



Journal of Educational Technology and E-Learning Innovations (JETELI)

ISSN: 3069-3624 (ONLINE)

VOLUME 2 ISSUE 1 (2026)



PUBLISHED BY
E-PALLI PUBLISHERS, DELAWARE, USA



Information Systems as Enablers of Results-Based Budgeting Reform in Higher Education

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Article Information

Received: November 09, 2025

Accepted: February 07, 2026

Published: May 07, 2026

Keywords

Budget Reform, Information System, Performance Measurement, University

ABSTRACT

Since the beginning of the third millennium, Morocco has implemented a series of reforms aimed at improving public management by establishing a new results-oriented culture across all sectors. The higher education sector has been affected by these reforms. Computerized tools have been an essential element to accompany these reforms. Through this communication, we wish to explore the information systems used by Moroccan universities and their role in the institutionalization of these reforms. It demonstrates through the results that these tools constitute a key factor for the success of the reforms.

INTRODUCTION

Public sector reform remains a topical issue. Since the late 1970s, a new wave of reforms has emerged in Anglo-Saxon countries under the banner of New Public Management (NPM). These reforms aim to introduce market-based mechanisms into the public sector in order to improve the performance of public organizations. Consequently, the pursuit of performance has become a veritable cult within the public sector. The growing emphasis on efficiency, effectiveness, and accountability has led to a shift in orientation, reflected in the transition from input-based budgeting to results-oriented budgeting (Sterck *et al.*, 2004).

In the era of artificial intelligence, governments are now required to support these reforms through the adoption of computerized tools. Information systems (IS) represent one such tool and are increasingly being implemented across public institutions. According to Kheybari *et al.* (2020), “an information system (IS) is an organized set of resources—hardware, software, personnel, data, and procedures—designed to collect, process, store, and disseminate information (in the form of data, texts, images, sounds, etc.) within and between organizations.”

In Morocco, this reform agenda is primarily embodied in the Organic Law on Finance Laws (LOLF). According to the LOLF performance guide, the objectives of this reform center on achieving macroeconomic balance through expenditure rationalization, establishing a climate of transparency grounded in accountability, and adapting the budgeting process to the new framework of administrative deconcentration and advanced regionalization.

Like other public institutions, Moroccan universities

have adopted these reforms in order to enhance their performance. To support this transformation, universities have implemented information systems designed to assist in management control and decision-making processes. Through an exploratory study, this paper examines the information systems adopted by Moroccan universities and their role in performance steering. To this end, we first highlight the importance of reliable information in the context of results-based budgeting. We then analyze the role of information systems in the performance measurement process. Subsequently, we present the context of our qualitative case study, before outlining the various information systems currently used by Moroccan universities.

LITERATURE REVIEW

Reliable Information as a Key Success Factor in Results-Based Budgetary Reforms

The budget is the most important instrument available to the State for providing an accurate reflection of a country’s economic and social policy (Schick, 1966). Building on this premise, many governments have sought to modernize their budgeting systems in order to ensure the effectiveness of public spending while improving the quality of services delivered to citizens. In this context, the adoption of New Public Management (NPM) principles has been viewed as a key response to enhancing public sector performance. NPM is characterized by the general idea that traditional public sector management is rigid and inefficient, and that only the transfer of management methods derived from the private sector can improve it. In return, NPM promises greater rationalization of public policies and improved performance of public action, accompanied by increased transparency vis-à-vis

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citizens (Agyemang & Broadbent, 2015).

Results-based budgetary reform is one of the reforms that has placed performance measurement systems at the center of public managers' concerns. Drawing on NPM principles, performance-based budgeting establishes a link between funding and outputs by introducing performance indicators that make it possible to assess predefined objectives, with the aim of improving the effectiveness and efficiency of public expenditure (Robinson & Last, 2009). In this regard, a precise budget preparation process is designed to facilitate the use of performance information in budgetary funding decisions. This process begins with the presentation of the primary objective for which funds are allocated, followed by the definition of measurable objectives through performance indicators, and finally by the reporting and accountability of past performance.

The theoretical foundation of results-based budgeting reform is rooted in agency theory. Indeed, an agency relationship exists between citizens and the government, as well as between parliament and the government. In order to reduce information asymmetry between the agent (the government) and the principal (the citizen, represented by parliament), results-based budgeting provides for a reporting system based on enhanced managerial autonomy combined with a culture of accountability that ensures the provision of reliable information to the principal.

Providing information on public sector performance can enhance transparency and also serve as a useful tool for governments to assess their own performance (Kraan, 2008). Although performance information is not a new concept, governments in OECD countries have examined more closely its integration into the budgetary process over recent decades as part of broader efforts to improve budgetary decision-making (Curristine, 2006). The reliability of information has thus become one of the main prerequisites for the implementation of results-based budgeting (Sterck, 2007). Only when reliable and timely information on the outcomes of government actions is available can budgetary decisions be genuinely based on performance considerations (Kraan, 2008). Consequently, performance-based budgeting can only succeed if each spending agency explicitly defines the outcomes that its services (outputs) are intended to deliver to the community, through key performance indicators designed to measure the effectiveness and efficiency of services throughout the budget formulation process.

The greatest challenge in developing a basic model of performance-based budgeting lies in keeping performance information simple, affordable, and usable (Van Dooren, Bouckaert, & Halligan, 2015). Generally, countries newly adopting this approach must invest significantly in the development of sophisticated and robust performance information systems to ensure the availability of reliable data and enable effective program evaluation (Manes-Rossi, Mussari, & Cepiku, 2022).

The availability of reliable performance information is

therefore a necessary but not sufficient condition for the success of performance-based budgeting. Performance information must also be genuinely used within the budgetary process (Sterck, 2007). There have been several examples of countries that have made substantial efforts to develop performance information and have adopted program-based budgeting, yet subsequently failed to make meaningful use of this information in budgetary decision-making (Curristine, 2006). For performance-based budgeting to be effective, the review of spending priorities and program performance must be formally and systematically integrated into the budgetary process.

The Role of Information Systems in the Performance Measurement Process

The quality and reliability of data are essential factors in the effective execution of tasks related to operational management control. Information systems ensure this quality by facilitating data traceability and the identification of stakeholders involved. According to Kheybari *et al.* (2004), information systems are "a management object that must be purpose-driven, organized, constructed, and subsequently operated and controlled."

The use of digital tools—such as Enterprise Resource Planning (ERP) systems, budget planning tools, consolidation tools, and office automation software—leads to changes in management processes that directly influence decision-making. The computerization of organizational activities increases, notably due to the growing volume of data collected, expanded and faster information-processing capabilities, and easier communication among individuals. Participation in the decision-making process now involves a broader range of actors with diverse skills and expertise (DeSanctis & Poole, 1994). Organizational memory is also enhanced through database management systems, allowing more frequent use of stored knowledge as consultation procedures are simplified. As a result, decision-making becomes both faster and higher in quality, insofar as it is based on more relevant information.

However, the implications of information technology tools for performance management operate at multiple levels. According to Daft (1992), digital tools contribute simultaneously to operational efficiency, efficiency in management processes, and the strategic effectiveness of the management control function. At the operational level, information technology facilitates the automation of certain tasks and activities, particularly repetitive and multiple data-entry tasks, which have largely disappeared. Moreover, these tools promote data standardization, thereby enhancing data consolidation and upward information flows within the organization (Boitier, 2002). Nevertheless, the primary challenge of implementing information technology lies in improving process management and achieving effective strategic control. At the same time, digital tools make it possible to monitor a large number of performance indicators. These indicators are carefully analyzed by management controllers, who

consequently have more time to contribute to the process of strategic emergence (Siegel & Dube, 2001). Information technology tools can thus foster the development of interactive control (Simons, 1990), as they provide real-time insights into key performance indicators and facilitate communication between top management and operational managers who supply data to the management information system (Boitier, 2002). Thanks to advances in information technology, management controllers spend less time collecting data and gain easier access to external information, thereby freeing up time for in-depth analysis and interpretation (Siegel & Dube, 2001). Their role increasingly focuses on information processing and analytical tasks, while software applications generate standardized financial outputs. Moreover, management controllers seek to optimize the productivity of staff involved in routine accounting activities, for example by proposing reductions in staffing levels or shorter information delivery times. Finally, management controllers are also responsible for ensuring the reliability of information and compliance with reporting deadlines (Bouquin & Pesqueux, 1999).

MATERIALS AND METHODS

Context

Like most developing countries, the Moroccan public sector has undergone profound transformations aimed at introducing market mechanisms through a series of reforms designed to modernize public administration at the organizational, budgetary, and human levels. The Moroccan government has implemented regionalization reform and carried out several waves of privatization. It has also initiated reforms of the compensation fund in order to reduce budgetary deficits. In parallel, it launched results-based budgeting (RBB) to enhance public sector performance. These reforms, which are rooted in the principles of New Public Management (NPM), were driven by structural macroeconomic imbalances and reinforced by recommendations from international organizations and donor agencies (Belhassan, 2023). The Organic Law on Finance Laws (LOLF) is the primary instrument governments use to accelerate public-sector reform. In Morocco, results-based budgetary reform was initiated in the early 2000s through an experimental phase. At that time, the Ministry of Finance introduced four mechanisms—the Medium-Term Expenditure Framework, performance-based contracting, the global allocation of appropriations, and performance control—aimed at familiarizing public managers with a new culture of budget management based on transparency, performance, and accountability. In 2015, the Moroccan government enacted a new Organic Law on Finance Laws (Law No. 130-13), which provided the legal foundation for institutionalizing and sustaining performance-based management practices.

The LOLF generated two distinct yet interrelated quantification processes: the development of a new budget classification system and the definition of

performance indicators for public policies. These processes are interconnected, as objectives, indicators, and targets were established for each program as defined in the budget framework.

The LOLF requires the government to submit, in support of the budget and for each program, a Performance Project (PP) outlining objectives and indicators, as well as, in support of each Finance Law settlement, a Performance Report (PR)—based on the same framework—accounting for achieved results (Gibert & Benzerafa-Alilat, 2016). Through the consolidation of annual Performance Projects and Performance Reports, Parliament is able to “compare the results achieved with the resources committed and annually review all allocated resources” (Alsharari, 2020). Finally, the General Inspectorate of Finance conducts an external evaluation of program results, which is presented during the examination of the Finance Law settlement.

Performance monitoring is based on the organization of a management dialogue, first within ministries and subsequently between the Budget Directorate, ministries, and Parliament. To facilitate this dialogue, the Budget Directorate establishes and regularly updates performance reference frameworks. Universities have also been directly affected by this new approach. Indeed, the Ministry of Higher Education is required to consolidate data from the twelve public universities in order to report their performance outcomes. However, the consolidated data are not always reliable and do not accurately reflect the true state of the sector. This situation has prompted decision-makers to launch projects aimed at implementing integrated information systems within universities. Nevertheless, the quality and reliability of these systems remain, in some cases, open to criticism.

Research Design

To address the research question, we first conducted a documentary analysis of secondary data. This analysis was based on official documents addressing information systems used by universities and budgetary reforms implemented in Morocco. These documents were published by:

- the Ministry of Higher Education and Scientific Research;
- the Higher Council for Education, Training, and Scientific Research;
- the Ministry of Finance;
- the Court of Auditors.

Subsequently, we carried out a multiple case study involving three Moroccan public universities. The unit of analysis, in the sense defined by Yin (2004), is the university. A total of twelve semi-structured interviews were conducted with university administrators, each lasting approximately 30 minutes. The interviews were carried out in March 2020.

While the literature review and documentary analysis provide an overview of existing knowledge related to the research problem, the interviews help to identify

key issues to be considered and to broaden or refine the scope of investigation beyond the literature. Several types of exploratory interviews exist; in this study, the convergent interview technique was employed to collect data and examine the perceptions of administrative staff in three Moroccan universities. Convergent interviewing is a qualitative data collection method used to gather, analyze, and interpret information related to individuals' knowledge, opinions, and experiences through a series of interviews that converge toward key issues, following a structured data analysis process (Rao & Perry, 2003). While the overall process is structured, the content of each interview becomes progressively more focused and refined as insights from earlier interviews inform subsequent ones.

RESULTS AND DISCUSSION

This section may each be divided by subheadings or may be combined. A combined Results and Discussion section is often appropriate. This should explore the significance of the results of the work, don't repeat them. Avoid extensive citations and discussion of published literature only; instead discuss recent literature for comparing your work to highlight the novelty of the work in view of recent development and challenges in the field.

In order to achieve productivity and efficiency gains, universities worldwide are increasingly relying on information systems (IS). In this regard, Moroccan universities have launched several initiatives aimed at implementing information systems to support their management processes.

The automation of public expenditure constitutes one of the key objectives of the LOLF, with the aim of strengthening transparency in public spending. Currently, budgetary expenditure management is supported by several information systems: the e-Budget system for budget preparation; the WADEF-AUJOUR system for personnel expenditures; the Integrated Expenditure Management system (GID) for non-personnel budget execution; and the accounting information system.

Apogee

Since 2003, within the framework of Moroccan–French inter-university cooperation, the Ministry and Moroccan universities have engaged in the modernization of student management through the implementation of the APOGEE information system (Application for the Organization and Management of Teaching and Students) as a management tool. APOGEE is a software package designed to support Moroccan universities in managing student enrollment, examinations, and the issuance of diplomas. According to the Court of Auditors (2018), APOGEE has not yet been fully generalized across all higher education institutions. The report highlights several technical shortcomings resulting from its partial deployment and the lack of centralized information management through APOGEE.

Implementation of an Integrated Financial and Budgetary Management System in Moroccan Universities: Sage ERP X3

Sage ERP X3 is an integrated solution designed to manage all accounting and budgetary processes within Moroccan universities. It incorporates the key elements required for results-based financial management. The primary objective of this information system was to simplify accounting flows and processes through greater standardization of internal operations.

The contract for the implementation of Sage ERP X3 was awarded in March 2010, with a total amount of MAD 18,147,600, to the company GFI Maroc. However, the deployment of Sage ERP X3 across Moroccan universities has not been generalized. Although the system was initially scheduled to be fully operational by 2015, only three universities have implemented it, two are currently in the process of deployment, and eight universities have not yet begun implementation. According to one interviewee, “staff resistance, driven by fears of losing control as a result of using this information system, is one of the main reasons for the failure of this project” (I2). Consequently, the non-use of this software represents a significant loss for Moroccan universities, negatively affecting their autonomy and accountability.

eBudget

The new information system “eBudget2” is designed to support multiple functionalities, including the management of a unified and shared reference framework, budget construction based on a program-oriented classification, multiannual budget programming, the preparation of performance projects, and performance monitoring and decision support.

Through the implementation of centralized information systems, the State seeks to dematerialize budget management processes and standardize budgetary procedures and documents, thereby benefiting from the advantages of enterprise software in terms of data consolidation, operational security, and enhanced performance steering.

The system was initially deployed in 2017, covering the General Budget, SEGMA budgets, and Special Treasury Accounts (CST), in order to support the implementation of the LOLF and advanced regionalization. According to Circular No. 8596/E dated November 14, 2018, the eBudget2 system was extended to incorporate the specificities of budgetary management in public institutions benefiting from earmarked resources or state subsidies. This extension aimed to unify budgetary and accounting management rules.

The main objectives of this information system are to:

- transform the budgetary process from a normative expenditure-based approach to a program- and project/action-based presentation, while integrating the regional dimension;
- facilitate the deployment of budgetary reform at all levels of the State (administrations, SEGMA, Ministry of

Finance, Parliament, etc.);

- cover all operational processes and support the new regulatory framework for public financial management;
- steer budgetary performance within ministerial departments and subsidized public institutions.

As such, eBudget2 is expected to have positive effects on budgetary management through the implementation of the new budget classification framework.

During our exploratory study, the eBudget system was still under preparation to become fully operational for all universities by January 2019. The objective of this system is to standardize budgetary procedures and documents and to dematerialize budgetary processes in order to ensure greater transparency and minimize the risk of errors. eBudget is responsible for the entry of three-year budget programming, monitoring budget execution, adopting the new programming classification scheme, and managing CGNC accounts. During its first year of implementation, the system underwent several adjustments to better adapt to the specific management practices of universities.

Integrated Expenditure Management

While eBudget primarily addresses the revenue side of the budget, the Integrated Expenditure Management system (GID) focuses on expenditures, which necessitates interoperability between the two systems. GID represents the most advanced and recent form of records management, as it aims to manage, in an integrated manner, administrative documents, permanent archival records, and reference documentation across multiple formats, including paper documents, microfilm, and electronic records (digital files, web pages, etc.).

GID covers all public expenditures—excluding public debt and personnel remuneration—and encompasses all stages of public expenditure, from the opening of appropriations to the preparation of the Finance Law settlement. In 2020, three universities were selected to pilot the GID system. The objective of this budgetary and accounting information system is to accelerate the processing of expenditure-related transactions, rationalize and simplify execution procedures, and ensure continuous reconciliation and consistency between the accounting records of the various stakeholders involved in the expenditure execution process.

As of February 2020, the various actors involved in the system were holding coordination meetings to adapt GID to the specific expenditure characteristics of universities. According to interviewee I3, “the functionalities of GID designed for universities were largely inspired by those developed for the Regional Academies of Education and Training. Currently, meetings are being held at the Ministry of Finance to incorporate additional functionalities related to specific university activities, such as continuing education and research projects.”

Information Systems within Moroccan Universities: An Imperative Necessity

It is difficult to discuss results-based management

without the support of a robust information system. The availability of reliable information is a decisive condition in the processes of planning, decision-making, and evaluation. Information systems constitute an indispensable tool within any organization, as they facilitate the circulation of credible and relevant information, thereby strengthening transparency—one of the three pillars of the LOLF reform. Indeed, the implementation of the LOLF is guided by three core information systems—eBudget, GID, and WADEF-AUJOUR—which are intended to be deployed across all components of the State. Furthermore, the development contracts of public universities have also emphasized the importance of information system development through the establishment of a digital workspace (ENT) or an integrated information system (SIG) within universities. An analysis of the development of management tools suggests a clear willingness on the part of university leaders to modernize internal management and control mechanisms. This willingness stems from several factors. First, it reflects the broader trend toward the “managerialization” of the civil service through the introduction of so-called modern management tools and instruments. Second, in order to support ongoing budgetary reforms, universities are compelled to modernize their internal steering and management practices. However, the mere implementation of such tools does not automatically lead to improved university performance.

CONCLUSIONS

This study highlights the central role of information systems in supporting results-based budgeting and performance management reforms within Moroccan universities. Drawing on the principles of New Public Management, these reforms place increasing emphasis on transparency, accountability, and performance measurement, all of which rely heavily on the availability of reliable, timely, and relevant information. As demonstrated throughout the analysis, information systems constitute a critical infrastructure for operational steering, decision-making, and the evaluation of public policies in higher education.

The findings show that Moroccan universities have engaged in the deployment of several information systems—such as APOGEE, Sage ERP X3, eBudget, and the Integrated Expenditure Management system (GID)—with the objective of modernizing financial, budgetary, and academic management. However, despite these efforts, the implementation of these systems remains uneven and, in some cases, incomplete. Technical limitations, partial deployment, lack of interoperability, and resistance to change among administrative staff continue to undermine their potential contribution to performance management and accountability.

The study further suggests that the effectiveness of information systems does not depend solely on their technical sophistication, but also on organizational, human, and institutional factors. The successful

integration of information systems requires strong governance frameworks, user involvement, capacity building, and a managerial culture that values performance information and actively incorporates it into budgetary and strategic decision-making processes. Without these complementary conditions, information systems risk remaining underutilized tools rather than becoming genuine levers of performance improvement.

In conclusion, while information systems represent an imperative necessity for Moroccan universities in the context of results-based public management reforms, their contribution to performance enhancement remains contingent upon a holistic approach that combines technological innovation with organizational change and institutional learning. Future research could further explore the dynamics of information use in decision-making processes and examine the long-term impact of integrated information systems on university performance and public accountability.

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