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## SELECTED PAPERS BOOK

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A number of selected papers presented at ICSOFT 2008 will be published by Springer-Verlag in a CCIS Series book. This selection will be done by the Conference Co-chairs and Program Co-chairs, among the papers actually presented at the conference, based on a rigorous review by the ICSOFT 2008 program committee members.

# ROLE OF ERP IN MANAGEMENT OF HIGHER EDUCATION FINANCING

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**Keywords:** Higher education financing, ERP, Integration, Management.

**Abstract:** Despite all the talk about new economy, higher education institutions still live by the old rules. Budgets are lean, yet agile enough to reflect changing requirements. With these realities, higher education institutions need proven solutions, the kind that only an ERP solution that integrates all financial processes: funds, financial accounting and managerial accounting can offer. The Ministry of Science, Education and Sports of the Republic of Croatia was implementing an integrated financial information system of 6 universities based on lump-sum principles and supported by SAP ERP solution. Some experiences regarding this project are presented in the paper.

## 1 INTRODUCTION

The time we live in, the 21<sup>st</sup> century that we have just entered, is marked by permanent arrival of new information technologies and trends that assume global knowledge. Information society that we are all witnessing is imbued with new relationships between higher education and society as a whole. Analysts of these relationships increasingly emphasize the need for development of a theory of '*academic capitalism*' (Slaughter, Rhoades, 2004) by which they explain the process of integration of university system/colleges and the new economy. The theory that originated within the American university system believes that universities and other institutions of higher education should not be turned into corporations or reorganized by external factors but it envisages groups of internal factors such as faculties, students, administration and academics as resources an individual country has, and these resources need to create a new framework of knowledge that would integrate higher education institutions with the new economy.

The role of internal factors is directed towards using resources given by the state to create prerequisites that would draw corporations to

university sector and higher education institutions, thus building a new network which would enable interaction of private and public sectors. This network would also enable expansion of managerial capacities to the sphere of monitoring the flow of external resources and to the sphere of investments drawn for development of infrastructure with one purpose – to support the trends of the new economy, invest into marketing of higher education, in its products and different services needed by students. This approach has a large impact on all universities, its faculties and all its other component parts because it envisages a reconstruction of universities' operation by lowering the costs of classes.

The '*academic capitalism*' theory goes even further from treating a student as a customer to treating him or her as promoter, i.e. subject of university marketing. More and more we witness students rationalizing their choice of university and studies, thinking about investments they have to make, and the return on the invested time and money. On the other hand, they rationalize the economic elements: business opportunities after degree, communication and media. Studying at a university does not only stand for getting a classical education any more but it also increasingly starts to resemble becoming a part of an *image* the university

of choice generally has in the market, together with its name and brand. Students thus gain the name and the brand of their university upon gaining a degree from it.

When they finish their studies, universities present their students as their products, their contribution to the new economy and at the same time they start treating them as alumni, i.e. potential donors.

It is necessary to point out that academic identity as market value of a student is not a constant, unchangeable value. It is a value that changes with the change of market status of university of choice or other higher education institution (Newman, Couturier, Scurry, 2004).

## **2 NEW THEORIES ON MANAGING HIGHER EDUCATION INSTITUTIONS**

Universities, their component parts, higher education as a whole, have a special obligation to rational and efficient spending of their resources no matter if the resources come from state budget or their own incomes. To enable management of universities and colleges to lower costs and increase efficiency of budget spending, it is necessary to create the system in which cost bearers (carriers) will be identified, the system of profit centres, and enable permanent tracking and analysis of costs, i.e.: of all expenditures on one side and all types of income on the other. (Brumec, et al, 2000)

### **2.1 Market Dimension of Higher Education Institutions**

To enable universities and other higher education institutions to be successful in market competition, they need to be aware of bringing information and their management up front as their management strategic commitment. That commitment brings the prestige and thus draws more and more of the quality students, as well as sponsors, and thus directly draws more financial resources.

Having in mind the global economy and its features, we can expect a further expansion of market influence on higher education, its work and development. This also indicates a need for managing the risks such flows bring. To enable managing structures of universities and higher education institutions to efficiently manage risks,

they need to institute a business-information system for risk management. (Bok, 2005)

The relationship between higher education system and the market is visible from: competition between universities in the first place, focus on generating prestige for themselves, and putting their campuses in the function of achievement of this goal. As prices of studying are rising higher and higher, the universities and colleges are starting to differ more and more in their offer of packages for different financial supports. In this way individual institutions of higher education become more or less attractive, that is, reachable to potential students. Except financial support, universities/colleges differ in other elements of student care – duration of study, help with employment of students, help with continuing education, caring for and following students after their degree. It is necessary that the market accepts better this diversification of offer when it comes to institutions and their programs, i.e. higher degree of specialization of a university.

### **2.2 Autonomous vs. Nonautonomous Higher Education Institutions**

The relationship between higher education institutions and market becomes a relationship of greater concern to society and, thus, to the line ministry as the representative body of the state. This care is, in the first place, visible in consolidation of higher education and it can be continued in two directions: intensifying the diversity of offer, or intensifying the homogenization. To ensure market survival of certain universities/colleges, especially those specialized in less attractive curricula, the line ministries in some countries intensify mergers with the universities/colleges which are in a better market position, all with a single goal – for the less attractive ones to survive. Here we need to stress that merging of universities/colleges and their large-scale consolidation can influence a reduced choice in studies which is the reason why countries are very careful when approaching this issue.

Within the academic community around the world there are different opinions on strategic development and the concept of operation, as well as management of higher education in conditions of contemporary economic flows. Researches that have been conducted prove the university/college management resistance to privatization of these institutions or some of their parts, their redesign, a resistance to outsourcing, branding and establishing a system of tracking and risk management.

In countries that are only entering the sphere of '*academic capitalism*', a rising trend of striving for independence from state and government is visible by large. In this process new challenges are poised in front of university management, or college management, especially public, i.e. state-owned universities. Autonomy of university becomes the basic question in talks and negotiations between academic society and state (Marcella, Knox, 2004). Two models are distinguishable in this field – one is the American model where autonomy is very high and the state invests in higher education by giving financial aids to students and giving help in many other ways. The other is the European model, in which the tradition is that universities are financed from state budget. The degree of university autonomy from the state can be measured from the method of their financing and is influencing the work and operations of university (Galliers, Leidner, 2003).

### **3 HIGHER EDUCATION INSTITUTIONS AND THEIR INFORMATION SYSTEMS**

Information systems have become the backbone of each complex organization in economic as well as public sector. Thus, they have become also the backbone of higher education. Implementation of a new information system, especially a new integrated business-information system (IBIS) is a complex undertaking that oftentimes does not bring the expected results. Mistakes, if made in the beginning phase of implementation, are the most costly and most difficult to correct. Therefore, the development of a new IBIS must be connected to a mission, a vision and a strategic plan of business development, business processes need to be reengineered, potentials of using the modern ICT technologies anticipated, and method of their application optimized for use in higher education institutions.

The Bologna process initiated the problem sphere of optimizing utilization of resources available: budget, own income, personnel, space, equipment, and division of funds using 'lump-sum' principles of financing. Based on the above mentioned, it is important to anticipate the fact that development and management of a complex system such as a unified information system of all universities of a country presupposes an integral information strategy as the point connecting

academic strategy, information system strategy, and business strategy.

#### **3.1 Integrated Business-Information Systems**

Besides the traditional method of solving academic questions, in order to be as competitive as possible, the management of higher education institutions needs to be increasingly oriented to management of financial and human resources. Application of new business strategies demands high quality and timely information on competition, potential markets, potential financing sources, technology, economic and political flows.

A business-information system of higher education has certain special characteristics not present in other business systems. They do not only provide information needed to run a university but information are provided here which help managing other members/institutions of academic society. Due to a high degree of autonomy of individual components, they need to be flexible enough and due to a big scope of users they need to be usable, reliable, efficient, sustainable and secure, together with being user-friendly. Unfortunately, most existing university business-information systems do not satisfy these pre-conditions well enough. The most common deficiencies are insufficient coverage of information needs of a university and lack of connection between certain business components, or parts (Luić, Schwarz, Uzelac, 2007).

Business-information system of universities is a very complex and specific system. Thus, larger demands for information are to be expected when compared to other organizations, arriving from its management, administrative personnel, professors and students. Of great impact and importance here is the high level of independence certain departments and persons within university have when compared to regular companies. Regular and often changes in Rector's office (elections of new Rector, Deputy Rector, and dean) also imply different approaches to IS.

#### **3.2 Technical Aspect of Implementation of Integrated Information System**

Setting up an adequate ICT architecture needs to be observed as a cyclical process, main initiator of which is the business architecture, characterized by organizational plans, visions, targets and tasks, problems and information for their support. User

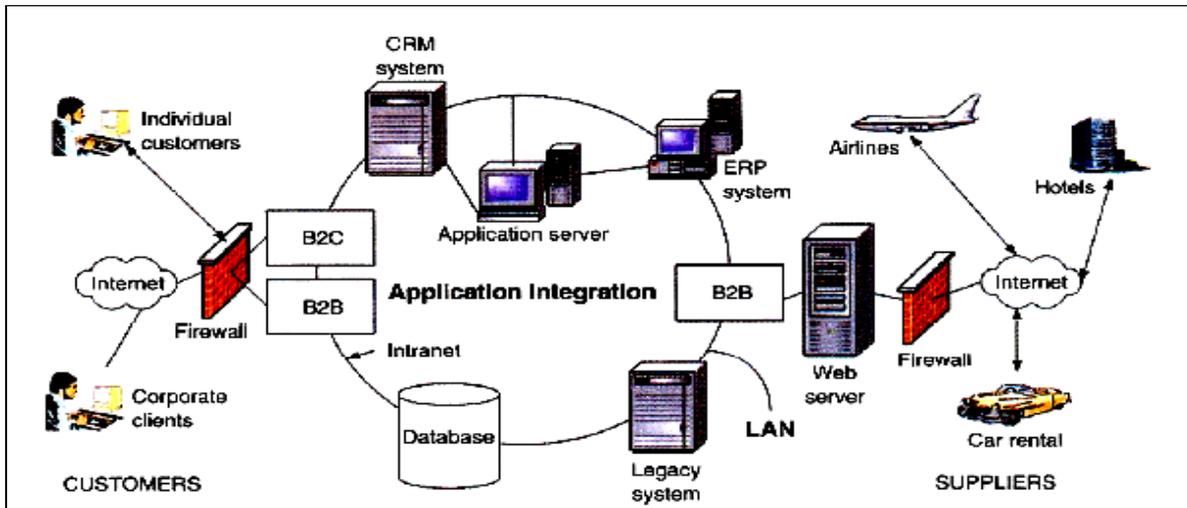


Figure 1: Example of ICT architecture

must have a role in business architecture as well, because only after setting up the ICT and business architecture, a higher education institution can fulfil its long-term targets and needs. Technical complexity of ICT architecture is visible in its simplified version in Figure 1. (Turban, McLean, Wetherbe, 2004).

Before setting up ICT architecture, it is necessary to define the following architectures:

- Business architecture: plans, visions, targets, tasks;
- Information architecture: information needs and ways of satisfying the needs;
- Data architecture: needs, sources, quality, security, scalability, storage, updating, data maintenance;
- Application architecture: integration, security, scalability, possible vendors;
- Technical architecture: hardware, software, networks, vendors, protocol standards;
- Organizational architecture: needs for human resources and outsourcing.

After designing the ICT architecture, the next step in construction of an integrated business-information system is consideration of needs of individual business, functional areas and their need for an ICT. Priorities oftentimes need to be adjusted to priorities of individual business functions which is of crucial influence to dynamics and duration of the project.

#### 4 ERP-ENTERPRISE RESOURCE PLANNING

ERP is one of the most successful tools for resource management of a certain organization. It is also an integral software solution with 'client-server' architecture and software architecture enabling business process management in real time. The main goal and task of ERP is integration of all departments and functions inside an organization with the help of integrated computer system that covers all needs of that organization. ERP systems represent integral support to business processes of organization thus creating prerequisites for integration of all business processes of an organization into an information system.

Conceptually designed and constructed by the end of the 1950s and the beginning of the 1960s, their orientation is to production and planning of material movement through productive cycles. Nowadays, it can be firmly stated that an ERP represents the backbone of a company. No matter what possible difficulties arise when implementing and ERP, the implementation itself becomes a necessity in contemporary organizations. Upon implementing an ERP system, transactional information systems rise from business and bureaucratic operations to networks of service delivery. Parallel to this, integration of different applications later saves time and minimises possibility of errors.

When we first start implementing an ERP system, we are dealing with many disconnected systems. We have a set of isolated applications to

which business events are written and these applications are not technologically connected. Gradually, individual modules of an ERP system are implemented and the system becomes partially functional.

Still, the consolidation on the level of organization is still not achieved. Further development brings us to the phase of complete functioning in individual business units which is well manifested in large and spatially dispersed organizations. Finally, in the last phase an ERP system becomes completely connected and fully functional (Ward, Peppard, 2002).

The largest and most frequently used ERP systems worldwide are *SAP*, *Baan*, *PeopleSoft*, *Oracle*, *SCALA* – software solutions for resource planning of an organization. These are integrated sets of solutions which cover implementation into almost all business segments and hyphenate structural functionality (based on best business practices) and reliability of the system.

Experiences from using an ERP system give proofs of positive effects on efficiency, positive influence on relationships as well as customer satisfaction – external customer satisfaction when dealing with this company. The implementation of an ERP solution to institutions of higher education needs to be observed in the same context.

#### **4.1 Specific Demands of Academic Community**

Has it ever been more challenging for universities, colleges, and research institutions to succeed in their core missions? Reduced funding from traditional sources has trimmed revenues, and competition for private funding – including grants, endowments, and alumni donations – is growing. Burgeoning student populations are creating physical space and service challenges. Government regulations pressure institutions to operate with a high degree of transparency, which intensifies the need to report, document, and track financial, demographic, and educational information. Demographic and regulatory reporting requirements are prompting additional spending on human resources management systems. Demand for corporate outreach and continuing education programs is increasing.

Competition has intensified for the best students, faculty, and academic and research professionals. To address these myriad challenges, higher education and research institutions need to leverage IT that aligns with business requirements and supports

change. Organizations need to operate more efficiently and integrate processes, from business services to academic affairs and student care, while collaborating externally with government agencies, service providers, and other constituents. Yet many organizations still use fragmented, non-integrated business systems. Inefficient, outdated, and expensive to maintain, these systems foster decision making that is tactical and reactive at best.

ERP solutions for Higher Education is a portfolio of highly scalable solutions specifically designed to meet the unique needs of public and private universities, multicampus institutions, research agencies and medical colleges. It supports all organizational processes, including campus management for student and academic services, grants management, Student Lifecycle Management, financials, operations, human capital management, procurement, analytics, research, and asset management. With these solutions, it is possible to sustain the continuing cycle of innovation and standardization in a single technology environment. One of the possible ERP solutions is powered by the SAP NetWeaver® platform, which allows creation of applications on top of existing infrastructure and fully leveraging current IT investments – for long-term adaptability, reduced costs, and flexible response to changing strategies.

#### **4.2 Functionalities for Financial Management of Higher Education**

For the purposes of this research it is necessary to mention some ERP solutions used in Higher Education institutions:

**Grants and Funds Management** – Solution which helps organizations compete for and manage a variety of department and sponsored grant programs, endowments, and research awards across their life cycles – including proposal development and submission, budgeting, award, spending and payroll, reporting, renewal, closeout, evaluation, and analysis. It provides principal investigators, fund administrators with timely and accurate information on financial activities, accountants, and research and transactions, ensuring that sponsored programs are conducted according to a sponsor's requirements. In this way, improved effectiveness of grant administration from pre-award to post-award, across multiple fiscal years, with enhanced accuracy of spending tracking is reached. Unified sponsored-program life cycle regulations and guidelines are made, such as the ones for enhanced funding streams

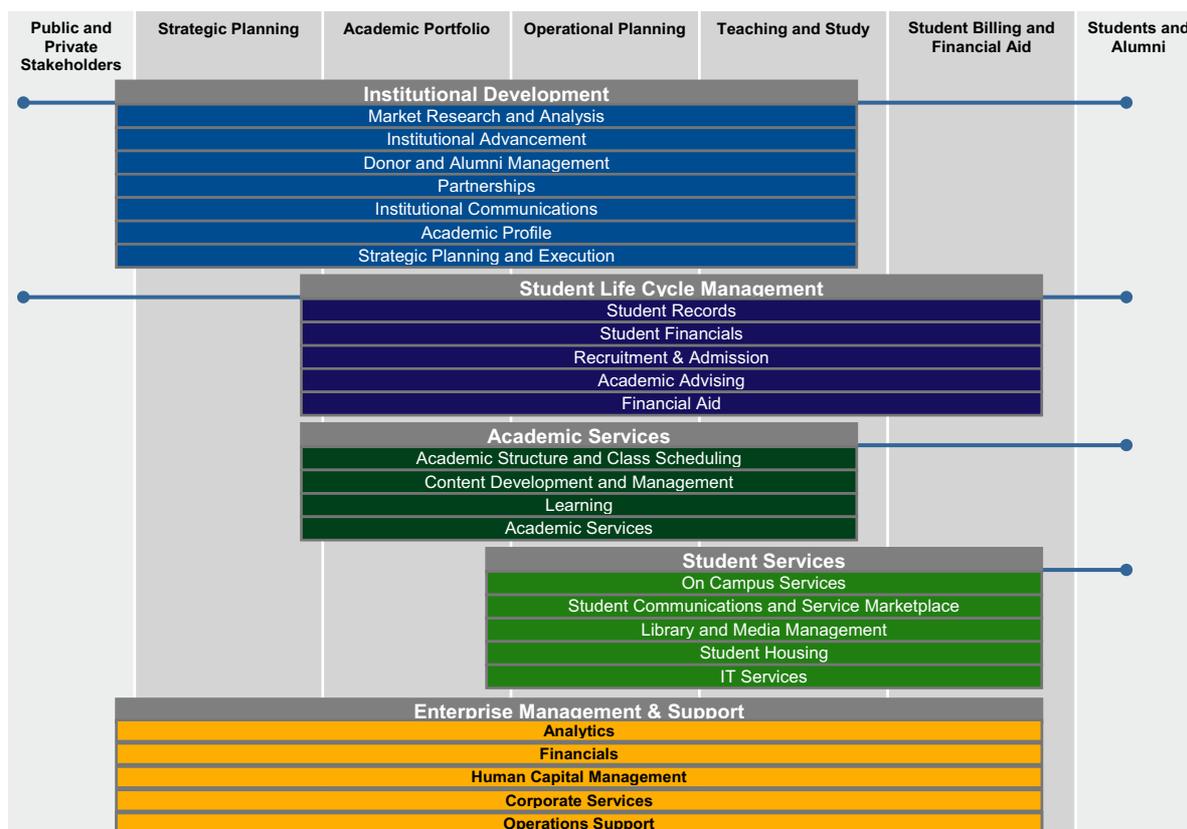


Figure 2: Key Business Processes for Higher Education and Research Mapped to SAP® Solutions. (www.sap.com, 2008.)

while supporting academic research missions. Competitiveness in pursuing grant funds is enhanced.

Manual processes and workload in planning, managing, and reporting grants are reduced.

### Financial Management, Budgeting, and Planning

– With this solution higher education institutions in Croatia create proactive financial planning, real-time budget visibility, and consolidated financial reporting. It streamlines cash flow activities and optimizes financial transactions through enhanced visibility of financial processes, including treasury management, billing, dispute resolution, collections, receivables, and payables – in a single, consistent, reconcilable, and auditable solution. Efficiency of budgeting is improved, as well as of planning processes, via cross-organizational financial control and visibility. Centralized financial and management reporting is achieved. Increased visibility of working capital, streamlined cash flow activities, reduced billing and payment costs, optimized financial transactions, and simplified financial consolidations across the organization. (Schwarz, Tipurić, Luić, 2007.)

**Business Process Integration** – is very important, because without it, it would be impossible to achieve efficiency of workflow processes through integrated systems. Final results are improved information and process integration of third-party applications and systems, increased collaboration through data shared across departments, organizations, suppliers, partners, and other stakeholders, reduced need for custom integration. Increased savings through reduced integration and maintenance, enhanced employee efficiency via single entry point and single sign-on functions are features this solution provides.

**Human Capital Management (HCM)** – For processes such as recruitment, administration, payroll, time management, and legal reporting, final score are reduced costs. It is also important to mention: maximized impact of training with reduced training costs, accelerated time for productive employees, reduced employee turnover, enhanced support for unique payroll requirements such as deferred pay and unions.

## 5 EXPERIENCES FROM CROATIA

With a joint effort of the Ministry of Science, Education and Sports (MSES), representatives of all universities in Croatia (Zagreb, Split, Osijek, Rijeka, Zadar, Dubrovnik) and b4b company, the main goal of the project of implementation of an Integrated Financial Information System of 6 Universities (IFIS-U6) based on lump-sum principles and supported by SAP application solution, has been achieved.

The project has been financed with MSES resources but for the benefit of universities, and this is the reason why the project had to meet the needs and interests of both parties. The main motive of MSES has been to integrate the financial system which would ensure transparency of budget spending of the assigned financial resources. On the other hand, universities' motive has been directed toward independence regarding the purpose of spending the budget resources and toward a stronger, more efficient management of the universities. In line with the motives and interests, project business goals have been defined and they had to ensure the following: independent spending of assigned budget resources by universities, development and integration of financial processes of university and their integration with financial processes of MSES, unification of the processes, creating an IT basis for high-quality decision-making and high-quality university management with the help of scalable application solution which shall meet highest standards of reporting.

IFIS-U6 project started in January 2006 and was completed in October of that same year, and since then, users and management of all six Croatian universities have been using SAP transactions and reporting and analytical system in their work.

### 5.1 Project Goals

Single project goals were directed towards:

- Permanent tracking of budget funds by individual university
- University's independent management of assigned budget funds
- University business process improvement and integration
- Uniform approach to necessary data and information

- Integration of university business processes with the business processes of MSES
- Solution scalability (ability for growth and further development)
- Achievement of highest business standards (data transparency and credibility).

Project being finished, it has helped in achieving transparency of management of assigned funds in terms of giving information on its purpose and spending, at the same time university retained its autonomy. Universities Rector's office became responsible for its regular operations while the Ministry of Science, Education and Sports took over the function of monitoring university's operations. (MSES, 2006)

### 5.2 Project Results and its Effect on the Institutions

IFIS-U6 system has achieved vertical integration upon which IFIS system of each university is integrated with the Ministry of Science, Education and Sports information system, and via this system, with State Treasury information system. The vertical integration includes business processes of budget execution, as well as financial accounting. The result of the above mentioned integration enables processes to be carried out in real time, by principle of event occurrence (on transaction level it implies posting of documents at one place only and their automatic transfer to connected systems) which contributes to data authenticity. This also creates a prerequisite for a stronger internal control. The process consists of budget fund provision which enables procurement of financial funds to universities on time, which also implies more orderly obligation fulfilment. The universities can also decide on obligation fulfilment method on their own: from a unique state treasury account (with the Ministry of Science, Education and Sports as a mediator) or directly, by university order.

As the most important project results, the following ones should be singled out:

- Setting up a vertical integration of university financial system with MSES information system, and via MSES with the central state treasury system,
- setting up an independent financial information system at university level as a prerequisite for future establishment of university's autonomy,
- enabling document entering at one place and their automatic transfer to all connected systems,

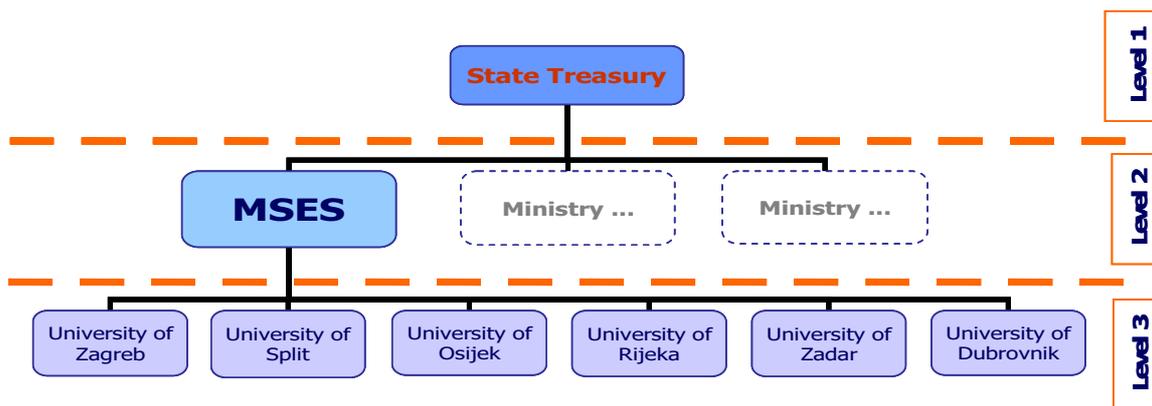


Figure 3: Integrated system of budget money management (IFIS-U6, 2006).

- running of processes in real time by event occurrence principle which results in availability of relevant information to all system users.

### 5.3 Project Application to Other Institutions

Based on experience and knowledge acquired in the project of concern, it can be said that IFIS system is also applicable to faculties, new universities and institutions, not only at administrative level but it could be used by students through Campus Management module after it has been upgraded. Thus, the whole project could be expanded to the sphere of a higher quality of education and to stimulus for scientific and research work

### 5.4 Open Problems and Long Term Goals

An integrated information system of higher education is a prerequisite for a serious reform of the financing scheme in this sector in Croatia. Currently the university staff salaries are regulated on the state level and depend only upon the formal status of a person. There is practically no correlation neither with the quality nor quantity of the work performed. The formal status is achieved mostly due to the count of published papers, for some fields especially if referenced in *Current Contents*. In applied fields, a valuable scientific article can be best produced as a side effect of some real-world project. Such papers should probably be more appreciated than the purely speculative ones? There is no difference in educators' salary between professions in high market demand and those that are maintained only due to preserve some tradition. The alleged

university autonomy is seriously challenged as long as the Ministry decides regarding new employments. There are no serious criteria in the newly established lump sum financing how to distribute the funds among single faculties. Faculties in most of Croatia are rather independent, spatially dispersed institutions varying heavily in their quality, relevance, size and local regulations. Nowadays, an incremental budgeting is performed, based on historical rights and it is hardly correlating with any rational indicator. As long as the full information is not available, the majority in university decision boards preserves the current status as more favourable for them, while the most advanced constituents have to pay the price. Here may lay the most serious risk for further advancement of computerisation in higher education financing.

## 6 CONCLUSIONS

Reduced funding from traditional sources has trimmed revenues, and competition for private funding – including grants, endowments, and alumni donations – is growing. Burgeoning student populations are creating physical space and service challenges. Government regulations pressure institutions to operate with a high degree of transparency, which intensifies the need to report, document, and track financial, demographic, and educational information. Demographic and regulatory reporting requirements are prompting additional spending on human resources management systems. Demand for corporate outreach and continuing education programs is increasing. Competition has intensified for the best students, faculty, and academic and research professionals.

To address these myriad challenges, higher education and research institutions need to leverage IT that aligns with business requirements and supports change. Organizations need to operate more efficiently and integrate processes, from business services to academic affairs and student care, while collaborating externally with government agencies, service providers, and other constituents. Yet many organizations still use fragmented, non-integrated business systems. Inefficient, outdated, and expensive to maintain, these systems foster decision making that is tactical and reactive at best.

Development, design and application of an integrated business information system are very complex processes. That is why planning and project management of implementation of an integrated information system should be carried out on the level of state and business system. Strategic planning of IBIS is a starting point in this process, and putting information in the middle of a corporative success, be it in private or public sectors, is the way in which information is used in the organization as a crucial factor of their competitiveness, efficiency and finally, their profitability. The importance of this research is first of all concerned with acquiring new knowledge that can indirectly influence qualitative changes in strategic planning processes, and its social significance lies in improving the knowledge and spreading its application into business practice.

From all the mentioned, scientific and social justification of this research can be derived from the fact that this research is an initial and starting research for a more detailed dealing with interdisciplinary issues of strategic planning of an integrated business information system.

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