

Research management in Higher Education Institutions: a process management experience in Italian Universities

Fabrizio Luglio¹, Nicola Bertazzoni²

¹ CINECA, *Solutions and services for university administration* Department, via Magnanelli 6/3, 40033 Casalecchio di Reno (BO) Italy, f.luglio@cineca.it - ² CINECA, *Solutions and services for university administration* Department, via Magnanelli 6/3, 40033 Casalecchio di Reno (BO) Italy, n.bertazzoni@cineca.it.

Keywords

Research Management, Publication Repository, Assessment, Project Management, Dissemination.

1. EXECUTIVE SUMMARY

1.1. Background

Although Italian universities didn't managed the "research process" so far as centrally and thoroughly as the "teaching/learning process", things are changing. They now realize that research area is the most important asset for future development:

- research attracts investments from alternative sources like the business/industry world, while national government funds are decreasing.
- research is a national/EU priority: for this reason there is much institutional pressure on universities in order to develop quality research activities and remarkable results.
- research is a way to improve the awareness and prestige of universities: it attracts students, researchers and professors.

1.2. Conclusions

CINECA, as a consortium made up of 36 Italian University members, has collected experience and close collaborations in the Italian HE world developing information systems to the management of the main administration areas of universities. Thus, CINECA has identified the lines which are guiding the management of Research in Universities and developed a system for their improvement:

- ***Project lifecycle: from definition to reporting.*** Universities need to manage all projects underway within a standard process which identifies various common operative phases, regardless of the nature of the financing body.
- ***Management and assessment of research results.*** The objective is thus to provide a repository for collecting all the internal research results (publications, patent, products..) and a system for coordinating the assessment processes.
- ***Research dissemination and technology transfer: spread and enhance research results.*** A university must thus distribute and make available its patrimony of skills and resources in an accessible form that can be exploited by interested organizations.
- ***Integration between the university research systems and national or EU institutional systems,*** in order to quicken and simplify the research development and administration.

1.3. European collaboration opportunities

The European Union and all the EU member states are committed to develop a common European Research Area. CINECA is looking at this process in order to support its customer universities with the best solutions for these issues:

- Research metadata standards and data exchange.
- Research Dissemination at a European/worldwide level
- EU Research Project data exchange with CORDIS and between partner universities.

2. CINECA AND THE U-GOV PROJECT: ADMINISTRATIVE APPLICATIONS FOR HIGHER EDUCATION INSTITUTIONS IN ITALY

CINECA is an Italian Interuniversity Consortium founded in 1969 to support Higher Education Institutions (HEI) and the Italian Ministry of University and Research in all key sectors of Information and Communication Technology:

- Supercomputing and research applications
- Administrative applications and IT services for Universities
- IT services for the Italian Ministry of University and Research.

Today CINECA is made up of 39 members: 36 Universities, 1 research institute, the CNR (National Research Council) and the Italian Ministry of University and Research.

Since the 1990's CINECA has supported Italian universities developing applications for the management of the main administrative areas: HR/Personnel, Accounting, Students, Planning and Controlling.

Since Higher Education Institutions (HEI) have unique organizational models and core processes compared to other business realities, CINECA is focused on developing information systems to support the specific HEI needs, instead of re-engineering ERP systems developed for business companies.

In 2005 CINECA has set in motion a new integrated information system for Universities, called U-GOV, which channels into a single systemic vision the CINECA software solutions so far offered. This activity proves CINECA's significant commitment to Higher Education, as CINECA is investing roughly 20% of its overall revenues in the HE Systems development.

2.1. U-GOV Project and Research management

In this scenario, one of the most interesting evolutionary directions is that Scientific Research has become one of the core pillars on which Higher Education Institutions are built and operate; its effective governance is a critical task and an ever-important "competitive" factor for Universities today.

For this reason, within the U-GOV Project, CINECA started the development of a new application for the Research management, called U-GOV Research; a system that supports the administration of the Research life-cycle by managing projects and collecting, evaluating, and publishing the internal scientific research production of a University.

3. RESEARCH MANAGEMENT IN THE ITALIAN UNIVERSITIES: ISSUES AND DEVELOPMENT GUIDELINES

It is generally accepted that the core processes of Universities are two, Teaching and Researching. The "Teaching" process (the knowledge transfer to students) is probably the most obvious and important mission these organizations have to fulfill. For this reason Italian Universities have always been focused on improving their knowledge base (hiring the best teachers) and developing better processes and services in order to increase the knowledge transfer to students.

On the other hand, the "Research" process hasn't been managed as carefully as the "teaching" process, since it hasn't usually been considered the "core" of these institutions. However, every Italian HE Institution today understands that the Research process should be managed as carefully as the Teaching process.

Experience and close collaboration in the university world has permitted CINECA to identify and understand the lines of development that are guiding the management of research activities and processes in universities.

These are described in the following sections.

3.4. Integration between the national dimension and the University

In Italy the management of publications requires a high level of integration between national repository systems and the university applications to ensure the streamlining of the processes and lightening of workloads for the teachers and administrative offices involved.

Similarly the assessment criteria for the scientific publications must comply with two separate typologies: the criteria defined on a national level by the assigned bodies and the qualitative objectives defined locally by each individual university. In Italy for example, there is a national organization created by the Ministry of University and Research whose mission is to develop a national assessment of scientific publication in order to find, evaluate and support the best universities and research groups.

Finally, in order to quicken and simplify the requested project's data exchange, Italian Universities need a close integration with the Italian ministerial system and web site for national projects and with the European Community web sites and systems for european projects.

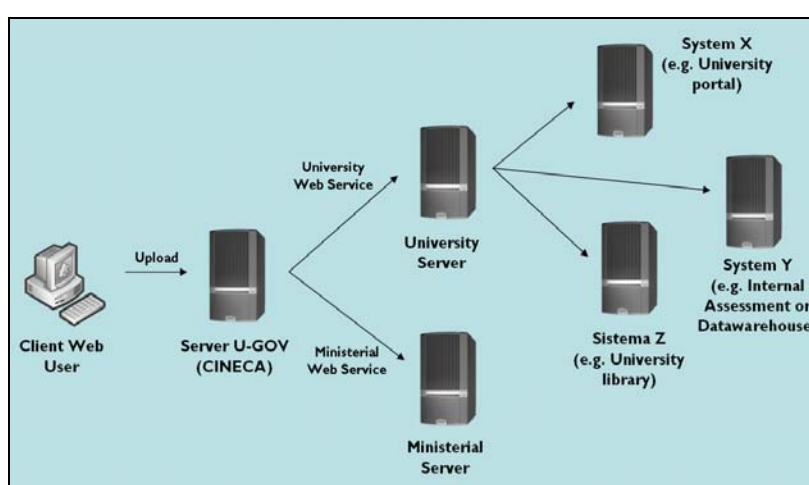


Figure 2. This image shows data exchange and dissemination processes

3.5. Integration with information and processes in other internal administrative areas

Research is certainly an area that transversally involves the activities of the entire university. The specific processes of this area integrate a stream of information arriving from the other main administrative areas, like accounting (for example for the fund/financing aspects) and human resources (for example for information on teachers and researchers). In this respect ad hoc solutions to cover individual functional areas are proving to be inadequate to satisfy the new requirements that the university has to satisfy.

It is necessary to share and integrate the processes of development/assessment and the information relevant to projects, finished goods, and the bodies involved.

3.6. KPIs and Dashboard

CINECA aims to offer not only instruments to best support the management of the research processes, but also systems with a more marked orientation towards governance, permitting universities to define policies to incentivate the high quality of the results and organize strategic development programs.

4. U-GOV RESEARCH: BENEFITS FOR ITALIAN INSTITUTIONS

In 2006 CINECA started the development of a new system for the management of the research activities. This system, called U-GOV Research, was born as part of a wider integrated system, U-GOV. Collaboration was promoted from the beginning with some Italian Universities which provided an important contribution of the skills and professional capacities they had available.

The responses of U-GOV Research to the complexity and scale that characterizes the research area today are articulated in the following points:

a) Project lifecycle: from definition to accounting

U-GOV Research offers important characteristics and functionality for project management: organizational structuring decoupled from financial management, cost budget and cost headings that can be implemented in relation to the characteristics of the project, support for a more detailed internal control, reporting structures on the basis of the requests of the financing body.

b) Management and assessment of scientific publications

With U-GOV Research each university can file and consult all the research publications. IN addition the university can manage the assessment process, fixing and configuring assessment criteria for each publication type, and can apply an automatic assessment to speed up the identification of higher quality, also allowing the use of nationally recognized indicators (for example the "impact factor" of journals). It is also possible to create the assessment sessions assigning the publications to assessors and managing the feedback. At the end of the process the system provides statistics and rankings.

U-GOV Research provides teachers and researchers with a unique entry point from where they can manage their scientific publications and their relationships with the university and the Ministry.

c) Publications and skills showcase: spread and enhance the research results

CINECA develops this process through the implementation of the tracing of all internal activities, instruments, resources, and skills and encouraging openness and distribution of figures and information for the publication of and assessment of excellence.

d) Integration between the national dimension and the university

To achieve this CINECA offer a high level of integration between the Italian national repository systems and the University publication repository, ensuring close synergy and lightening the workload on teachers and the administrative offices involved. In addition, the CINECA application offers integration also with the ministerial web site for national projects' data exchange.

U-GOV enhance the work of teachers and researchers simplifying the access procedures to finances, providing project heads with information, including accounting updated in real time and improving the management of the available resources. It offers support for the management of the resource supply procedure and cost-items budget change process. The openness and integration of the system also facilitates the coordination of projects developed in partnership with other organizations.

e) Integration with information and processes in other administrative areas

The transverse integration in U-GOV of the data from the different functional areas is the essential basis for implementing control instruments or improving the integration of offices (for example with the sharing of the university's organizational structure and the data for the teachers and researchers).

f) KPIs and Dashboard

CINECA has started the development of Business Intelligence and BPM/Dashboard applications integrated with U-GOV Research in order to get the broad vision on the processes and to control results. This is possible thanks to dynamic monitoring, constantly updated for the state of advance of each individual project and the use of financial resources, personnel, instruments, and skills involved in this activity within the university.

5. U-GOV RESEARCH: MODULES AND FUNCTIONS

U-GOV Research is currently composed of three modules described in the following sections.

5.1. Publication Repository and Assessment

This module files and organizes all the research results/outputs (like publications patents, products, conferences, seminars) and to manage the assessment processes.

The Research Catalogue and Assessment module was one of the first U-GOV modules ever released.

Repository of Research Results

These are the aims of the research results repository:

- It gathers all the research results produced by an author that works for the University (publications, patents, products, conferences, seminars, ...)
- It shows statistics about publications, researchers, research teams, research units, areas, ...
- It is the start point for assessment process
- It exports data to:
 - University libraries
 - University Portal
 - National/Ministerial systems and websites

To facilitate the creation of a repository, the module includes the option to automatically load all the publications inserted by teachers or other university staff into international archives. In this complex initial phase an ad-hoc application simplifies the identification and possible elimination of duplicates. The same duplicate recognition functionality can be activated by users during the insertion of new research products.

The personalization of the functions, cataloguing rules, and attributes do not require intervention on the program source code. These are defined and configured during the set-up phase ensuring the university maximum flexibility and speeding up issue times.

Created within the architecture of the U-GOV system, this module can combine data from other functional areas (Accounts, Resources, Human Resources, etc.) for example acknowledging the research authors (teachers, researchers, etc.) belonging to the university, giving their legal status and thus the faculty, department, and scientific sector to which they belong. At the same time the close integration permits analyses cross referencing the information in the publications repository with financial, economic, and organizational data.

Through the use of web services the Publication Repository and Assessment module of U-GOV integrates with the existing applications and in particular with the university's institutional portal. All this permits the university to fully exploit the potential of the U-GOV system, displaying the data and functionality to distribute access, consultation, and use.

The integration with the Italian ministerial web site permits the Publication Repository to automatically maintain synchronization of data on the ministerial web site. The university lecturers thus manage the archive of their publications using U-GOV as a single interface: through U-GOV they can use the entered data both for ministerial purposes and within the university.

In conclusion, these are the main benefits:

- No duplications: automatic recognition of publication already submitted
- Each publication has a unique data owner
- Attachments to publications (e.g. full text)
- Integration with the University's U-GOV Human Resource system: infos about authors
- Integration with national and institutional IT systems
- Import and export using standards like MODS, BibTex, ISI, OAI, Endnote, Pubmed

- Gateways for systems interoperability and data export (e.g. OAI-PMH publication metadata harvest, other web services).

Assessment of Research Results

The Publication Repository quickly and efficiently manages the assessment process of research results. The module permits the configuration of the assessment session depending on the needs of the university.

The assessment system is made up of three components:

- Assessment session configuration functions
- Assessment functions
- Reports and statistics

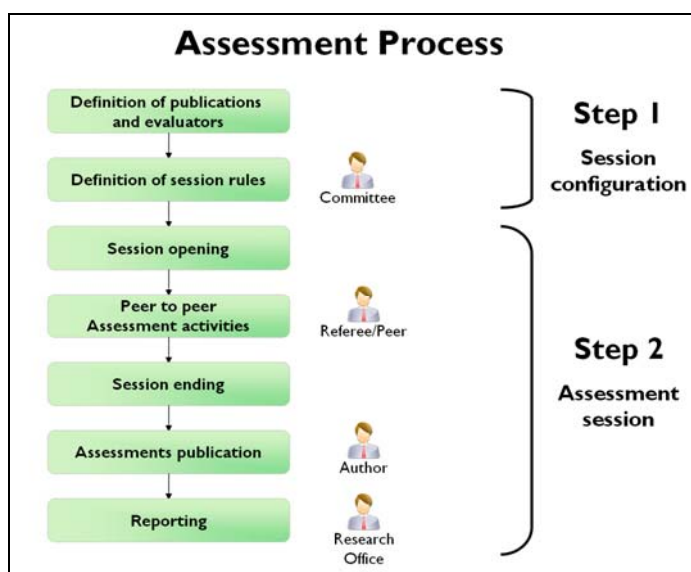


Figure 3. Assessment process

The first step is the assessment session configuration. To configure a session means mostly to answer to these three questions:

- WHAT do we want to assess? (publications, projects, ...)
- HOW do we want to assess it? (session rules, assessment types, ...)
- WHO are the referees? (automatic assessment, referees names, ...).

The division of work is simplified by an interface that makes it possible to create publications or authors categories and to assign them to different referees/assessors. The university establishes the assessment criteria for each publication type.

Regarding assessment rules/types, multiple types of assessment can be expressed for a single publication and for each type there can be multiple individual assessments from different assessors. It is also possible to automate an initial phase of assessment on specific publication types, reducing the intervention of assessors only to necessary cases.

The classification of the publications used by the assessment system is independent from that applied within the catalogue. This feature makes both cataloguing and assessment simpler and more flexible. In the assessment phase it is possible to reorganize the publications in ad hoc categories on the basis of the criteria chosen by the university, without this subdivision influencing the existing catalogue classification.

The Assessment session can be described as follow:

- Session opening
 - Referees can preview the assigned publications
 - Blind review.
- Session management
 - Referees report errors/issues, view progress of requests.
 - President and Research Office manage session work in progress and warnings (open/in progress/accepted/rejected).
- Reporting
 - Session analysis
 - Final results sorted by categories, authors, groups and teams, areas.

Referees can express themselves through a predefined range of judgement, indicate classification anomalies, duplications, or errors identified during assessment. The governing bodies, referees and the Research Office can display the statistics for the state of advance of work at any time in order to monitor the development of activity.

The final assessment foresees a summary judgement which can be indicated manually or calculated automatically through predefined rules. Final statistics and reports are available on the concluded sessions and the judgements expressed. If the university considers it necessary the system also permits the activation of a function for the management of appeals from the assessed subjects.

In the future CINECA plans to extend the assessment functions to permit the use of the same application logic also for the assessment of other "entities", always within the research area, like for example projects, resources, and structures.

5.2. Project Management

These are the main functions of the applications:

- Project configuration
 - Project type
 - Cost prospect model
 - Work package model
- Project information
 - Total budget and annual budget
 - Work Packages definitions
 - People and resources
- Timesheet submission by researchers
- Reporting for funders
- Internal reporting about work in progress and results

This application monitors all research projects active in the university from an operative and financial perspective.

From the university's point of view the Project Management module provides the instruments for the control and coordination of all active research projects, regardless of whether these are financed with internal or external funds. These can be monitored as part of the management of resources like personnel, equipment, and logistics.

At the same time Project Management also represents an instrument of integration and connection between the organization of project activity, requests for resources that start management cycles, and the financial aspects of the project referring both to the organizational units and to the cost centers of management accounting.

From the project financial management view point, Project Management simplifies the correspondence between the cost items derived from a tender and the university accounting.

The form is titled "Grant agreement Preparation Forms" and "Coordination and Support Action A3.1: What it costs". It includes fields for Project Number, Project Acronym, Participant number in this project, and Participant short name. Below these are sections for "Funding % for Coordination and Support Actions", "Indirect costs" (with options for Actual indirect costs, Simplified method, Standard flat rate, and Special transitional flat rate), and a table for "Type of Activity" with columns for Coordination/Support (A), Management (B), Other (C), and TOTAL A+B+C. The table lists various cost categories like Personnel costs, Subcontracting, Other direct costs, Indirect costs, and Total costs, with sub-rows for reimbursement methods and EC contributions.

Figure 4. Form of an European project

Regarding the Italian research area, at the time of creation of the project derived from a Italian national tender, Project Management has an automatic import system for the project data (cost items, budget, resources, deadlines, purchase of materials, etc.) directly from the Ministerial web site. The university can add additional information of their interest to this data, like for example a more detailed description of the cost items to permit a more detailed understanding of the project costs.

From the point of view of lecturers and researchers the system offers support in various steps through the project realization: from the purchase, enrolling and organization of the necessary resources to the compilation of cost statements and financial reports, to the estimate of the work in progress, and the production of reports for the control bodies.

The close integration between the operative and financial data makes it possible to extract the accounting data for an expense at the end of every research project and the communication of the project balance to the financing bodies.

5.3. Research Resources

Research Resources brings together, organizes, and presents all the information relative to the research activity conducted within the university.

The module gathers and manages information regarding:

- the research structures.
- the groups, teachers, researchers, and other personnel involved in the research activity.
- the research projects and activities conducted, with all the data relevant to the disciplinary aspects, scheduling, resources utilized, costs, and logistics.
- the laboratories and equipment useful for the development of the projects.
- the scientific skills developed.

The information patrimony managed by Research Resources is designed as a base for initiating processes of governance of university research. Using this centralized archive the university can establish at any time the state of advance of projects, down to the detail of the entities (finances and resources) involved in individual projects. The integration and cross referenced analysis of the information collected (also originating from the other applications of U-GOV) enable the definition

of a complete overview of scientific activity from different analytic perspectives: On a university level, by structure, by individual lecturer and researcher.

As already stated, one of the main objectives of the university is the exploitation of internal scientific skills, raising the profile of the best scientific production. In response, Research Resources facilitates the definition of a "shop window" of know-how, resources, and research activities to promote contact and collaboration with local companies and organizations, simplifying the work of the ILO's (Industrial Liaison Office). Through web services the Research Resources data can be exported in real time to the institutional university portal and other applications.

Relative to Research Resources, the data managed by Publication Repository and Assessment represents the patrimony and tangible result produced by projects, which is most usefully consulted and assessed in a separate process from that of management of the data base of other research resources. For this reason the decision was made to manage research publications in a separate specially designed module.

6. THE NEXT CHALLENGE: INTEGRATION TOWARDS THE EUROPEAN RESEARCH AREA

The European Union and all the EU member states are committed to develop a common European knowledge area throughout two lines of direction:

- The European Higher Education Area. It includes 46 states and is driven by the Bologna process.
- The European Research Area, driven by the Berlin Declaration.

The discussion during European Councils concerning the research activities remarked that European universities are not currently in a position to achieve their potential: HE institutions are behind in the increased international competition, they lack of flexibility in order to adapt to the changing research agendas and suffer excessive public control.

As a result, the European Research Area aims at coordinating national research policies and Union research policy: career structure synergy, scientist mobility and exchange, access to scientific publications and data exchange, support for cooperation between universities and research groups, promotion of peer review assessment.

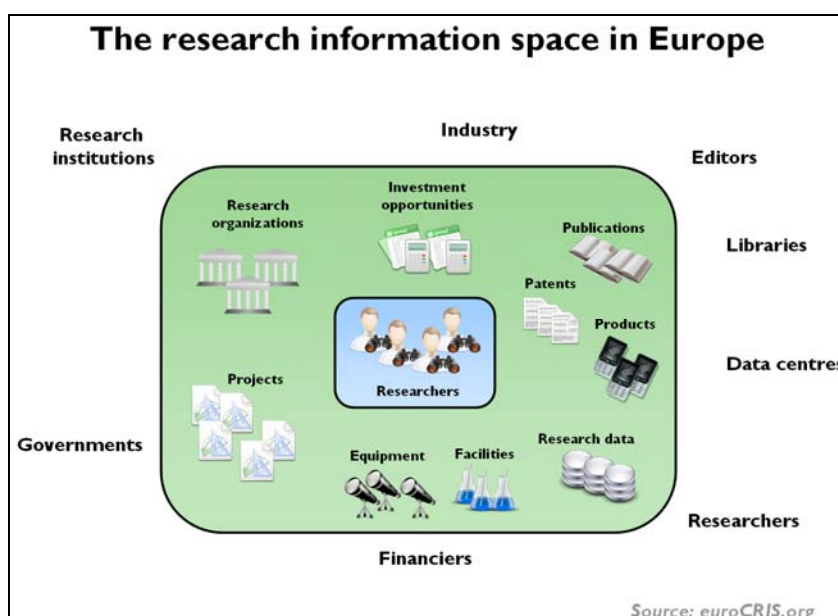


Figure 5. The Research information space in Europe

CINECA is looking at this process in order to support its customer universities with the best solutions for these issues:

- Publication Repository standards (Open Archive, euroCRIS CERIF standard, Driver Project)
- EU Research Project data exchange with CORDIS
- EU Research Project data exchange between partner universities
- Connection to EUROPEANA repository
- Research Dissemination at a European/worldwide level.

7. RESULTS

Today we number the installations of U-GOV Research in about twenty Italian universities, including Bologna, Ferrara, Florence, Lecce-Salento, Milan Politecnico, Milan "Bocconi", Modena e Reggio Emilia, Naples "Federico II", Pavia, Turin, Trento, Venice IUAV, Verona.

Thanks to this solution these Universities have developed a single database of scientific research results, a basis for monitoring and assessing publications and checking achievement of objectives.

This repository also simplifies the publication and dissemination of research outputs. Data import/export functions based on standards (MODS, BibTex, ISI, OAI, Endnote, Pubmed), interoperability gateways and web services (also based on the same standards) let Universities spread their results through portals and websites and leverages the relationship and the transfer of know-how and technologies to the territory and to business companies. Outputs, skills, equipments and resources of all the Research Units inside the Institution are now traced and organized and can easily presented and browsed.

Similarly, U-GOV supports researchers in managing their publications catalogue, and submitting the calls for national projects and funding requests.