Opening up an interuniversity collaboration among Catalan university academic staff

The case of CIRAX pilot experience

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***Abstract* — The openness movement supported by the development of information technologies, the empowerment of knowledge-sharing communities of practice across the network, as well as the need to ensure higher quality education, provide the framework for the "Col·laboratori interuniversitari de recursos d'aprenentatge en xarxa" (CIRAX) program.**

The CIRAX project aims to promote and consolidate a teaching community which should be active in the creation, updating and sharing resources, and learning practices. The tool for achieving this goal is a repository-in-collaboration where resources could be shared, well-catalogued and well-managed.

In light of the experience, we have identified the factors that influence sharing and reusing resources and which have been tested on university teaching staff of introductory math courses. Among these factors, we have observed a high degree of sharing practice but constraints on reusing, due to prioritization of time and a lack of information regarding open licenses.

The first year results allow us to establish essential lines of action in order to consolidate and enhance this experience within the mathematical teaching community at the Catalan university system: a) simplify the prototype and its workflows; b) articulate the shared resources in a normalized and clear way; c) develop strategies for consolidating the community and dissemination of information; and d) enhance the institutional recognition of teaching practice.

Keywords — Catalan University System; CIRAX; interuniversity collaboration; Open Educational Resources; repositories; teaching quality.

I. Introduction

CIRAX project is an initiative from the Government of Catalonia, through the Secretaria d'Universitats i Recerca de Catalunya (Comissioner for Universities and Research) and which is carried out by the Consorci de Biblioteques Universitàries de Catalunya (Consortium of Academic Libraries of Catalonia, CBUC) involving a multidisciplinary team constituted by academic staff, administrators and librarians from different Catalan universities.

The project is focused on two principal areas of interest:

- Reflecting on university teaching quality and analyzing the mechanisms that motivate or inhibit sharing and reusing of resources in a virtual environment (classification, licensing, reward and recognition, evaluation resources) within the university academic staff.
- Developing a technology environment to enable sharing and dialogue regarding educational resources and experiences.

The project has been initially developed through a pilot phase in order to take greater control of the sample and to measure the impact of the implemented actions. This pilot stage has been carried out among Catalan professors who teach in basic mathematics courses. They have a twofold objective: students should learn the fundamental terminology, techniques and concepts of Algebra and Mathematical Analysis, and should be able to apply this knowledge in practical cases. These courses are taught in all Catalan universities, but they are optional in each university program. For that reason, they usually use different names and each faculty decides the specific contents, lengths, approaches and purposes. In any case, they provide an introduction for students and give them a solid foundation for the subjects required in their degrees.

The main objective of this paper is threefold: to locate this project in the framework of openness, practice communities and professional identity; to show the project methodology and results and analyze the first year experience.

Through in the following sections we present the different steps of this first stage of CIRAX carried out in 2013. The background section describes tendencies, attitudinal and cultural changes as well as local and European strategic directives related to Information and Communication Technologies in university teaching and learning. The following section presents the prototype of the first stage of the CIRAX project as well as it describes the procedures performed during this pilot phase internally. Then, there is an analysis of the prototype and results regarding its use and perception. Finally, this study points out the most relevant findings arising from the discussions and results described above as well as identifies courses of action for the CIRAX project.

II. Background

There are three factors that explain the context in which the CIRAX project has arisen: a) the Openness movement, led by the development of ICT and networking; b) the development of communities of practice who share knowledge across the network; and c) the need to ensure a higher quality education to meet the Europe 2020 strategy objectives for smart, sustainable and inclusive growth.

The introduction of ICT in the conception, design and development of educational resources has resulted in significant changes in teaching and learning practices. At the same time, networking has increased the possibility of developing teaching materials in a collaborative way and using them remotely.

The Declaration for Open Education [10] proposes a new pedagogy for educators and students as actors, who create, develop and shape knowledge together, deepening their understanding and skills in the process. Therefore what they are proposing is more accessible but also more effective education.

One of the most commonly-held views is that the main advantage of Open Educational Resources (OER) is that it improves quality and cost-effectiveness [8]. Most OER are under an open license that allows duplication, a certain degree of editing and repurposing of the material [20]. In line with these approaches, stakeholders are found to develop a more open perspective in terms of policies and courses of action. At the end of 2013, the European Commission proposed to the European Parliament an agenda and a set of actions in order to enhance and open up the learning environments to deliver education of higher quality and efficacy [11].

In the framework of projects that promote the sharing of open educational resources, different models have been described. The technological tool could be similar, but attitude and willingness to collaborate can produce very different dynamics. The social network becomes a meeting place and a showcase for its users' materials. The community of practice is characterized by collaborative work and the common goals of its members [16]. Both phenomena are interrelated or co-exist separately.

Regarding CIRAX, its direct antecedent came in 2007 with the creation of a Learning Resources Repository, Materials Docents en Xarxa (MDX). This online tool was implemented in order to unify the teaching materials produced in the different Catalan universities and to have their own management and preservation strategy towards digitization.

Several research projects have carried out an analysis of the Spanish and Catalan use of university repositories, whether for research or containing teaching resources. One of these studies is the REBIUN, which covered the whole state. This comprehensive study identifies a lack of institutional policy regarding repositories that hold educational resources. Moreover, the REBIUN analysis concludes that there has been a low use of Creative Commons licenses as well as no follow-up regarding the control of the materials published in repositories [17]. Concerning material typology, the study found that most of them were textual and plain, without either multimedia or interactive content. Therefore, there is an evident lack of conviction that educational materials must also be part of digital collections of university libraries [7].

Among the conditions which encourage the participation in educational repositories, the literature supports the fact that it is fundamentally based on cultural issues rather than technical limitations. For this reason, proposals to guide the success of projects such as educational repositories often involve human and cultural strategy types [9], [6]. Alternatives to institutional repositories such as disciplinary or thematic oriented ones arise. In consequence, collaboration is only carried out within the framework of a subject or a set of subjects.

CIRAX, which is initially being carried out on the Catalan mathematics lecturers' community, aims to enhance and consolidate this specific and inter-faculty group of teaching staff. In this sense, professional and emotional links are often stronger between colleagues of the same discipline (whether they come from the same institution or not), than in institutional repositories that can fragment the knowledge base in different locations and hinder institutional collaborations [5]. In fact, [13] points out "professional identity" as a key element in the analysis of factors influencing the resistance to change in institutional contexts. In the context of higher education, the professional identity of academic staff has been analyzed from multiple perspectives but there are not many studies that analyze their conceptions of the teaching activity or their feelings about this activity [1].

The particularities that characterize the profile of university teaching staff add up to a singular case. According to [22] teaching (at university) is a complex activity that involves cultural and political elements [12], and which has its own characteristics and is distinct from the other tasks professors carry out. Teaching is different from research, management, cultural outreach, or participating in other professional projects (reports, audits, consultancy, etc.). It is said that university education is an activity with a split personality because it depends on the quality and standards of

teachers, as well as on the rules that are imposed by the evidence accumulated by the activity [22].

Introduction of ICT, the rise of e-learning and, in particular, the emergence of MOOCs have led to the redefinition of the missions, visions and values of university institutions. Specifically, teachers must provide students with the necessary skills that will allow them to become active and responsible citizens but also highly capable and competent workers in the 21st century.

As [15] states, the diversity of students and the different educational situations in which a professor can be involved, highlights the fact that academic staff may take advantage of the many available resources and customize their own teaching activities. At the same time, lecturers should collaborate with each other in order to maintain a spirit of research in their classrooms by sharing resources, observing and reflecting on their own teaching. Finally, academic staff should improve their teaching performance gradually.

The results of several studies suggest approaches to the concept of "good teaching" or "good practices" as well as the development of academic knowledge throughout a university education. Understanding how students learn and what perception they have is associated with the development of this knowledge. However, the teaching in our country –not particularly systematic and focused more on individual practice– is not subject to any review mechanism or improvement.

A quality system for teaching and learning should support decision-making in relation to learning resources and the assessment of teaching through reflection and self-assessment but also through peer reviews.

In particular, the development of skills in the fields of science, technology, engineering and mathematics (STEM) is increasingly important to the success of students at all levels and for their professional development. In addition, the economic situation of the present century is closely linked to the contributions that can be made by these areas.

The Catalan university system has taken steps to pursue the recognition of teaching quality and innovation in teaching from different perspectives.

Internally, Catalan universities have launched initiatives to recognize and reward the work of their academic staff and the Generalitat de Catalunya annually announces a quality teaching award for universities, called the Jaume Vicens Award. It is usually the responsibility of the Education Science Institute (ICE) of each university to reward or provide support for innovation to teachers. In addition, universities offer services and infrastructure though ICEs or library services to provide innovation support, design and development of teaching materials.

The Agència per a la Qualitat del Sistema Universitari de Catalunya (AQU) is the Catalan institution responsible for guaranteeing the quality of higher education in line with European quality standards. Its strategic plan includes evaluating academic staff and providing updated assessment methodologies in order to improve the quality of the teaching. Furthermore, it enables standardization through the establishment of a common reference framework for all Catalan universities.

The latest studies of the AQU emphasize the need to promote university teaching activity, to include recognition accreditation processes, and to increase economic incentives [2], [3], [4]. As remarked [22], in the teaching practices "it is imperative that (people who teach at university) are satisfied with their salary levels, prospects for promotion and treatment, the intellectual challenge of research, the pleasure of teaching and the emotional quality of the communities of practice in which they work" [14].

Thus, as outlined [18], although there probably is a local policy framework which helps to define the identity of teacher training, a system of incentives and appropriate recognition criteria and values of quality and prestige can help to shape it. A definition of various profiles, a weighted system of incentives and the appreciation of teaching could definitely contribute to the enhancement of the professional identity of university academic staff [18].

III. The prototype, procedures and methods

The definition of the full project, the development of the prototype and the pilot experience as well as the reflection on the importance of establishing an active educational community related to the creation, use, reuse and sharing of resources have been carried out by a great number of professionals connected with the Catalan university system. They have been organized in seven different but complementary work teams, according to the objectives and designated areas they have worked in:

- PT1: *Theoretical framework and assessment* focused on motivating interest in the project by analyzing data related to sharing, reusing and collaboration practices.
- PT2: *Prototype* to make the necessary technology available to achieve the aims of CIRAX.
- PT3: *User studies and usage requirements*, focused on detecting the needs of university staff and proposing mechanisms and procedures concerning metadata, licenses and classification.
- PT4: *Pilot experience*, responsible for locating the university staff that teach preparatory math courses, requesting their collaboration, collecting materials and providing the necessary support for the implementation of the pilot experience.
- PT5: *Encouragement and incentives to the community*, focused on designing and developing initiatives and mechanisms that foster and maintain community involvement in the sharing and reusing of resources.
- PT6: *Regulations, recognition and quality of faculty*, responsible for analyzing the mechanisms established by universities as well as regulations at a state level

that recognize and reward teaching and learning activities.

- PT7: *Dissemination and secretary* is in charge of maintaining both the internal and external communication of the project.

As mentioned above, the CIRAX project was initially deployed in a pilot phase to allow greater control of the sample and to measure the impact of the actions undertaken. Mathematicians from all Catalan universities who teach introductory mathematics courses were chosen for this pilot stage. Among other factors, there was a common purpose for choosing this particular subject: providing the necessary grounding for other subjects. The capacity of the introductory courses to even out differences in level and their purpose (providing grounding in mathematics is crucial for the subjects in question) provide a starting point for unifying criteria. Moreover, these subjects become a good bridge between high school, which has an established and state curricula, and university. For these reasons, these courses need to have an even greater variety of teaching and learning materials.

The approach of the project has been to collect teaching and learning resources that mathematics teaching staff developed and used in their teaching of these courses. According to CIRAX a learning resource includes anything that can be used to learn the skills related to basic mathematics, in this particular case. However, establishing the minimum unit of content is one of the biggest challenges for not only sharing but also for promoting the reuse of materials.

To achieve a good level of participation, the mathematics teaching staff who wish to share their materials only have to email them to CIRAX and provide basic data about the document (e.g. authors, licensing, resource description, context and level). The CIRAX team in charge places them in the repository and makes them accessible from the social platform. During the pilot phase CIRAX received different kinds of resources without previous filtering. The final submission process will be more clearly defined this year, 2014, in order to improve the quality of the resources, as well as to allow optimal labeling and classification so that the resources can be located and recovered easily.

The end user for the prototype implemented during this pilot experience is, of course, the same mathematics academic staff teaching basic math subjects.

Technical issues concerning the platforms used for the prototype have been handled through CBUC (in collaboration with CESCA) and the mathematical software company Maths for More. The repository MDX managed by CBUC provided the starting point for all the platforms used. A copy of its system was produced and at the same time it was adapted to a social platform (OER Commons). Maths for More was responsible for implementing the copy and integrating it with the social platform in order to establish communication between the two platforms. The MDX electronic deposit system is a DSpace, which allows the storage, indexing and preservation of the resources. Although its full potential has not been fully explored, the tool has proved to be a reliable repository in which the resources are efficiently sorted and catalogued with an associated set of identifying metadata: authorship, license, university, college, course materials, type, summary and context of each resource.

The OER platform makes up for the low user centrality of the initial MDX repository as it enables each resource to be associated with a real particular user, the author (or group of authors) of the material, who is part of the CIRAX OER group. In this sense, OER Commons acts as a web portal that displays all the links of the resources which have previously been hosted and organised on MDX. The social part of this prototype enables different forms of interaction within the academic community: assessing resources, reviewing resources, commenting on them, and creating a user's own folders in order that each user can have their personal collection of resources. This constitutes an essential feature of the platform.

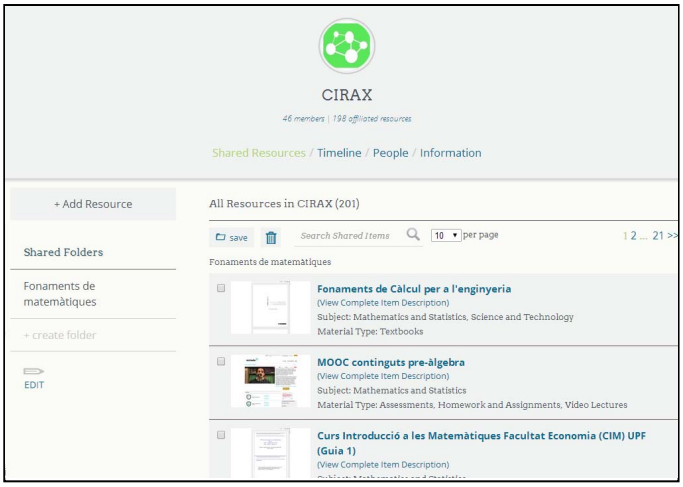

Fig. 1. OER CIRAX group.

In order to gather the requirements of the academic staff featured in this area, three initial profiles of users were considered: enthusiastic users of ICT and repositories, users who have the potential to share resources, and the most reluctant users in the use of ICT and sharing resources. Most of them are characterized by their effort to develop educational resources and to use new ICT techniques. However, during the pilot phase, two other groups have been identified as potential users: on the one hand, students of the subjects in question as users of open educational resources for their studies; and, on the other hand, secondary school teachers, due to the bridging nature of the chosen subject, and, perhaps, even overlapping content.

During the pilot phase, the list of teachers who have received information about the project in a systematic way has grown. There are several reasons for this: because they have subscribed to the CIRAX newsletter, their participation in the I CIRAX Workshop, their attendance at teaching and innovation conferences where CIRAX has been presented or the recommendation of another professor. CIRAX stresses that participation in the project is voluntary and the decision to share resources is up to the authors of the materials. However, one of the project's aims has been to foster awareness and open discussion in order to reflect on teaching at university

and possible teaching improvements, both in the short-term and the long-term, individually as well as collectively. In this regard, issues related to the recognition of teaching and the possibility of establishing mechanisms to ensure the quality of resources soon emerged.

The study of the user experience and dynamics will not only allow us to diagnose the situation in relation to teaching and the learning process and its recognition by the administration and institutions, but also to define possible future lines of action.

It is important highlight that this first stage of the project only focuses on the behavior of the mathematic academic staff (lecturers and professors). The impact on the students' community is going to be studied in the second stage which is being developed throughout 2014.

IV. Analysis and Results

The prototype of CIRAX was officially launched on June the 27th, 2013, in the context of the I CIRAX Workshop. Fifty professors and lecturers of mathematics at Catalan universities were previously contacted, and some of them had already sent teaching and learning resources to be uploaded to CIRAX. The analysis of the impact of the pilot experience of CIRAX was carried out in the last quarter of 2013.

To present the data from the pilot study it is necessary to take into account the specific nature of the prototype, which is integrated by two relatively integrated components (the MDX repository and the OER social platform) and a dissemination web site (www.cirax.cat).

At the end of this analysis, CIRAX has:

- 50 authors of teaching and learning resources, including co-authorship
- 206 learning units, integrated by:
    - 3 full courses of introductory mathematics (1 MOOC, 1 online course, and all the materials for a face-to-face course)
    - 9 parts of introductory mathematics courses (videos, exercises, problems, self-assessment questionnaires, theory pdf, powerpoints, ebooks)
    - Resources not explicitly placed in a specific course (educational games, virtual learning tools, simulations, exercises, etc.).
    - 4 scientific resources (one dissertation, one doctoral thesis and two papers) related to innovation and the teaching of mathematics
- 42 registered users in the CIRAX OER group, most of them with a mathematical teaching profile
- 123 university professionals signed up for the CIRAX Newsletter

Different qualitative and quantitative methods have been deployed in order to achieve the project's objectives. These can be summed up as:

- Discussion groups of librarians and support staff of learning units.
- In-depth interviews to better define the profile and the daily work of university academic staff involved.
- Online forms and questionnaires, filled out at the beginning and the end of the courses, in order to better understand CIRAX's target audience and, consequently, to obtain qualitative data regarding the use of CIRAX and to monitor it.
- Technology round tables in order to analyze the integration and functionality of the technology supports of the project.
- Analysis of the MDX repository traffic, the use of and the activity on the social platform OER Commons, and the visits to the dissemination website. For this purpose, we have used tools integrated into the repository, the social platform and the web as well as Google Analytics. As a result, we obtained data related to the resources downloaded and displayed, the origin of the visits, the user profile and their behavior, and the relationship of the users with institutions or groups with shared interests (universities, secondary schools, etc.).
- Discussion groups to analyze external aspects that influence the sharing and reusing of teaching and learning resources
- Comments, opinions and observations that CIRAX users directly expressed on their own.

The results of the pilot test allow us to identify the factors that influence sharing and reusing resources within the framework of this first stage of CIRAX focused on academic staff of basic mathematics. Among these factors, we underline the sense of a well-defined community as a success factor for knowledge sharing and which, in a virtual environment and with common goals, manifests itself as a community of practice. Analyzing the results in detail we have classified the factors involved in the use of CIRAX according to three principles: a) attitudinal; b) educational; c) external or strategic.

For a good analysis of the results and the impact of the pilot experience, the CIRAX team produced different reports (i.e. a Log Analysis report, a technological report, a User studies report, a Prototype Audit, a regulatory and recognition report, etc.) in accordance with the main objectives of each working group. These results can be summarized in different lines of activity, as follows:

A. Processes relating to open educational resources

- The quality control system of resources is not solved, yet. During the pilot stage two positions have been observed related to creating and sharing resources:

- The need for a panel of experts to filter resources previously
- The need for authors to check and review their resources and a secondary community filter

- It is necessary to educate the university teaching community about possible teaching licenses that ensure the legal use of resources.
- Technological tools must be updated in order to unify processes and distinguishing features. The platform should have a single access point.

  The idea is very positive but OER implementation […], makes it cumbersome. (Math Lecturer)

- Tagging resources is an issue that must be reviewed.

  It is not easy to search for specific contents. (ML)

- The role of the librarian in the whole process has to be better defined.

B. Development, management and sharing of OER

- In general, academic staff has an open attitude towards sharing educational resources but some barriers, mainly cultural, have been identified.

  I think the idea of the repository, "collaboration" is very good because it's like ... I think it will be good because it allows us to say "look there is this" and it is another way for professors to have all their materials in one place and it doesn't have to be a case of "because I went to a Congress or I met this or that professor". And also for students, who can access these materials from a single place. (ML)

  It would help us to know what other people are doing, if they are good, if they fit our curricula … and it helps you to learn to do new things. And for the students, so I guess the idea is to have open access. (ML)

  Maybe it can be the reference point for consultation and sharing materials. (ML)

  Writing materials and making it an open-access resource exposes you to criticism and you must also be brave. You should be aware that there are always errors and be aware of the fact that if you do what you think is right and you do it in a quality way, no one should be ashamed. (ML)

- The finest granularity of resources is perceived by users and authors as advantageous and very necessary in order to share and reuse resources.

  More material and better categorized. (ML)

- Traditionally, planning and designing teaching and learning activities is conceived of as an individual task. Lack of time for teaching staff in planning their (own) activities is one of the main obstacles for the development and sharing of open educational resources. Both librarians and academic staff argue that reuse already occurs, but in a disorganized and uncontrolled way, without a legal framework that protects the recognition of intellectual property of the author.

  The idea is very positive but […] the lack of time makes it difficult to access resources easily (ML)

  Because of my day-to-day work I don't have enough time to check and look at CIRAX materials. I've recently become familiar with the environment but I find it difficult to use. (ML)

- Most professors believe that learning resources are closed products. But, it has been observed that authors have previously updated all materials before uploading to CIRAX. Thus, it is proof that teaching resources are not closed instruments.

  Being critical of myself, I haven't made enough effort to classify the materials because I have not reviewed how the materials I send are classified. (ML)

  You should be aware that there are always errors […] (Math Lecturer and Author of resources)

C. Institutional policies

- A lack of institutional support, recognition and reward for the creation and reusing of resources has been detected.
- During the pilot experience, the need to provide value to teaching by incorporating mechanisms for teaching evaluation as well as incentives for daily dedication to teaching has emerged. From the observed results it is fairly clear that lack of time and a mandatory dedication to other tasks that are considered as a priority are inhibiting factors.

  As we are always busy with many issues it means we can't respond as fast as we'd like to (ML)

- Features that can nowadays define the teaching activity profile can be summed up as followed:
  - Teamwork and project work
  - Transparency and openness
  - Hybrid teaching activity. Areas of teaching-learning process are renewed, and classroom lessons become interactive spaces (flip-classes)

- Connectivity and Networking.
- Customization: teacher's ability to adapt their teaching process to the needs of each student
- Communication as an essential skill of the teacher.

- Workflow and processes can be integrated with current institutional practices.
- Institutional support should be included in a broader political strategy (interuniversity).

D. Technical issues and sustainability

- A platform with a single access is needed.
- Version management is a major concern for the sustainability of the project.
- We need an easy and user-friendly way to upload and gain access to the resources, as well as having more autonomy in terms of having control of own resources, sharing them and accessing them easily.

  I think it could be a reference site, if it is finally well organized, and if users can use it and update features easily.

- Metadata can be suggested by academic staff.

Notice that in this stage of the project the impact of CIRAX on students' community is not analyzed. As it is said before, this study is the focus of the second phase of the project that takes place over 2014.

V. Conclusions and Future lines of action

The first stage of CIRAX which is presented in this paper has been a successful experience: it has been able to collect open educational resources with a Creative Commons license from most Catalan universities. Currently CIRAX has materials created by Catalan university academic staff and which is used in introductory mathematics courses from eight different Catalan universities.

The experience shows that the use of digital resources, the sharing and collaboration among teaching staff are not common practices and the existence of a specific repository with some social features is not enough. Although expectations regarding CIRAX are high and the belief in its potential is shared, the impact on the introductory mathematics teaching staff has been limited. However, we have to keep in mind that the proposed activity is basically for using, reusing and sharing, which represents a cultural shift in the conception and the practice of the teaching staff in the Catalan university system.

A thorough review of the literature, such as the information collected through interviews and focus groups, has shown the importance of narrow conceptions, in which the recognition of professional activity and academic career progression are mainly based on the evaluation and assessment of research. Therefore, it will be necessary to involve the different actors in the Catalan university system in a way that leads to greater integration: beyond the academic staff, it is fundamental to have a political strategy with specific measures from both the government and the AQU agency, as well as from universities and academic leaders.

Regarding the technological tools, it is clear that we need to simplify their use, including better labeling and granularity of the resources as well as a faster and more intuitive system for access, search and classification. At the same time, it is necessary to make the academic staff involved feel part of a particular community.

In view of the pilot experience and in order to achieve greater involvement of the community, the communication side of the project and the implementation of campaigns to foster the community need reformulating.

Subsequent to the redefinition of the role of academic staff, there are different proposals to introduce mechanisms and indicators to encourage university teaching staff. The evaluation and verification of teaching is necessary and relevant. Thus, the institution should guide and establish requirements in order to assess teaching quality. At the same time, it is fundamental to have the involvement of the government in the strategy of the universities [19].

In order to improve the management of the resources, we recommend the involvement of students from Library and Information Science. In addition, future professors at university should be involved in the process. For this reason, it would be a good idea to invite maths students, guided by an academic supervisor, in order to work together on the development or adaptation of resources to be uploaded in CIRAX, establishing their classification and application fields to allow the maximum level of classification. Thus, from a strategic perspective, future university professors will be introduced to the main objective of CIRAX, which is the practice of sharing resources.

In a nutshell, CIRAX project needs a forward step in three directions:

- extending the project,
- getting a greater visibility of the CIRAX activities,
- enhancing the quality of teaching resources classified in CIRAX and CIRAX as a repository.

For this reason, the action plan for 2014 is focused on two main aspects. On the one hand, identifying and adding new and interesting resources to CIRAX as well as giving recognition to the best of these resources in order to enhance the excellence and prestige of university teaching. On the other hand, promoting interuniversity activities, which allow us to study students' usage and feelings relating to CIRAX.

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