

Integrated Software Application for University Research Management

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MIAACU project (Integrated Information System for University Research Activity Management) has as main objective to setup a complex information system, which is a novelty in the Romanian university management system: an integrated system for the research activity management in universities, and by extension, in any other specialized public institution or private company.

The main element of the research activity administration is the research contract and its management is realized handling instruments based on project management theory. Project Management, as defined in 1996 by the Project Management Institute (PMI), proposes to apply knowledge, abilities, tools and techniques on tasks within a project to satisfy and exceed requests and expectations of the interested factors.

The integrated system has to provide not only the computer aided current research activity but also to structure information in reports necessary for university management to take decisions in real-time, constantly considering the project constraints (scope, time, and budget).

This purpose is achieved by developing a software application independent of platform (Windows, Linux, Solaris etc.), for relational databases (Oracle, Microsoft SQL Server etc.) and using WEB technologies (J2EE and JSF), JDBC, Hibernate and JasperReports, which are sustained by ORACLE and Open Source Java community.

The system represents a new approach based on applying the public accounting system, converging with the European Directives and International Standards for Public Sector (IPSAS), contract management rules and projects management theory. On the other hand, repetitive actions are being eliminated: all the logistics and financial flows generated by the activities of research contracts management (e.g.: procurement invoices for material resources needed to carry out research projects, involved staff payroll etc.) are automatically continued in the specialized modules of accounting, cost management per organizational division and budgetary execution.

The system will be implemented in several locations; but chronologically, the first locations are University POLITEHNICA of Bucharest (UPB) and the Academy for Economic Studies Bucharest (ASE), sustaining the prototype testing and the final software product validation.

The system for the research activity management is designed as fully integrated with the University's current system for economic, financial, and logistics management (EMSYS – Enterprise Management System as well integrated with module SIMREM for material resources management), but also it is opened to other ERP systems; both management systems can be accessed from anywhere, in Intranet as well as via Internet, only by using a browser (e.g. Internet Explorer). Installing new version and technical assistance can be also realized by Internet (lower costs).

1. Technical architecture

From the technical point of view, the informatics system is conceived to be safe while functioning by: insuring tolerance to incidents, auto-recovery instruments for the database, treating processes in transactional regime, treating users' errors and events once with data introduction. The transactionality is given by the achievement of a complete process or by its cancellation in case of incident ("all or nothing").

In case the connection between the client and the application server is interrupted and then restored, the transaction can be continued from where it was interrupted.

The application is such structured on four levels: database server, web server, application server and thin client. Data security is insured at many levels: network, communications, database and by own application tools (Figure 1).

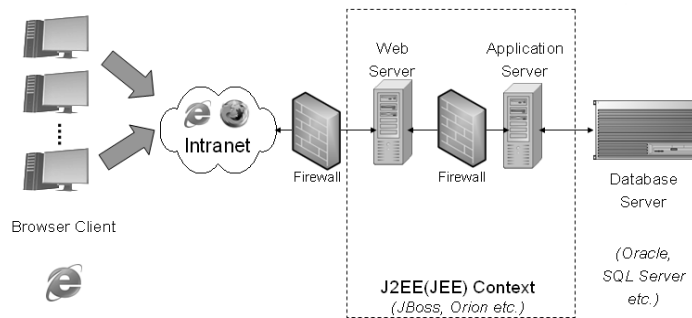


Figure 1: The technical architecture of the informatics system MIAACU

The system works in real time: no additional manufacturing of data are done. Once the information is validated by the user, this one is transmitted by internal mechanisms in all components of the system where it has impact.

The access to information can be configured at different levels: module (projects, budgets, inventory, reports), function (projects, planning, costs and resources, budgets, invoices, issues, payments), project manager, project, task and warehouse. The access to data can be integral (visualizing and/or updating) or restricted (only visualizing).

Reports can be extracted on different shapes: pdf, excel, on screen or in text file.

There are also implemented mechanisms for monitoring users' actions and history reporting of the realized transactions.

2. Conceptual and functional description

From the functional point of view, MIAACU is an informatics system for research activity management which solves the following functions of the organizations (Figure

2): registering the research contracts by filling appropriate identification information, planning tasks and deadlines of the research stages/phases, gradual describing of products and services which are to be realized, planning realizing costs and resources within the budget limit, tracking the flows of activities which forego the research theme acceptance and the obtaining financing, budgeting necessary resources, tracking costs and incomes per project and execution phase, tracking purchasing in the limits of the stipulated material resources, opening budgetary credits, spending commitment, tracking payments and obtaining reports concerning: accepted projects, deadlines, payment terms, dealt contracts and results of the research.

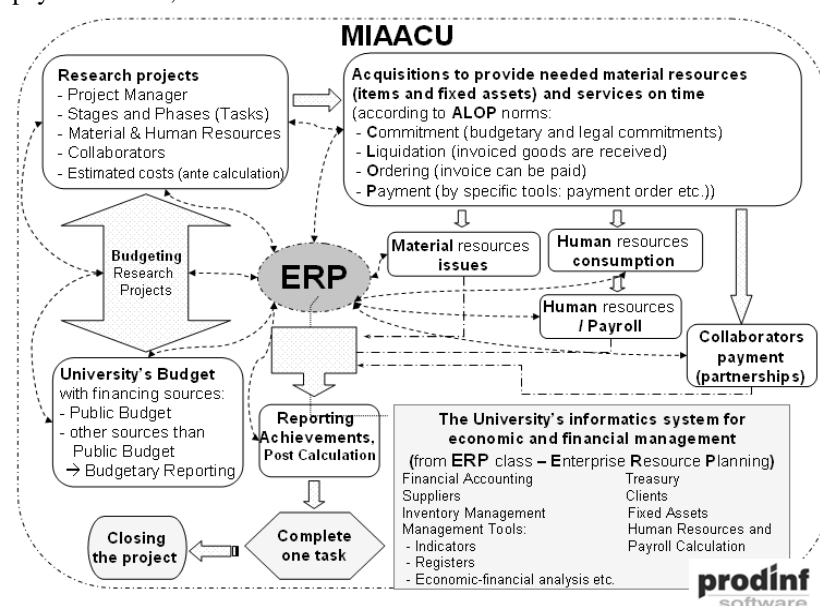


Figure 2: The functional architecture of MIAACU

The system permanently checks, for any action regarding project's tasks, compliance project constraints (scope, time, and budget) and the integration with the system for economic, financial, and logistics management provides corresponding information in real-time also for Financial and Accounting departments.

This feature, strengthened by implementing the ALOP norms for spending Commitment, Liquidation, Ordering, and Payment, allows tracking of projects and their budgets in real-time, as forecast and execution. At the initiation of any action regarding a task of project the system will check the corresponding constraints (scope, time, and budget) and if affirmative, it also records the respective phenomena in the budgetary and financial accounting of the University.

2.1 The management of research projects and contracts

In any research organization, and particularly in a University, first step in research is identifying the research theme. Starting from this, the research team establish the way to solve the theme and transposes it into a detailed structure of tasks (WBS – Work Breakdown Structure) with specifying duration, needed resources, estimated costs and

possibly other time constraints; then the terminal nodes of WBS forms the “precedence diagram” used to plan activities. If large projects, it can be used “Critical Path Analysis” to plan the tasks, integrated with a specialized program (MS Project, Primavera). If the research theme acceptance and project financing are obtained (process can be iterative, changes can occur at each iteration, even for the estimated costs) then comes a certifying document called “research contract” which also specify the total budget and the budget for each stage, further detailed by type of expenditure.

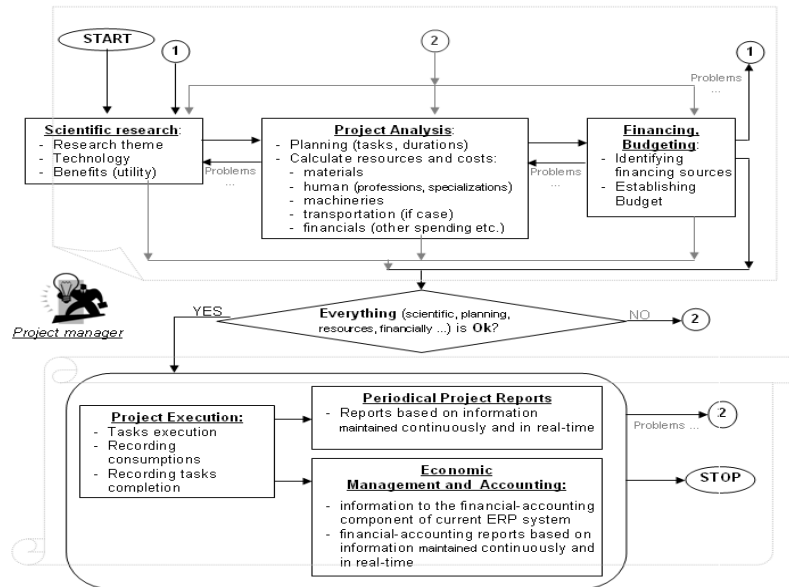


Figure 3: The integrated management of research projects

2.1.1. Planning the research projects

The project structure and organization depend on the initial requests transposed into an estimation: materials, spending (part of them indirect), the prognosis of the phased budget (per total, periods, chapters). From the economic-financial point of view, no matter the complexity and levels of detail, the project should be represented at work package level (last level of WBS) in the organization’s economic-financial structures. All documents belonging to initiation, acceptance and financing the project can be scanned and saved in electronic format, in the system’s database. Always can be known: what materials came and have been reserved on the respective project (task), availability of the organization’s human resources and how many have been already allocated and what for, deviations (percentage and absolute), invoices and receipts corresponding to the respective project (task). Work packages, as final elements of WBS are assimilated to working orders from Costs Management. Thus, registering the costs and/or incomes corresponding to a project, the triad <cost area, cost center, working order> is filled with actual values from the MIIACU and from all ERP connected domains.

2.1.2. Budgeting the research projects

Financial aspects of the research contracts are compounds of the university budget which, on its turn, is partially a part of the Public Budget. MIAACU purpose is to

integrate the research management budget in the general budget of the university. Building up the university budget aims to structure the budgetary process: elaboration, approving, execution, control, correcting and reporting (see Figure 4).

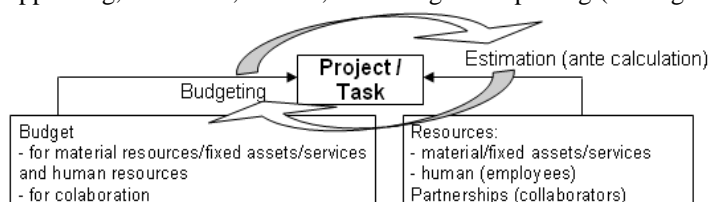


Figure 4: The estimation balanced with the available budget (iterative process)

The project's structure can have changes (sometimes major) determined by the available budget, but without affecting the objectives and methods: some tasks order can be changed, some material/human resources can be substituted, due to performant and low costs technological solutions (appeared in the period between initiation and acceptance-financing of the project whose stages, phases and ante-calculation have already been established). The project's deadline is also conditioned by money delivery stipulated in the project's budget, so that now can be finally established tasks deadlines, according to the start date of the project, task duration and deadlines or previous tasks' duration.

2.1.3. Research projects going on

On the first hand, the research projects going on implies providing the needed materials on time, without which human resources, even available, cannot realize the activity they have been told to do. In the case of public organizations, the acquisition procedure for material resources, fixed assets, and services must respect the norms for spending commitment, liquidation, ordering and payment; MIAACU insures this by the integration to the system for economic, financial, and logistics management.

Based on normative month, the timekeeping for persons involved in the project is updated correspondingly (at project/task level), and it is validated to be paid.

The consumption of material resources is registered in the inventory management module within the system for economic, financial, and logistics management, with the mentioning of the project and the respective task.

2.1.4. Research projects in collaboration

As this is a collaborative project, the coordinator registers partners documents in its organization accounting, but only essential data, in accessible format, easily to process by the system for economic and financial management.

2.1.5. Completing a task from a project; closing projects

One activity/project is completed when the scope initially set has been achieved: it is not enough to consume human and material resources, it is necessary the results should be those predicted. It is also possible that the project scope has not been achieved, although maybe every task from project has been realized successfully. Thus project can be declared completed and closed only after project manager consults all tasks responsible and only with the financial-accounting departments approval (for budgetary planning and execution). When closing a project, the project manager must check and register the final results and effective consumptions (quantity, quality, value).

2.2 Integration to the system for economic, financial, and logistics management

MIAACU integration to the system for economic, financial, and logistics management has as effect reducing of human effort in processing transactions and the strengthening of collaboration between organizations departments by: using a unique database, using times obtained from relative staff economy to analyze the economic and/or operative phenomena, automatic transfer of the actions from the operative administration in the organization's general accounting, the automatic charging of the related costs, inputs registering (of materials, fixed assets, services) in the suppliers accounting, affecting expense section of the budget by inventory issues processed for the projects etc.

3. Conclusions: Economic and social effects

Because UPB and ESA participate to this project there is created the premises of testing the system in real conditions and the motivation of implementing and exploiting the final informatics product. From the social point of view, MIAACU determines a better social dialogue from the users of research centers and the university management departments and also increase transparency of the organization towards the social partners: ministry and other institutions launching competitions to fund research. For implementation at national level, MIAACU is promoted in the academic community by publishing manuals and presentation materials, organizing workshops to present and debate. It is aimed to extend the model for private companies.

Acknowledgement

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