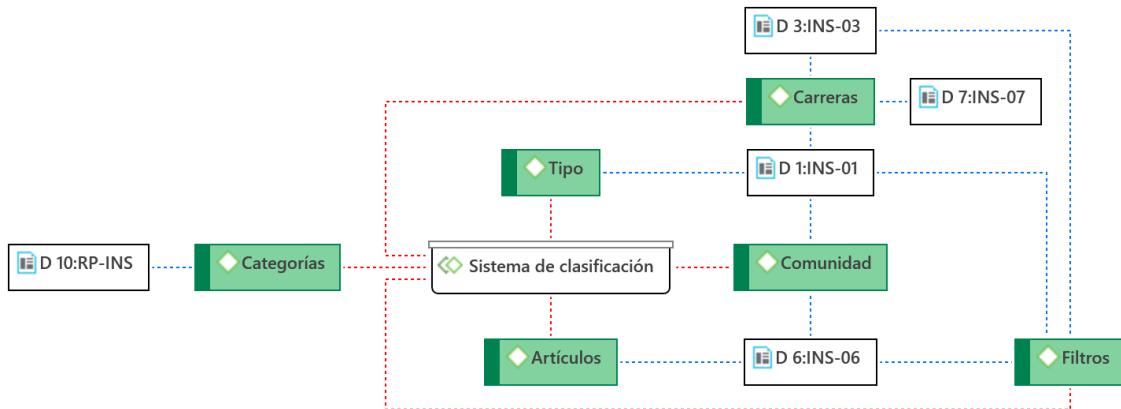


Figure 3. Analysis categories, documents, and related codes. **Note.** Prepared by the authors based on institutional documents analyzed in Atlas.ti during 2024.

It is noteworthy that the university has formally established the creation of the institutional repository (RI). The founding document outlines a regulation including the purpose and functions (2 articles), the structure, organization, and operation of the RI (12 articles), and some final considerations (5 articles). Regarding the structure, the following organizational categories are identified: institutional documents, research, teaching, and bibliographic productions. Institutional documents include the institution's annual reports, informational magazines, newsletters, manuals of functions, procedures and operational manuals, regulations, relevant final course projects for network sharing, and various productions organized under the miscellaneous subcategory. The research category includes doctoral and master's theses, scientific journals (or articles), and patents. The

teaching category encompasses all academic outputs resulting from teaching activities, such as teaching guides, instructional manuals, assessment rubrics, tutorials, etc. Bibliographic productions include conference papers, presentations at scientific meetings, speeches delivered at official institutional events, book chapters, and books (or technical sheets of books published by the institution). Additionally, new categories and subcategories may be incorporated or existing ones adjusted to facilitate information availability and access (D 10:RP-INS).

Other categories within the university RI include communities organized by faculties, schools, and administrative units. Within each community, organization is given by categories such as Young Researchers' Conferences (JJI), theses, and final

course projects, while higher schools include master's and doctoral programs. Administrative units include categories such as newsletters and scientific journals. The RI also provides filters organized by publication date, authors, titles, and subjects, which facilitate searching and access to materials (D 1:INS-01) (D 7:INS-07).

A second RI, called the Knowledge Portal, exists on the website of one academic unit. This portal has a classification system by academic units, with a single classification of articles within each unit. Defined categories include articles, monographs, books, theses, and final degree projects, with search filters by publication date, author, title, and subject. Although the categories are similar to those of the university RI, the number of records and classification systems do not match the university's main RI, indicating the use of different criteria related to policies and guidelines for RIs (D 6:INS-06).

A third repository exists on the website of another academic unit. This repository is presented in two separate links: the first as a repository of final course projects (TFG), classified by degree program and year; the second as a research work repository, classified by year of the work. No search systems or filters are available for this third repository, and the productions presented belong solely to the individual institution (D 3:INS-03).

Although the university has established a well-structured RI with clear categories, implementation varies across academic units. The existence of multiple repositories with different classification

systems and policies highlights the need for greater standardization and coordination to improve accessibility and usage of available resources. Incorporating search systems and filters in all repositories is essential to facilitate access to information and maximize the impact of institutional repositories, as noted by Barrueco Cruz et al. (2017): "A repository cannot merely be a document depot. These documents must be described using a sufficient number of metadata based on international standards and minimally normalized, organized through the application of some content classification" (p. 9).

Regarding results on the classification and management systems within the RI, teachers' perceptions show both consensus and divergence, reflecting the need for a more uniform and coordinated approach. Some of the most relevant findings are highlighted below.

Concerning document classification in the RI, most teachers (53.33%) agree that it should be based on content type. This approach allows for a more logical and accessible organization of materials. Detailed results are shown in Figure 4. Regarding the inclusion of full theses (Figure 5) and thesis summaries (Figure 6), while the majority (57.66%) support including summaries, the inclusion of full theses generates neutral responses, with 35.34% agreeing. However, the mode is neutral, indicating uncertainty or the need for further clarification on the benefits of including full documents in the institutional repository for knowledge generation.

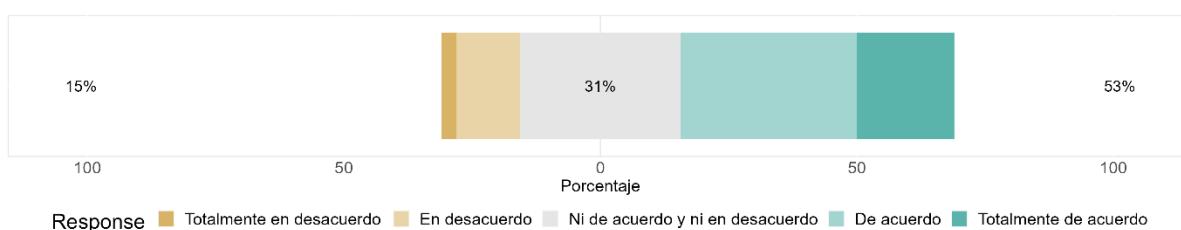


Figure 4. Survey results: Materials should be classified according to content type. **Note:** Prepared internally based on surveys conducted among teachers during 2024.

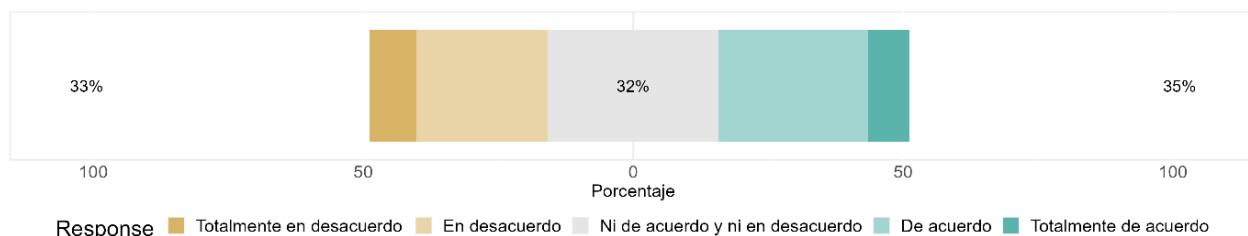


Figure 5. Results of the survey: Classification should include full theses. **Note.** Prepared by the authors based on surveys conducted with teachers during 2024.

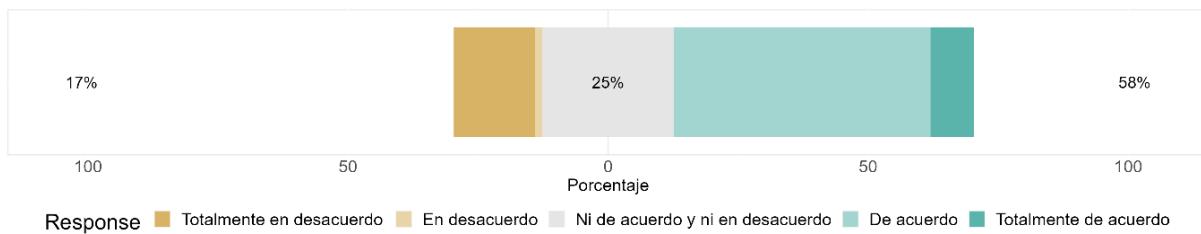


Figure 6. Results of the survey: Classification should include thesis summaries. **Note.** Prepared by the authors based on surveys conducted with teachers during 2024.

At this point, the difference between including full theses and thesis summaries is noteworthy. In this context, Table 3 presents the results considering the teacher's category and the inclusion of full theses. This table shows the cross-tabulation of survey responses regarding the current teacher category and the inclusion of full theses in the institutional repository. The majority of teachers adopt a neutral position (31.67%) regarding the inclusion of full theses, followed closely by those who agree with their inclusion. Among permanent faculty members (assistant, associate, full professor), there is a range of opinions from strongly disagree (1.33%; 2.33%; 1.33%) to strongly agree (1%; 0.67%; 0.33%), indicating a slightly more negative tendency at the

extremes. In contrast, non-permanent categories (teaching assistant, course coordinator, module professor) show lower participation in total disagreement.

Regarding the inclusion of journal articles, there is strong agreement for internal articles (59.67%) and for external articles (52.67%), highlighting the importance of these resources within the academic community. However, a notable percentage remains neutral or opposed to using these resources, reflecting concerns about their relevance and/or accessibility. Detailed information can be found in Figures 7 and 8.

Table 3. Cross-tabulation results of teacher category and inclusion of full theses.

Teacher Category	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Total
Teaching Assistant	0	5,33 %	3,33 %	6,33 %	0,67 %	15,67 %
Course Coordinator	3,67 %	10 %	11,67 %	10 %	3,67 %	39 %
Assistant Professor	1,33 %	4,33 %	3 %	2 %	1 %	11,67 %
Full Professor	1,33 %	3 %	5,67 %	5,33 %	0,33 %	15,67 %
Associate Professor	2,33 %	1,67 %	2,33 %	2,67 %	0,67 %	9,67 %
Module Professor	0	0	5,67 %	1,33 %	1,33 %	8,33 %
Total	8,67 %	24,33 %	31,67 %	27,67 %	7,67 %	100%

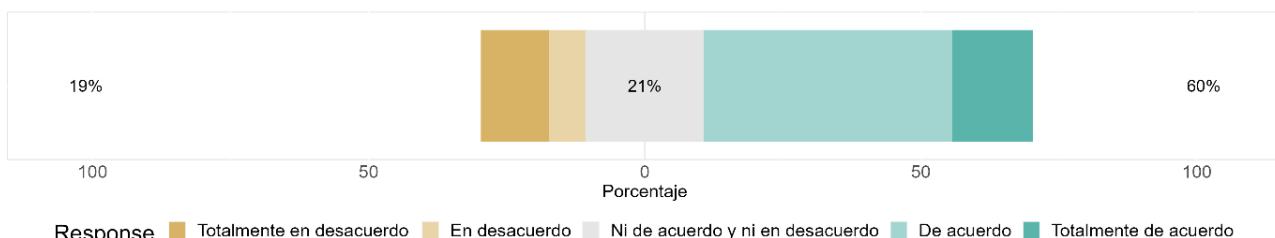


Figure 7. Results of the survey: Classification should include journal articles. **Note.** Prepared by the authors based on surveys conducted with teachers during 2024.

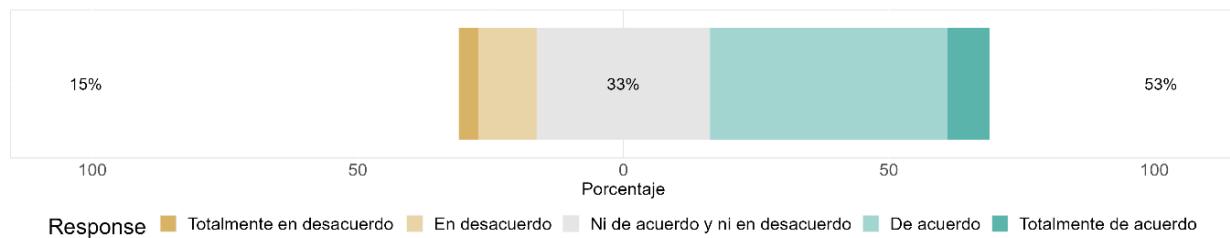


Figure 8. Results of the survey: Classification should include external articles. **Note.** Prepared by the authors based on surveys conducted with teachers during 2024.

Regarding the inclusion of visual materials, such as photos, images, and videos, there is a marked disagreement accompanied by a high level of neutrality: 30.33% of respondents are in favor, while 35% are against. These results highlight the need to establish policies and criteria to guide the implementation and relevance of these materials in the repository. Sánchez and Melero (2007) note that including such visual documents may present implementation challenges due to the need for specific software, regulatory compliance, or costs. This may explain why visual media are not widely included, underscoring the need for clear guidelines to facilitate their inclusion and proper management in the RI.

Regarding maps, statistics, and economic documents, opinions are quite divided, with a high proportion of neutral responses, suggesting a lack of clear consensus. However, statistics are favorably viewed by 43.67% of teachers.

For specific academic materials such as doctoral theses, master's theses, conference proceedings, and conference communications, there is substantial support for including doctoral theses (44%) and master's theses (50%), as well as conference proceedings. Neutral positions are prevalent, reflecting variability in the perceived relevance of these materials across disciplines. Casate Fernández (2017) emphasizes that "repositories of theses and dissertations (both undergraduate and graduate) constitute a widely used type of institutional repository, considering the need for visibility of such documents, especially doctoral theses" (p. 46). Visibility of theses in RIs is therefore very important. Neutral positions are most common regarding master's theses (42%), while 50% of teachers agree with including doctoral theses, taking into account the highest academic degree held, as shown in Table 4. This table presents the cross-tabulated results of teacher highest academic degree and inclusion of master's and doctoral theses in the institutional repository.

Table 2. Cross-tabulation of inclusion of master's and doctoral theses by highest academic degree of teachers.

Highest Academic Degree	Master's Thesis Agree Neither nor Disagree	Master's Thesis Agree Neither nor Disagree	Doctoral Thesis Agree Neither nor Disagree	Doctoral Thesis Agree
Bachelor	4%	3%	2%	5%
Engineer	3,67%	1%	2,33 %	4,33%
Specialist	18,33%	14,33%	12 %	20%
Master's	12%	11,33%	9,33 %	15%
Doctor	3,33%	3,33%	2,67 %	3,67%
PhD	0,67%	2%	0,67 %	2%
Total	42%	35%	29 %	50%

Regarding the inclusion of e-books and book chapters, teachers show a favorable attitude toward including e-books (51%) and book chapters (47.67%), emphasizing the importance of these formats in education and research, particularly for preservation within the institutional repository.

Concerning classification criteria such as academic unit, subject, and language, the majority agree on classifying materials by academic unit (50%) and subject (51.67%), indicating that these categories are considered useful for organization and access. Classification by language shows higher neutrality (43%), suggesting that not all teachers view language as an essential classification criterion.

Comparing the classifications established in institutional documents with teachers' opinions about the classification system to be used reflects the need to unify criteria and policies across different institutional repositories and involve teachers in the process. The importance of well-established classification systems is critical, as ignoring these processes could negatively affect institutional visibility.

Management of university RI resources should be guided by appropriate policies incorporating best practices and expert recommendations. Freitas and Leite (2018) state that "institutional repositories are a set of services that enable the grouping, storage, organization and control, preservation, retrieval, access, and, above all, dissemination of the scientific information produced by the institution" (p. 97). Promoting the visibility of universities through their academic and scientific output requires policies that ensure comprehensive and proper management of RI resources.

Conclusions

Contrasting university teachers' perceptions with institutional documentation identified uncertain aspects of RI management that require attention. Key results include:

While the RI classification system is established with categories and subcategories facilitating organization and access to academic and scientific output, the coexistence of files with heterogeneous criteria and content generates confusion and fragmentation. Standardization of classification criteria across repositories is necessary.

Teachers' perceptions show both agreement and disagreement. Negative opinions are primarily related to lack of training on the RI, suggesting that enhanced training and socialization would improve perception and usage.

Restricted access to institutional documentation in some faculties highlights the need for more effective communication and dissemination of RI policies. The absence of unified criteria and content is seen as an institutional management issue, indicating a need for coordinated organizational efforts.

Survey results show differing views on the appropriate RI classification system, but strong consensus on including master's theses, research reports, journal articles, and academic documents, as well as classification by academic unit, research line, and subject.

Recommended actions to improve RI effectiveness:

Ensure access to institutional documentation through protocols that guarantee all faculties access to public and specific RI documents.

Increase communication and dissemination by developing and implementing a clear communication plan on RI policies and guidelines.

Standardize classification and management criteria through an interdisciplinary working group to unify practices across university RIs.

Promote cooperation among faculties through joint initiatives and projects.

Establish a working group to manage and supervise the RI, continuously addressing needs and challenges.

Implementing these recommendations will ensure that the university RI becomes a valuable and useful tool, improves teachers' understanding and compliance with RI policies, ensures access to documentation across the academic community, and fosters transparency and coherence in RI management. Unified criteria and collaborative participation from all academic units will enable all RIs to follow the same standards, facilitating knowledge transfer and increasing the effectiveness and utility of the repository for the university's academic and scientific community.

Author contributions

Idea: C.G.; Project development: C.G.; Literature review: C.G.; Methodology: all authors; Data collection: C.G.; Data analysis: C.G.; Results presentation: all authors; Discussion and conclusions: all authors; Draft writing: C.G.; Final revisions: all authors; Approval for publication: H.P.

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