

Integrated Software Application for University Management of Material Resources

Dorina Adamescu^{1*}, Mihnea Costoiu¹, Mihai Corocăescu¹, Valentin Pleșu¹, Petrica Iancu¹, Gheorghe Adamescu¹, Constantin Arsene², Monica Tălpuș²

¹ Centre for Technology Transfer in Process Industries, University POLITEHNICA of Bucharest, 1, Gh. Polizu Street, Bucharest, Romania

²S.C. PRODINF Software SRL, Pitești, Romania
cttip@chim.upb.ro

The main purpose of SIMREM project (Integrated System for the Management of the Material Resources) is to setup a new and complex integrated software system for management of university material resources, putting emphasis on purchasing correlated to organization's approved budget. The system has to be designed and developed for using also by any other public institution or private company.

In these respects, a software application was developed as platform independent (Windows, Linux etc.), for relational databases (Oracle, Microsoft SQL Server etc.) using the newest WEB technologies (J2EE/JEE), JDBC, Hibernate and JasperReports, which are sustained by ORACLE and by the Open Source Java community. The innovative development technology enables access to system from anywhere, either Intranet or Internet, using only a regular internet browser (e.g. Internet Explorer). Besides ease-of-use for end users, this unique and remarkable feature significantly reduces system costs (acquisition, implementation, maintenance and support).

The application insures centralized support for the management and for making decisions in real-time regarding acquisitions and inventory issues, services and fixed assets, permanently in agreement with approved budget. Due to the integration of all acquisition processes and to the continuous balancing of acquisition activity and organization's approved budget (both of them based on applying the public accounting system, converging with the European Directives and International Standards for Public Sector), SIMREM is unique in Romania and once more different from almost ERP and MRP software tools on the market.

The system is implemented in this moment in several locations; but the first location in chronological order is University POLITEHNICA of Bucharest, who sustains the prototype testing and final software product validation.

SIMREM is fully integrated with the actual university system for economic and financial management (EMSYS – Enterprise Management SYStem, produced by PRODINF Software), but it is opened to any other ERP system. Besides, it is also a functional platform for another innovative software system: MIAACU (Integrated Information System for University Research Activity Management), which is produced through collaboration between University POLITEHNICA of Bucharest (UPB),

PRODINF Software and Academy for Economic Studies Bucharest (ASE) for the research activity management in universities and, by extension, in any other specialized public institution or private company.

All the two integrated systems (EMSYS and MIAACU) are developed based on the same innovative technology as SIMREM is.

1. Technical architecture

The technical architecture of the informatics system was such created to be safe while functioning by: insuring tolerance to incidents, auto-recovery instruments for the database, treating processes in transactional regime (“all or nothing”), treating users’ errors and events once with data introduction.

The application is such structured on four levels: database server, web server, application server and “thin” client (browser).

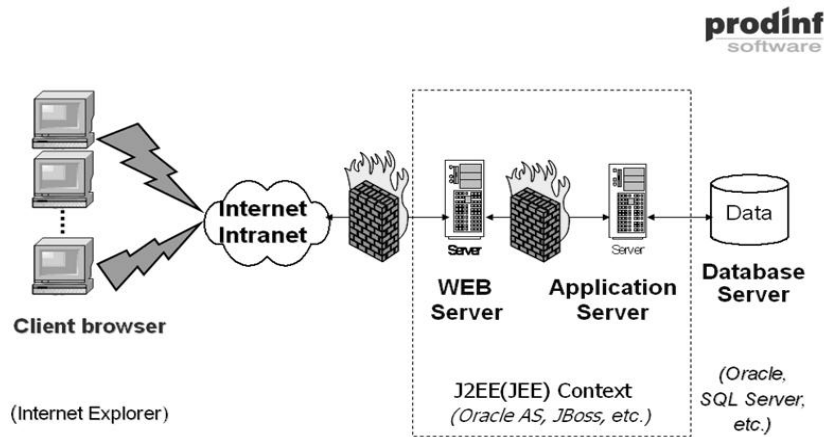


Figure 1: *The technical architecture of software integrated system SIMREM*

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.

Data security is insured at many levels: network, communications, database and by own application tools. 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 (acquisitions, inventory, reports), function (processing purchase requests, offers, contracts, purchase orders, receiving documents, suppliers invoices, inventory issues, cassations, material transfers), applicant, expert budget-administrator, accountant, procurement responsible. 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. Mechanisms for monitoring user actions and history reporting of the realized transactions are also implemented.

2. Conceptual model and functional architecture

From the functional point of view, SIMREM is an informatics system for management of material resources which solves the following functions of the organizations: accounting the purchase requests, contracts and purchase orders, projecting the procurement plan as instrument for budgeting material resources, processing the procurement process (receiving documents and invoices), the management of materials with the insurance of the patrimonial integrity (by inventory management and determining the stock level from which it can be automatically launched material requests).

The system permanently checks, for any acquisition, framing the allocated approved budget and the integration with the system for economic and financial management insures information in real-time for Financial and Accounting departments.

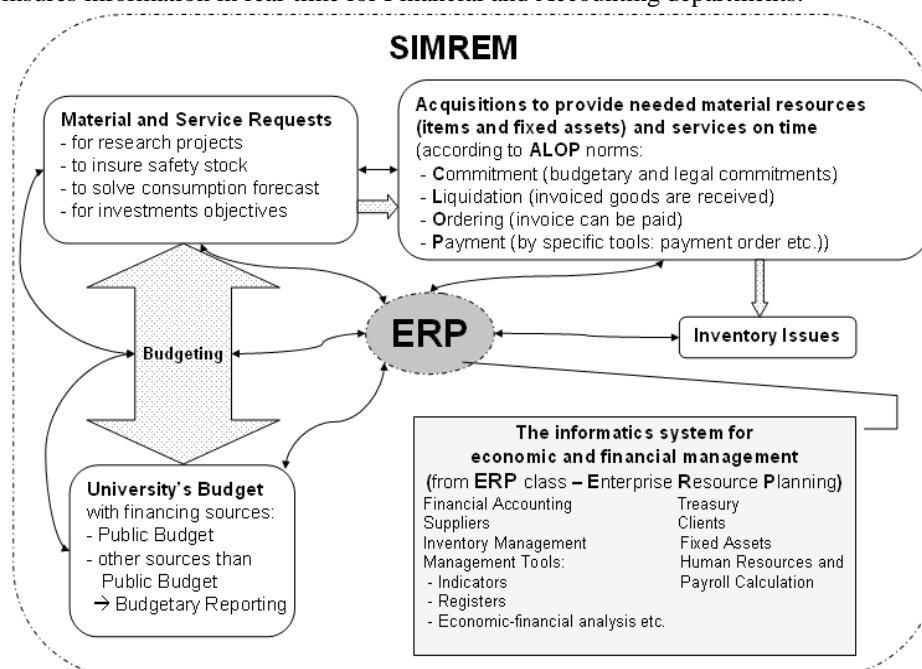


Figure 2: The functional architecture of SIMREM

This particularity, doubled by the special integrated implementation of the ALOP norms for spending (Angajare – Commitment, Lichidare – Liquidation, Ordonantare – Ordering, Plata – Payment), allows real-time tracking of budgets, as forecast and execution.

When a user initiates any action regarding the acquisition process, the system checks framing the approved allocated budget and if affirmative, it also records the respective phenomena in the budgetary and financial accounting of the University.

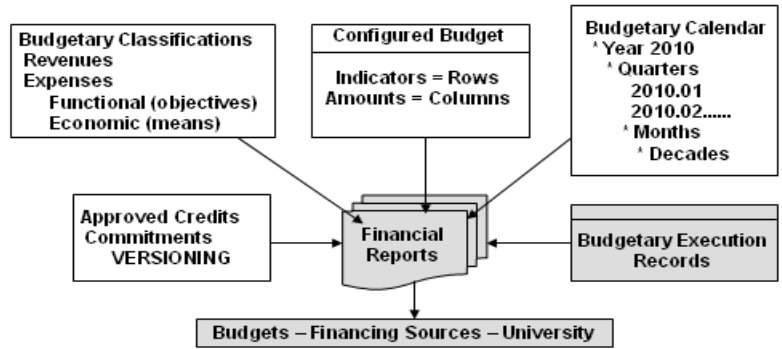


Figure 3: *Configuring and monitoring the budgets*

2.1 Procurement and inventory management

In any organization, and particularly in a University, first stage in the supply chain is to establish and justify the procurement necessary based on the specific technical-economic documentation. In SIMREM the main tools are procurement plan (according to Public Procurement Law) and MRP (Material Requirements Planning) calculation control functions (MRP II standard is implemented).

2.1.1 Purchase requests and budgetary commitments

The purchase request (PR) regroups and sorts requirements of products and services and can be launched by different applicants (departments of the organization); it mentions the products codes, requested quantities and estimated values. The expert budget-administrator establishes the necessity and the opportunity of the acquisition, specifies the financing sources and checks framing the approved budget. The accountant certifies it and releases the afferent budgetary commitment. Preventive financial control and the credit ordinate supervise the process by signing accordingly. Later on, the procurement responsible fills in the CPV (Common Procurement Vocabulary) codes and starts the procurement procedure.

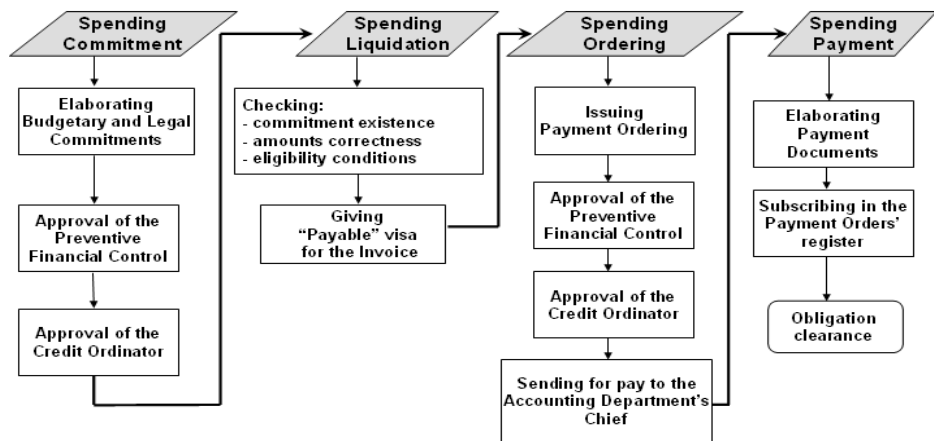


Figure 4: *The process schema for the ALOP norms*

A tracking system allows to all persons involved to see anytime the status of PR.

2.1.2 Purchase orders/contracts (legal commitments)

The purchase order/contract (PO) is the document by which the organization requests the supplier to deliver products or services. In the case of public organizations the legal base of any PO is the approved PR which always must frame the approved budget; the system insures traceability by forming PO from purchase requests. After signing the contract, procurement responsible updates in the system the eventual price changes, but in the limits of the approved budget, and marks the order as “Receivable”.

In this moment, according to existing norms, the commitment stage is finished.

2.1.3 Receiving of ordered goods, spending liquidation

The transactions referring to materials or fixed assets receiving documents, based on the supplier invoice or delivery note are ruled by registered PO. Items receiving can be achieved in a buffer zone of receiving/inspection or in the warehouse; items received are allocated to orders. Traceability of the received items is insured by procurement lots. The system also realizes returns management; there is available a monitor regarding the procurement history, orders received after due date, unfilled orders, etc.. The spending liquidation stage is sustained in SIMREM by functionalities which allow to register explicitly in the system the supplier invoice and to associate it to the receiving documents to establish eventual differences of quantity and price. Only if there are no differences (neither quantity nor price), supplier invoice can be approved as “Payable”; this meaning also finalizing the liquidation stage.

2.1.4 Spending ordering and payment

Ordering is the phase in the budgetary execution process where it is confirmed that goods delivery have been done and the payment can be realized. The internal document is the payment ordering, by which the credit ordinate orders to be realized the payment. According to norms, the payment ordering needs to have original justification documents as well as approval from authorized persons, confirming the correctness. The system ensures payment ordering by simple specification of the “Payable” invoice and of the amount to pay. Due to it’s unique integration, the system automatically identifies all justification documents (receiving note, minute for works/services, PO, PR etc.).

Payment ordering is approved and together with all supporting document in original is sent to payment. The payment is registered in suppliers accounting module (in EMSYS), based on the payment ordering from SIMREM.

2.1.5 Inventory Management

Regarding the inventory management, SIMREM solves: the quantity-value accounting of the stock globally and at different detail levels, methods of inventory evaluation (LIFO, FIFO and moving average cost), systematic updates of the products and materials schedule, inputs transactions, outputs and transfers, stocks dimensioning, if necessary (filling level, safety stock), tracking the evolution of effective inventory related to the estimated limits, tracking of effective inventory issues related to norm limits. All inventory transactions are monographer and integrated to EMSYS.

2.2 The integration to the system for economic and financial management

SIMREM integration to the system for economic and financial management has as effect reducing the human effort in transaction processing and strengthening the collaboration between organization departments by automatic system actions:

- updating the accounts balance for inventory, expenses, fixed assets and commitments;

- charging of procurement costs per cost centers;
- registering material inputs, fixed assets, services in the suppliers accounting;
- affecting treasury flows with the payments ordered for the received goods;
- affecting expense section of the budget by processed inventory issues etc..

3. Conclusions

A new and unique software application for university material resources management has been developed and implemented. Complexity of such a project involved structuring the solution by realizing an informatics application to insure information aggregation, experimenting the integrated system in different environments (PRODINF Software, University POLITEHNICA of Bucharest, other locations), elaborating documentation for commercializing prototype's copy, monitoring changes from the initial version and setting-up corrective procedures.

The main benefits of implementing SIMREM are: updated information for the management to enable them to make decisions regarding the acquisitions on time, efficient budget management, efficient control of inventory issues, better management of stocks and collaboration with the suppliers. The innovative development technology enables reducing the system costs (implementing, operating, administration, support). Registration of the SIMREM mark (Integrated System for the Materials Resources Management) in Romania, to the National Office for Investments and Marks (OSIM) and to the Romanian Office for the Author Rights (ORDA) is also an aim of the project.

Acknowledgement

The authors kindly acknowledge the financial support of PNII-INOVARE Program, funded by the Romanian Ministry of Education, Research, Youth and Sport project no. 183/2008.

References

- Calvinato J. L. and Kauffman R. G., 2000, *The Purchasing Handbook – A Guide for the Purchasing and Supply Professional*, McGraw-Hill, New York, USA.
- Chopra S. and Meindl P., 2001, *Supply Chain Management – Strategy, Planning, and Operation*, Prentice Hall, New Jersey, USA.
- Council (EC, Euratom), Regulation no. 1605/2002 of the Council of 25 June 2002 relating to the Financial Regulation applicable to the general budget of the European Communities (in Romanian)
- Commission (EC, Euratom), Regulation no. 2342/2002 of 23 December 2002 laying down detailed rules for the implementation of Council Regulation no. 1605/ 2002 (in Romanian)
- Hamilton S., 2003, *Maximizing Your ERP System – A Practical Guide for Managers* McGraw-Hill, New York, USA.
- Financial Ministry Order no. 1792, 2002 to approve the methodological Norms regarding the spending commitment, liquidation, ordering and payment (Of. Mo. no. 37/23.01.2003), with further changes and completions (in Romanian)
- Wild T., 2002, *Best Practice in Inventory Management*. Elsevier Sci Ltd., Oxford, UK