

Contribution of Integrated Management Systems to University Management: Case Study of the Federal University of Rio Grande Do Norte

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Abstract: Problem statement: The Higher Education Institutions (IHL) have intensified process of introducing undergraduate and graduate courses to more remote regions, which expanded the scope of what these institutions and allowed the formation of population of these regions. This expansion (whether by on-campus or distance learning) presents new challenges for university management and integration of the players involved in this process. The purpose of this article was to demonstrate importance of information systems for university management and integration, focusing on decentralization and expansion of IHL. **Approach:** The investigation was descriptive and the article is practical in nature. A case study was conducted at the Federal University of Rio Grande do Norte (Brazil). The research proposal of article was to answer the following question: How does an information system contribute to managing university expansion? **Results:** Results showed the relevance of integrated management systems, given university expansion and broadened horizons observed in recent years. The system analyzed proved to be extremely efficient, since practically all university activities can be monitored and evaluated. **Conclusion:** It was concluded that using integrated management systems during higher learning expansion maximizes this process, resulting in credible and rapid procedures that are more efficient and more effective.

Key words: Higher education research institutions, ICT in education, Institutions of Higher Learning (IHL), Integrated Management Systems (IMS), distance education secretariat, electronic document manager, Enterprise Resource Planning (ERP)

INTRODUCTION

According to Alonso (2010) *apud* INEP-Anísio Teixeira National Institute of Educational Studies and Research (2008), higher education is experiencing rapid growth in Brazil and the dynamics of expansion is marked by a growing private sector. It is worth remembering that in accordance with data from the Anísio Teixeira National Institute of Educational Studies and Research, higher education in Brazil is one of the most private-based in the world.

With this growth, according to Fook and Sidhu (2010) Institutions of higher education to revisit have their purpose assessment of if they hope to equip learners with skills and their competencies needed to succeed in today's workplace.

According to INEP (2010), 84% of the 5,115,896 higher education enrolments in 2009 were in private institutions, representing 89% of the 2,281 establishments.

The 2007 Census of Higher Education shows that 106 institutions were federal, 82 state and 2,032 private (Alonso, 2010). Approximately 2 thousand were characterized as faculties, schools, institutes, integrated faculties and technological faculties, while universities and university centers accounted for 8% and 5.3%, respectively. To accelerate growth in both federal and private IHL, the federal government adopted a series of measures aimed at public higher education called REUNI (Program of Support for Plans of Restructuring and Expansion of Federal Universities).

The REUNI program budgeted R\$ 64 million for maintenance, personnel, designated functions and management positions and R\$ 81 million in new projects, renovations and equipment, in addition to 344 new professors and 447 technical-administrative employees.

Based on this growth, it can be stated that universities have more information to manage and more complex processes to execute. This procedure includes

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student registration, grade processing and absences, as well as administrative information related to internal processes such as ordering material and employee attendance.

According to Elias *et al.* (2010) students seem to have difficulties in their academic study and coping with the learning tasks. Their difficulties include studies, personal, emotional and social matters; the use of tools can help in order to remedy this difficulty.

Institutions are therefore resorting to technology to enhance and simplify information management. Emulating information systems used by companies, teaching facilities are also adopting Enterprise Resource Planning (ERP), but only for information management.

It is noteworthy that ERP is an information system that integrates (in an only system) all organizational functions and processes (Karsak and Ozogul, 2007; Zahedi *et al.*, 2011) facilitating the processes in the administrative functions (Drucker, 1998), providing cost reduction, waste of time, among other benefits (Hendricks *et al.*, 2007).

Accordingly, the purpose of this article is to demonstrate the importance of information systems for university management and integration, focusing on decentralization and expansion of IHL. The research proposal of the present article is to answer the following question: how does an information system contribute to managing university expansion

The article begins with an introduction, followed by a section on theoretical foundations discussing university management and the information management system. Section 3, methodology, addresses the research methods used. Section 4 presents the case study, analyzing the information management system used by UFRN. Results of this analysis are shown in section 5, considering the contribution of the information system to university expansion, thereby meeting the study objective. The article concludes with a list of references.

Framework: Universities need adequate organizational structure and competent management. The strategies should be aimed at service quality and awareness of the importance of information systems in disseminating and socializing knowledge (Weiping, 2010; Bernardes and Abreu, 2004).

Information systems play a potentially key role in university administration since these institutions, like all organizations, are created to satisfy customer needs. The clientele of Brazilian universities is society as a whole, which benefits from their teaching practices and research. How can universities improve their management systems, both academically and administratively?

Over the years higher education in Brazil has undergone rapid and profound transformations in terms of its expansion and ultimate purpose (Macedo *et al.*, 2005; Nascimento, 2006; Barreto and Filgueiras, 2007; McCowan, 2007; Castro, 2009; Omidinia *et al.*, 2011). How can information management be optimized amidst this growth? An effective decision would be to implement an integrated information system, gathering information on all institution users, whether staff or students, in a single place. This would make it easier for the entire academic community to use the system in addition to streamlining administrative and academic procedures.

In this context, university management studies are relevant in that they indicate tendencies regarding the use of information systems aimed at the decision processes of IHL, in accordance with Bernardes and Abreu (2004) and Omidinia *et al.* (2011).

Universities should also adopt good management and technology processes to satisfy their users, that is, society, which enjoys the benefits of their teaching practices and research (Wainwright, 2005; Melian-Gonzalez and Bulchand-Gidumal, 2009; 2010). To that end, universities must make proper use of new technologies, primarily information management, by adopting systems that fit their specific needs (Bernardes and Abreu, 2004; Hidalgo *et al.*, 2011).

Based on this knowledge of university management, we will now discuss concepts of information management systems and how these are incorporated into higher education institutions.

By “system” we mean a group of elements or parts integrated by a common objective (Davenport, 1998). Thus, the idea of organizations as systems integrates different functional areas towards a common goal. Information systems, in turn, can be understood as a group of interrelated components that collect, process, store and disseminate information to support decision making and managerial control. These systems can therefore be defined as the transformation of data into information used to determine organizational structure and that provides administrative sustainability aimed at optimizing expected results (Stair and Reynolds, 2009; Laudon and Laudon, 2007; Murphy and Jongh, 2011).

Using information systems requires knowledge of the organization as well as information technology management. In order to understand the nature and impact of an information system on an organization, one must be aware of the problems which they are designed to solve (Lai *et al.*, 2010), the solutions proposed and organizational processes leading to these solutions (Morton and Hu, 2008; Ifinedo, 2011).

The main characteristic of information systems is the integration of different organizational databases, irrespective of their origin, in order to provide support for the strategic administration process. Thus, the concept of an information system depends on the administrative system that it will support. Efforts related to the architecture and development of information systems should concentrate on identifying data required in the strategic administration process and determining the subsystems that must generate it.

As observed by Laudon and Laudon (2007), an information system that produces the organized information needed for decision making, operational control and creation of new products and services performs three activities, namely: input, processing and output. Input for an information management system consists of internal and external data. The most important internal source is the system of recording daily transactions and operations within the organization and can originate from various functional areas. External sources correspond to data on entities such as customers, suppliers, competitors, government and shareholders.

The processing phase includes elaboration of tasks, operations, ordering, calculations and execution of functional requirements. Several data processing methods can be used such as manual, mechanical, electrical, electronic depending on the product and information desired.

Typical information system outputs are periodical, on-demand and exception reports. Periodical reports involve the monitoring and systemized control of organizational actions such as a key indicator report. This summarizes the previous day's activities and must be presented to management first thing in the morning. On-demand reports are issued or developed upon management request and aim at meeting a particular information need, normally outside standard operating procedures. Exception reports are automatically produced when a situation is unusual or requires specific managerial action.

Before system implementation, awareness of process needs is required to elaborate a coherent system and then be able to implement it. After implementation, information ends up influencing decision making. This influence is attributed to information's capacity to reduce the uncertainty of environmental conditions and consequently induce management to make the best decisions. Among the benefits of an information system is the ability to optimize organizational performance, allowing strategic management committed to efficiency, whether by visualizing corporative data or providing immediate information for the decision-making process.

Integrated systems directed at university management are increasingly more common in the university sector. Their primary objective is to improve services provided to the internal community (professors, students and employees).

By using these systems students have direct and rapid contact with the different university departments, facilitating communication between members, allowing files to be exchanged, enrolments to be made, projects to be registered, debate forums to be created. This type of management allows for simultaneous monitoring of student performance and relationships between university members, resulting in a faster and more simplified flow of operational information.

The academic management system of institutions contains the databanks required to monitor teaching and resource utilization, in addition to being a support tool for planning, decision making and institutional assessment. This can also be unified with administrative and financial management, allowing for elimination of redundancies and inconsistencies and enhanced control of transactional processes, which promotes greater transparency in university management decisions and increased efficiency in the application of physical and financial resources.

MATERIALS AND METHODS

This is an exploratory study with a qualitative design, using a bibliographic survey and case study. The Federal University of Rio Grande do Norte, located in Natal, Northeast Brazil, was selected to investigate The Integrated Management Systems (IMS) developed by this IHL. The methodology describes the steps that will be used to meet the following study objectives:

- Understand and evaluate university administration and information management systems
- Analyze the system used by UFRN
- Explain how information systems contribute to expanding the horizons of higher education

Case study: The Federal University of Rio Grande do Norte currently offers 75 on-campus undergraduate courses and 73 graduate courses. Its academic community is composed of 33,000 students (undergraduate and graduate), 3,108 technical-administrative employees and 1,760 professors. The institution also has the Distance Education Secretariat (SEDIS), which offers courses to approximately three thousand students in 4 states (Alagoas, Pernambuco, Paraíba and Rio Grande do Norte). Seven undergraduate courses are available (Mathematics,

Chemistry, Physics, Geography, Biological Sciences, Business Administration and Public Administration) and four new ones are planned (Physical Education, History, Arts and Pedagogy), in addition to two specialization courses (Public Management and Municipal Public Management) and a master's course in Mathematics.

Distance courses are offered in certain parts of the state called units. These are support facilities located in urban areas to attend as many students as possible. Each unit contains equipment such as an informatics laboratory, library, academic secretary and specific laboratories for all areas. The university currently employs 200 on-campus and 73 distance tutors distributed into 20 support units.

Part of this growth is associated with the REUNI Program, which created 16 new undergraduate courses at the Natal, Caicó, Currais Novos, Santa Cruz and Macaíba (Jundiá) campuses in 2008. This expansion will generate 2,700 new places by 2012.

The institution under study has significantly widened its geographic and academic scope and the other campuses have also shown good growth numbers (for number of courses offered, students enrolled, professors and employees).

In light of this scenario and the need for increasingly efficient integrated systems that facilitate decision making, the university developed the Integrated Institutional Management System, composed of five systems with different uses and access levels, as

follows: Integrated System of Patrimony, Administration and Contracts (SIPAC); Integrated Management System of Academic Activities (SIGAA); Integrated System of Management, Planning and Human Resources (SIGPRH); System of Systems Administration-Technical and Management (SIGAdmin); Electronic Document Manager (SIGED). Another system is the iProject (Integrated System of Project Management), designed to manage development of the remaining systems (SINFO, 2011).

These Integrated Management Systems (IMS) are used by the entire UFRN academic community (professors, employees, students, researchers), allowing for a link between UFRN systems and management systems used by the Federal Government (Fig. 1). Of the five existing modules (Management Systems), three are considered primary: SIGAA, SIPAC and SIGPRH.

SIGAA, which is responsible for procedures linked to academic management, contains thirty-one modules related to the nature of the activity. These include, among others, undergraduate, graduate (master's, doctoral and non-degree) and technical courses, elementary and secondary schooling, submission and monitoring of projects and research scholarship holders, submission and monitoring of extension programs, submission and monitoring of teaching projects (tutoring and innovations), registration and reports on professors' academic production, distance teaching activities and a virtual learning environment (called Virtual Class) (SINFO, 2011).

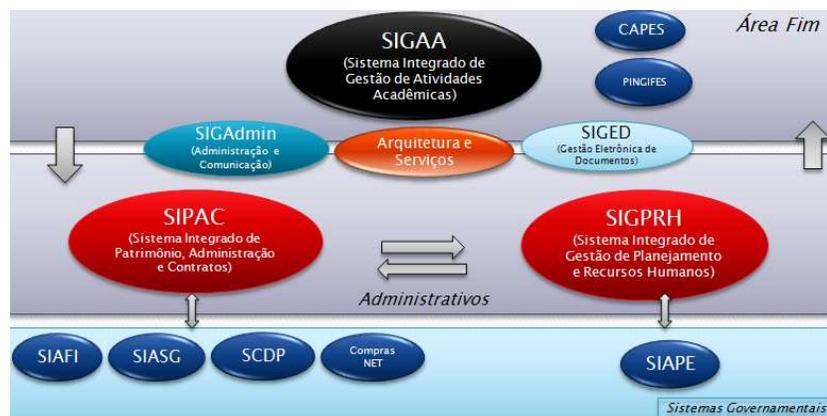


Fig. 1: Integrated Institutional Systems of UFRN. **Source:** SINFO (Informatics Superintendency), 2011. **Legend:** SIAPE: Integrated Financial Administration System of the Federal Government (Brazil); SIASG: Integrated General Services Administration System (Brazil); SCDP: System for the Concession of Tickets and Daily Expenses (Brazil); Compras NET: Web portal for Federal Government Purchases (Brazil); SIAPE: Integrated System of Human Resources Administration; CAPES: Coordination for the Improvement of Higher Level Personnel (associated with the Ministry of Education and in charge of expanding and consolidating postgraduate master's and doctoral courses in the country); PINGIFES: Platform for Integrating Data from Federal Institutions of Higher Learning)

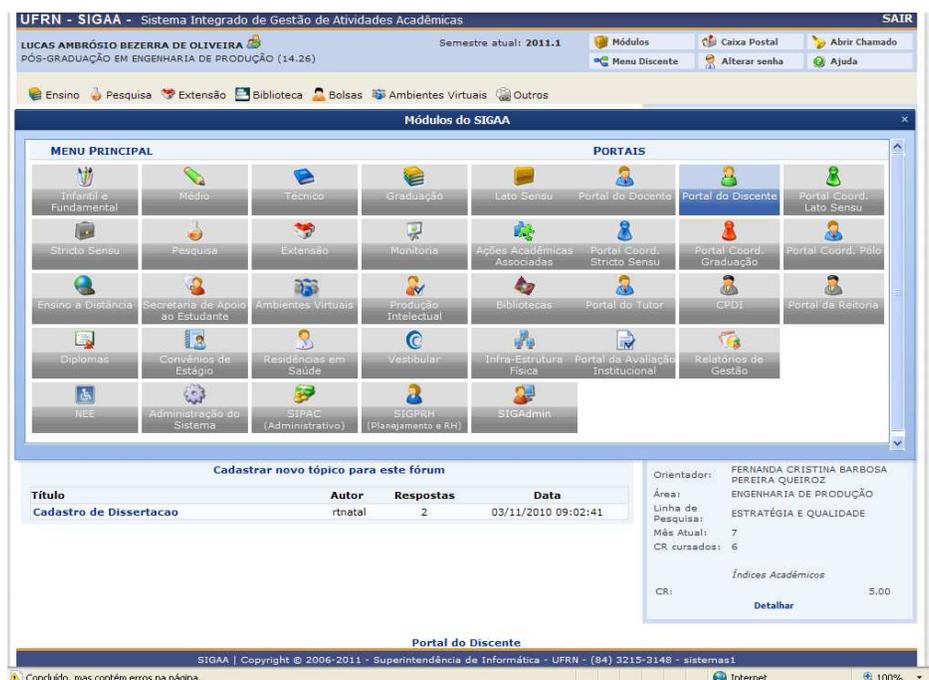


Fig. 2: Main screen and modules (and available operations) of the Integrated Management System of Academic Activities. **Source:** The authors, 2011. **Legend:** Main Menu-Preschool and Elementary, Secondary, Technical, Undergraduate, Non-Degree Courses, Professor Portal, Student Portal, Non-Degree Coordination Portal, Degree Courses, Research, Extension, Tutoring, Associated Academic Actions, Degree Courses Portal, Undergraduation Coordination Portal, Unit Coordination Control, Distance Learning, Student Support Secretary, Virtual Environments, Intellectual Production, Libraries, Tutor portal, Permanent Institutional Development Commission (PIDC), President’s Portal, Diplomas, Internship Agreements, Health Residency, College Entrance Examination, Physical Infrastructure, Institutional Assessment Portal, Management Reports, Special Education Needs (SEN), System Administration, SIPAC (Administrative) SIGPRH (Planning and HR)

The Fig. 2 above describes the information system and its modules available for a student.

SIPAC manages units responsible for finances, patrimony and contracts. The system integrates the entire administrative sector, from requisitions (material, services, financing, daily expenses, airline tickets, lodging, informative material, infrastructure maintenance) to internal budget control (SINFO, 2011) and contains twenty-seven modules.

SIGPRH, composed of twenty-three modules, manages human resource-related procedures such as: scheduling/altering vacations, calculating pensions, functional assessment, workforce planning, staff absence control, public service tests, qualifications, online services, employee petitions, employee records, HR reports, among others. Some of these operations interact to some extent with the SIAPE system (SINFO, 2011).

These three modules are integrated by SIGAdmin, responsible for administering and managing these systems. This system aims at managing common

entities (users) of computerized systems, meaning only system managers and administrators have access.

Each system and its modules perform innumerable administrative and academic procedures/operations (each with a specific purpose) created according to the university unit requirements. These procedures follow internal (UFRN) and government resolutions (municipal, state and federal).

The importance of these three modules justifies their analysis. They are the primary systems used in the institution, encompassing all university management areas (academic and administrative) so that intercommunication occurs, as depicted in Fig. 1. The next chapter describes the case study, followed by results obtained from the analysis in question.

RESULTS AND DISCUSSION

Teaching institutions worldwide are expanding rapidly, increasing enrolment and the number of

professors and employees. This is especially so in higher education, where, in addition to natural expansion (owing to the development of institutions, society and the market), consolidation of distance learning through the internet has broken traditional regional education barriers.

If the academic and administrative management processes of institutions of higher learning used to be complex (due to innumerable processes and the large number of students, professors and employees), activities have become even more costly since university expansion and decentralization. Thus, in order to manage these institutions, administrators must have access to reliable data and information to make better decisions. In this context, integrated management systems are of primary importance.

These systems integrate data from other systems, favoring efficient management of several organizations. Integrated management systems at the Federal University of Rio Grande do Norte are composed of five interconnected systems. This provides the necessary means for academic and administrative management of IHL against the backdrop of expanding horizons and decentralization.

Unit managers can use these tools to make any type of administrative request, material requisition, office supplies purchase, schedule employee vacations, in addition to carrying out all university academic procedures. For example, management at a distance learning unit located in the city of Petrolina (state of Pernambuco), 897 km from the central campus of UFRN, can make any requisition and receive answers in real time (for some procedures).

These rapid processes allow for efficient management, reduce the cost of office supplies, such as paper, safe release of information, automatic protocol generation. Moreover, systems (according to current legislation) monitor the length of time to complete a particular function, helping managers execute tasks.

A significant innovation was the creation of the integrated management system. Before it was implanted, all procedures (from publishing research results to buying coffee) were carried out and stored in different databases, often on paper. Academic and administrative management of the different university units, albeit partially standardized, was done manually, requiring considerable time and effort to complete procedures.

According to the Webometrics (2011), of the 200 largest universities in Latin America, UFRN ranked 24th among IHL in terms of internet visibility and quality content. This ranking was based on institutional publications (scientific articles published in journals,

research results, registered patents), considering content relevance. Also based on the aforementioned site, UFRN ranks 15th among Brazilian universities and 3rd in the Northeast, behind the Federal Universities of Pernambuco and Bahia and 583rd worldwide.

These data are important, since, according to Webometrics (2011), four of the top 50 Brazilian universities are implementing the system used at UFRN, through technical cooperation and seven other Federal Institutions of Higher Learning (FIHL) are also doing so. In addition to these FIHL, five federal departments (Federal Police Department, Federal Highway Police Department, Ministry of Justice, Ministry of Culture and Brazilian Intelligence Agency) are implementing integrated administrative management systems (SIPAC and SIGPRH). The Ministry of Planning is considering implementing IMS in all Brazilian institutions (SINFO, 2011).

This illustrates the relevance and influence of UFRN's integrated management systems. Thus, with system implementation, university administrators gained simple and rapid access to a wide range of information/reports such as number of students enrolled, which professor had the highest travel expenses or published the largest number of articles; which course had the highest failure rate/which campuses were adhering to budget estimates; which professors and/or employees were on vacation and for how long, among other information. Thus, academic and administrative management becomes very efficient, even though campuses and teaching units are located throughout Rio Grande do Norte and in other Northeastern states.

Although it is not yet possible to determine the exact university cost savings resulting from IMS implementation, it can be unequivocally stated that these systems allow for effective educational management in all areas of the IHL. Furthermore, rapid processes, reduced bureaucracy, decreased geographic barriers and easy and quick access to institutional information are other benefits achieved from implementation of these systems.

Final considerations: Teaching institutions, especially higher education facilities, find themselves in a new era, characterized by expanded teaching horizons. The number of courses offered, undergraduate or graduate, on-campus or distance, as well as students, professors and employees, is increasing steadily. Against this backdrop, academic and administrative management of IHL becomes even more complex, making efficiency and effectiveness essential components of quality education. Integrated management systems therefore provide the necessary tools for effective management.

This study, conducted at the Federal University of Rio Grande do Norte, Brazil, achieved the established aims by illustrating the importance of integrated management systems for institutions of higher learning. These systems provide the necessary elements for academic and administrative management, even though the institution has several campuses and teaching units spread throughout the Northeast of the country. Processes that were done manually and stored in different databases are now concentrated and managed by online systems.

Integrated information systems permitted effective university integration and management. Results show the efficiency of the research method used. With respect to the contribution of information systems to management during university expansion, these systems were found to provide positive elements under this scenario. They are therefore very important in the current educational context worldwide.

The systems analyzed in the case study confirm their efficiency, since several higher education institutions in Brazil are planning to implement them. Moreover, important federal government entities, such as the Ministry of Justice and Brazilian Intelligence Agency, are also establishing integrated management systems.

CONCLUSION

It is concluded, therefore, that information systems are extremely relevant for university management against a backdrop of expansion. Additionally, these systems allow for integration between the social players and participating entities of a university environment, by providing tools that enable online information exchange.

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