THE IMPACT OF APPLYING ENTERPRISE RESOURCE PLANNING (ERP) SYSTEMS IN THE GOVERNMENT ACCOUNTING SYSTEM ON OPERATIONAL EFFICIENCY: AN ANALYTICAL STUDY IN A SAMPLE OF IRAQI UNIVERSITIES

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The purpose of this research is to investigate the effect of ERP systems in government accounting on Iraqi university operational efficiency and testing the role of the mediating effectiveness of accounting information system in that effect. The research took place in the environment of Iraqi universities; Anbar and Al-Sarraj Universities, to be exact. There were 99 data used in both universities, and their views on the items of the questionnaire prepared by the researchers as a tool for conducting it to reach its objectives and test hypotheses. The utilized methodology was a quantitative analysis with path coefficients through structural equation modeling. The study concluded that ERP systems have a strong significant impact on the effectiveness of accounting information system and operational efficiency, as well as accounting information quality will add value to organizational performance. In the questionnaire, system integration, accuracy of information, speed of accounting process and efficiency in reporting were named as variables most affecting implementation (now on three different aspects), compared to training, technical support and user adoption which had been regarded having the least impact meaning that there is a need for improving not only human resources but also infrastructure. The research concludes that implementation of Enterprise Resource Planning (ERP) is contributing to positive financial and administrative performance. To maximize the gains there is need to improve accounting information systems, a conducive technological change environment and increasing training and development, integration of interdepartmental operations and e-government to enhance transparency and sustainability. Moreover, future studies suggest investigating the long-term effect of such systems on organizational performance and considering other mediating and controlling variables such as digital transformation, managerial innovation and the quality of strategic decisions..

Keywords: Enterprise Resource Planning (ERP) systems; accounting system; operational efficiency; Iraqi universities.

1- INTRODUCTION

During recent years, a few changes have been experienced in the processing of financial and administrative information within government institutions. Strategic need for accountability and operational effectiveness is calling for adoption of Enterprise Resource Planning (ERP) systems to improve government accounting. These are critical systems in determining the accuracy of financial reporting and effectiveness of internal controls, as well regulating data flows, consolidating intercompany transactions, processing information more efficiently and making decisions faster. These are the basic elements that underpin effective management of public resources and the objectives of educational, as well as administrative organizations.

As for the universities of Iraq, financial and accounting management is one of the first bases adopted to achieve sustainability in performance, in order to realize academic and administrative objectives at a full scale. There are growing problems in these universities concerning plurality of transactions, heterogeneity of funding sources, complexity and volume of accounts processing and sometimes the high level of manual transactions in some units. It results in time consuming procedures, high error probability and operational ineffectiveness. Given the above context, ERP system

implementation has been considered as a necessary instrument in improving financial and administrative performance, ensuring more transparency and accountability, providing timely decision-takers with relevant reliable information. This research is important considering insufficient attention has been given to explore the actual contribution of ERP system towards enhancing operational efficiency in Iraqi Universities, as there are few analytical studies that have examined the influence of such systems within Iraq universities. This study attempts to fill the gap of information about an SCP to estimate the effectiveness of ERP systems implementation and its impact on government accounting system and performance efficiency. This study aims to bridge the information gap concerning the Total Quality Management (TQM) program for assessing the effectiveness of ERP implementation and its impact on the government accounting system and performance efficiency. It also highlights the mediating role of the effectiveness of accounting information systems (AIS) in the relationship between ERP systems and operational efficiency.

This research is important, because it presents a holistic scientific foundation for the working mechanism between the implementation of ERP and operational effectiveness. It discusses the moderating influence of AIS effectiveness on the relationship ERP has with operational efficiency. Accordingly, academic and administrative staff at Iraqi universities will be able to judge the efficiency of their financial systems, take corrective decisions that increase productivity and expedite best use for available resources which, in turn, would lead towards developing financial and accounting administration in higher education institutions..

2- RESEARCH PROBLEM

Iraqi universities suffer from lots of difficulties in the utilization and control of financial and administrative resources because there are a variety of procedures and complicated mechanism as well as lack of supervise over these systems, also some units still depend on process operating manually. This also makes the work slow, prone to errors, and inefficient. Despite market attempts to create good accounting systems, the difference between such technology and what people can do to apply it still yawns.

From this perspective, Enterprise Resource Planning (ERP) systems are a strategic solution that improves an organization's operational efficiency and reliability, while simultaneously increasing the accuracy of accounting records. Therefore, this research examines the impact of adopting ERP systems on operational efficiency in Iraqi universities, and how the studied mediating variables interact within this environment to improve financial and administrative performance. Thus, the study will answer the following question: How does the implementation of ERP systems within the government accounting system affect operational efficiency in Iraqi universities, and how is this relationship influenced by the effectiveness of accounting information systems as a mediating variable?

3- SIGNIFICANCE OF THE RESEARCH

The significance of this research lies in highlighting the vital role of ERP systems in improving the operational efficiency of the government accounting system within Iraqi universities. From a scientific perspective, the research contributes to bridging the knowledge gap related to evaluating the impact of implementing ERP systems in the local context, focusing on studying the effectiveness of accounting information systems as a mediating variable. The practical significance of the research is embodied in the universities' urgent need to develop planning systems to keep pace with developments in digital transformation, enabling them to survive and grow. The implementation of these systems will empower universities to face intense competition.

Furthermore, the research's significance lies in its social dimension, as improving the operational efficiency of the government accounting system enhances transparency and accountability in universities, leading to better management of public financial resources. This, in turn, positively impacts the quality of educational services provided to students and the academic community, and contributes to raising the level of trust in government educational institutions.

4- RESEARCH HYPOTHESES

Based on the conceptual research model, the following hypotheses can be formulated:

H1: There is a statistically significant effect of the Enterprise Resource Planning (ERP) systems implemented in the government accounting system on operational efficiency (OE) in Iraqi universities.

H2: Adopting Enterprise Resource Planning (ERP) systems in the government accounting system increases the effectiveness of Accounting Information Systems (AIS).

H3: Enterprise Resource Planning (ERP) systems have a significant positive effect on operational efficiency (OE) by mediating the effectiveness of Accounting Information Systems (AIS).

5- PREVIOUS STUDIES RELATED TO RESEARCH VARIABLES

Enterprise Resource Planning (ERP) systems represent a significant and strategic investment by organizations aiming to integrate and coordinate all their resources, information, and business functions into a unified, organization-wide system built upon a single, shared database (Kallunki et al., 2010). The principal motivation behind adopting these

complex, integrated information systems is the pursuit of enhanced operational efficiency, which, in turn, is expected to lead to increased productivity and overall improved firm performance (Haleem, 2021). Research indicates that ERP implementation can significantly affect core operational areas, such as the processing of accounting information (Tijani & Ogundeji, 2014), and a substantial majority of businesses perceive the software itself as a cost-effective solution (Halimuzzaman et al., 2023).

The literature emphasizes that the Accounting Information System (AIS) is not merely a module within ERP but often constitutes the very core of the enterprise system (Halimuzzaman et al., 2023). For organizations that adopt ERP, the system essentially functions as an integrated accounting system, consolidating all relevant operational and financial data into a single repository (Halimuzzaman & Sharma, 2022). This introduction of a sophisticated AIS within the ERP framework fundamentally transforms how business leaders view their information systems (Haleem, 2021). Furthermore, the accounting information generated by this integrated AIS is vital, as it is frequently used to assess and measure the success and financial impacts of the ERP system's implementation (Halimuzzaman & Sharma, 2022).

The effectiveness of ERP systems in boosting operational efficiency is often not a direct consequence of the technology alone, but is contingent upon mediating organizational mechanisms, with AIS and related practices playing a pivotal role. The financial benefits of ERP, such as reduced IT infrastructure costs, can lead to direct improvements in financial performance (Kallunki et al., 2010). However, the most significant performance improvements are typically achieved indirectly by leveraging the system's capabilities for better planning and control (Kallunki et al., 2010). One study explicitly found that accounting practices have a significant mediating effect between the AIS within the ERP environment and the organization's firm performance (Haleem, 2021). Similarly, other research has demonstrated that the positive, long-term effect of ERP adoption on non-financial performance is mediated by the effective use of formal management control systems (Kallunki et al., 2010). Since AIS provides the visible, accessible, and structured financial data that forms the basis of these formal control systems, it acts as the essential channel through which the ERP system realizes its potential to improve overall operational and organizational performance (Odoyo & Ojera, 2020)

6- THEORETICAL FRAMEWORK OF RESEARCH VARIABLES
6-1- Enterprise Resource Planning (ERP) Systems
6-1-1 The Concept of Enterprise Resource Planning (ERP) Systems

Brady defined it as a technological methodology based on the integration of a series of diverse functions and activities with the aim of optimizing internal value chain activities. Such a methodology is based on the use of a central database that allows data sharing between different sub-workstations located in different work departments and uses manufacturing, financial, supply chain, human resources, customer relationship management, inventory management, and decision support systems software. (Mohammed et al., 2010) and (Taheri and Belloula, 2018) defined it as a management software package that transforms information entered into a single, central database into management information suitable for a part or all the organization's information system. This achieves complete integration of information flowing through the organization's various functions, including accounting information, manufacturing and human resource management information, supply chain information, and customer information. This enables the use of a single computer network to serve the needs of different functions within the organization, thus achieving system integration. (Taheri and Belloula, 2018)

This system (ERP) was defined by (Zhang, H., 2018 & Dezdar, 2016) as an integrated software suite that helps the organization's management effectively utilize resources (resources, human resources, finance, etc.) by providing a comprehensive software package to process information requests within the organization. The researcher defines it as an enterprise software package, designed in the form of modules and closely integrated, based on a unified central database to facilitate, coordinate and automate all core business processes of the organization in real-time, with the aim of enhancing the efficiency of operational processes, improving the flow and quality of information, and supporting strategic and competitive decision-making.

6-1-2 Benefits of an Enterprise Resource Planning (ERP) System

An Enterprise Resource Planning (ERP) system offers numerous benefits to organizations, including: (Faraj, 2020)

- An ERP system provides accurate, relevant, and reliable information that assists senior management in strategic planning for the entire organization and contributes significantly to guiding management towards sound administrative decisions and the development of short-, medium-, and long-term policies.

- An ERP system provides management with sufficient information to enable them to judge and control daily operations and tasks.

- An ERP management system integrates certain steps and creates new methods between departments to help them provide sufficient information in line with the re-engineering of organizational processes.

- An ERP system provides comprehensive technological support to management using information technology and is considered a guarantee for the organization to achieve its objectives, whether strategic or tactical. - Integrating all functions and processes within the organization, including order fulfillment, resource management, planning, supervision, and human resource planning, facilitates immediate, timely, accurate, and consistent access to up-to-date information.

- Implementing and updating an Enterprise Resource Planning (ERP) system improves accounting processes and strengthens accounting systems to provide information to users and analysts both inside and outside the organization, and to assist management in decision-making.

6-1-3 Enterprise Resource Planning (ERP) System Characteristics

The Enterprise Resource Planning (ERP) system possesses several characteristics, including the following: (Al-Silawi & Al-Ghaban, 2024)

- Integration: The ERP system provides integrated data to support multiple business functions, integrating all the organization's data using a database.

- Flexibility: The ERP system can adapt to professional and legal operating rules, and to the organization's requirements after defining its parameters.

- Best Practices: The ERP system is considered the best business practice, as it serves a large and diverse range of organizations and relies on numerous options to suit and support the various business processes carried out in different types of organizations.

- Information Technology: This characteristic relates to the software packages used and represents one of the most important features that distinguishes this system from other systems. It was developed to meet the general needs of a range of organizations, and these packages provide technological tools that simplify accounting, financial, and administrative tasks.

6-1-4 Stages of Enterprise Resource Planning (ERP) Implementation

Implementing an Enterprise Resource Planning (ERP) system involves several stages that should be followed to facilitate the process, as follows: (Al-Silawi & Al-Ghabban, 2024)

Stage 1: Preparation Stage: This includes the comprehensive planning process, identifying those who will assume leadership roles, defining objectives and the project plan to be followed, and determining the budget.

Stage 2: Analysis of the Current Business Process: This includes understanding workflows and internal and external processes and then gathering information to select the system before intensive training and job development. This gives the project team a broad perspective to map the design of the new process. A sound project management framework is also a crucial condition for the overall success of ERP implementation.

Stage 3: Realization: This stage focuses on developing the technical foundation while testing each designed process.

Stage 4: Final Preparation: In this phase, the process design integration is thoroughly tested under full data load. Personnel affected by the system are educated and trained to understand how data flows through it and how the system operates at every point in the supply chain.

Stage 5: Immediate Operation: This phase emphasizes streamlining processes and continuously improving the system to capitalize on the new competitive advantage.

6-2- Operational Efficiency

Countries strive to preserve and sustain their natural resources for as long as possible. Therefore, governments have adopted a strategy of rationalizing resource consumption through sustainable development planning, which has reinforced the trend towards promoting the concept of efficiency in various activities and projects undertaken by countries and governments.

Operational efficiency can be defined as the relationship between the quantity of resources used and the results achieved by maximizing outputs or reducing the quantity of inputs used to reach a certain level of output (Abrihi, 2019). It is measured by the following ratio: Operational Efficiency = Actual Outputs / Maximum Outputs from Available Resources (Ogundari, 2015). Operational efficiency is also defined as the ability to achieve more results or production using fewer resources by improving processes and reducing waste, and it is measured by ratios that reflect the relationship between inputs and outputs within an organization. (Al-Shaba, 2025) Similarly, it is the economic relationship that links available resources to the level of results achieved using these resources. This is done by increasing the quantity of output obtained from a specific quantity of inputs, or by reducing the quantity of inputs used to reach a certain level of output. (Bin Samaha, 2013) Operational efficiency is a fundamental pillar in the performance of modern organizations. It represents an element in developing the performance of individuals, organizational teams, and departments, ultimately leading to the achievement of major strategic goals. Operational efficiency can be analyzed across several overlapping levels: (Abdulmalik et al., 2025)

- At the individual level: Efficiency has become a vital necessity for individuals in the contemporary work environment, which is characterized by constant change, instability, and intense competition. Efficiencies enable individuals to: enhance their opportunities in the changing labor market; protect themselves from the risks of dismissal or transfer due to technological and organizational changes; and ensure professional advancement and career development through acquiring appropriate skills and qualifications.

- At the collective level: Competencies in activating cooperation within organizational teams, achieving integration among individual competencies, resulting in collective performance that surpasses isolated individual efforts; building "competency networks" within the organization, which are interactive systems that rely on utilizing individual competencies within a collaborative framework to solve problems and achieve goals; and improving the teamwork environment and reducing conflicts by developing understanding and communication skills, thus strengthening team spirit.

- At the level of human resources management: Human resources management has shifted its focus to competencies rather than individuals or positions, a strategic shift reflecting: the adoption of flexible recruitment methods that include permanent, seasonal, and contract workers, based on their competencies rather than their job status; and the restructuring of human resources tasks to keep pace with digital transformations through e-recruitment and the development of career paths based on competency analysis.

- At the level of the organization as a whole: Competencies are among the most important assets of an organization in the digital economy era, given their role in supporting competitive advantage by possessing and developing unique skills that are difficult to imitate, and keeping pace with the changes associated with globalization and the technological revolution by stimulating innovation and empowering individuals to act freely and responsibly in the face of challenges. Thus, Operational efficiency is no longer just a technical or organizational concept but has become the general framework upon which institutional efficiency is built in all its dimensions.

6-3 Operational Efficiency in Higher Education and Research Institutions

The application and integration of human resources, technology, processes, research and publication, communication, community service, training and development, and effective teaching in a cost-effective manner, without compromising the quality of final outputs, are characteristics that give higher education a competitive advantage over all its rivals. This description provides a comprehensive explanation of the concept of operational efficiency, not only reflecting a wide range of operational efficiency factors but also examining their implications for institutional performance. The application and practice of efficiency depend on a fundamental operational philosophy that provides a platform for holistic practice involving participants in the operational process. (KEHINDE et al., 2020) Efficiency is a complex concept, and few conceptual tools are available for studying it within the context of higher education. Discussions of efficiency are also challenged by the diversity of approaches and interpretations. Therefore, it is suggested that the topic be considered from the perspective of different levels and dimensions of efficiency that correspond to core university environments. Efficiency can be addressed at three different levels, presented below: (Kupriyanova, 2018)

• System level (national or regional), linked to the framework conditions established by national governments for efficiency-related activities in universities.

• Sector level, encompassing collaborative activities undertaken by university networks, collaborations, and partnerships, often in conjunction with other stakeholders. Collaboration at this level extends across national higher education frameworks and can involve a wide range of actors with diverse needs and interests.

• Institutional level (including faculty, departmental, and individual levels), covering the various activities of higher education institutions related to the design and implementation of institutional efficiency agendas.

6.4. Dimensions of Operational Efficiency in Higher Education Institutions

Efficiency can be explored through several dimensions: (Kupriyanova, 2018)

(a) Operational efficiency (efficiency in professional, operational, and support services): Operational efficiency is attributed to the need to streamline business processes and optimize resource utilization. It encompasses a wide range of activities or measures undertaken to ensure the effective implementation of day-to-day university operations, including facilities and venue management, procurement, finance, human resource management, and student support services. Operational efficiency measures lead to internal organizational reorganization or resource sharing, improving operations.

(b) Academic efficiency (research, teaching, and learning efficiency): Academic efficiency encompasses processes related to the organization of teaching and research. Examples include enhancing the academic offering, digital learning and the use of information and communication technologies in teaching and learning, and developing research profiles, among others. The issue of academic efficiency arises at all institutional levels, including faculty and departmental

levels, and concerns individuals involved in research and teaching activities. Institutional measures in this area can include defining teaching loads, class sizes, and research output requirements.

(c) Strategic governance efficiency: Strategic governance efficiency is linked to a wide range of activities related to illustrating efficiency within a value creation model to support performance management and institutional development; accountability and management of institutional capital (financial, intellectual, human, relational, natural, reputational, etc.); developing an institutional "culture of efficiency" based on leadership and employee engagement; investing in skills, technology, and capacity building; effective internal communication; engaging governing bodies; and stakeholder value recognition and reporting. Integrated.

6.5 Core Enterprise Resource Planning (ERP) Modules for Higher Education

Enterprise resource planning (ERP) systems in higher education institutions are designed to centralize and automate various administrative and academic processes. These systems include several core modules that simplify institutional processes, enhance efficiency, and improve data-driven decision-making. The most important ERP modules in higher education institutions include the following: (Gonugunta, 2024)

6-5-1 Student Information System (SIS)

The Student Information System (SIS) is a crucial component of an Enterprise Resource Planning (ERP) system in higher education institutions, managing the entire student lifecycle from application to graduation. The system manages student admissions, registration, academic records, grades, academic transcripts, and course registration. SIS also facilitates student engagement by providing self-service portals for registration, fee payment, and access to academic progress reports. By automating these processes, institutions can reduce administrative burdens and enhance student services.

6-5-2 Human Resources

The Human Resources module in an ERP system supports faculty and staff management, streamlining recruitment, payroll processing, benefits administration, and performance evaluation. Universities rely on this module for employee record-keeping, contract management, and workforce efficiency monitoring. Furthermore, human resources analytics tools provide valuable insights into faculty workload distribution and professional development needs.

6-5-3 Finance and Accounting

Financial management is a core function in higher education institutions. Enterprise Resource Planning (ERP) systems include financial modules for handling budgets, accounts payable/receipt, payroll, and financial reporting. These systems ensure compliance with financial regulations and enable institutions to track expenses efficiently. Automating financial transactions reduces errors, enhances transparency, and improves financial planning.

6-5-4 Learning Management System (LMS)

Modern ERP solutions integrate Learning Management Systems (LMS) to support course management, e-learning platforms, and the delivery of digital content. LMS modules enable online assessments, discussion forums, and collaboration tools, fostering a more flexible learning environment. They also integrate with Student Information Systems (SIS) to track student progress and facilitate seamless academic administration.

6-5-5 Integration with Existing Systems

Despite the benefits of ERP systems, integrating them with legacy systems remains a significant challenge for higher education institutions. Many universities rely on pre-existing student management, finance, and human resources software that may not be directly compatible with new Enterprise Resource Planning (ERP) solutions. Ensuring seamless integration requires middleware, APIs, and extensive data migration efforts. Successful ERP integration enhances institutional decision-making by enabling a unified data flow across departments. When properly integrated, ERP systems provide immediate access to information, improving coordination between administrative units and academic departments. This holistic approach supports better resource allocation, student services, and financial planning. A major concern during the integration process is interoperability, as institutions often use different platforms with varying data formats and protocols. The complexities of data migration also pose risks, as transferring historical records from legacy systems to the new ERP platform requires careful verification to prevent data loss or corruption. Institutions must invest in effective data governance strategies to ensure data accuracy, consistency, and security throughout the integration process. To overcome these challenges, higher education institutions should conduct comprehensive system assessments before deploying an Enterprise Resource Planning (ERP) system, engage IT specialists to adapt the system, and adopt phased implementation approaches to minimize operational disruptions. A well-integrated ERP system ultimately enhances institutional efficiency, reduces redundancy, and fosters a more resilient digital environment in higher education.

7- METHODOLOGICAL PROCEDURES

This section will address the statistical analysis procedures and methods used to achieve the research objectives. We will begin by discussing the research population, followed by the research methodology, research limitations, the data collection instrument, statistical tests related to the reliability and internal validity of the instrument, and the evaluation of the research model. Finally, we will examine the hypothesis testing using Structural Analysis Modeling (SEM) with PLS-SMART software.

7-1- Research Population and Sample

The research population consists of public and private universities in Anbar Governorate. It includes two public universities: Anbar University and Fallujah University. The private universities in Anbar consist of three: Al-Maarif University, Al-Huda University College, and Al-Siraj University. The study will focus on Fallujah University and Al-Siraj University, which together constitute the research sample.

7-2- Research Methodology

The researcher employed an inductive approach due to the nature of the study within this population. This involved reviewing and thoroughly examining previous studies. Additionally, the descriptive-analytical approach was used to gather facts and information about the study topic from the target population. This approach aimed to analyze the impact of enterprise resource planning (ERP) systems on operational efficiency in the studied universities, as well as to investigate some mediating factors expected to influence the relationship between the dependent and independent variables.

7-3- Developing the Research Instrument

A questionnaire was developed as the primary instrument for obtaining primary data from the study population. The instrument was tested because it is one of the most common and widely used data collection methods, and because of its suitability and relevance to the nature of the study. This questionnaire was developed based on the theoretical foundation of the research topic, and its evaluation and refinement were carried out by presenting it to a panel of experts in the relevant field. Business administration, accounting, and statistics. Details of the main variables and the number of items in the approved questionnaire are shown in Table (1) below:

Table 1: research variables

Main Variable			Variable Code	Dimension	Dimension Code	Number of Items
Enterprise Resource Planning Systems			ERP	System Integration	INT	5
				Ease of Use	EUS	5
				Data Accuracy	ACC	5
				Processing Speed	SPD	5
				Decision Support	DSS	5
Accounting Information System Effectiveness			AIS	Information Quality	QIN	5
				Reliability	REL	5
				Relevance	RELV	5
				Timeliness and Accuracy	TIM	5
Operational Efficiency			OE	Cost Efficiency	CST	5
				Productivity	PROD	5
				Service Quality	QSRV	5
				Transaction Speed	STP	5

7-4 Model Specifications

The proposed research model was designed to study the impact of implementing Enterprise Resource Planning (ERP) systems on the effectiveness of the Government Accounting System (AIS), and consequently on operational efficiency (OE) in Iraqi universities. The model aims to integrate both the technological factors represented by the components of ERP systems and the organizational factors represented by the accounting system, based on previous studies that confirmed the vital role of implementing ERP systems in enhancing operational performance within public institutions. The hypothetical model, which represents the relationship between the variables, can be illustrated in Figure:(1)
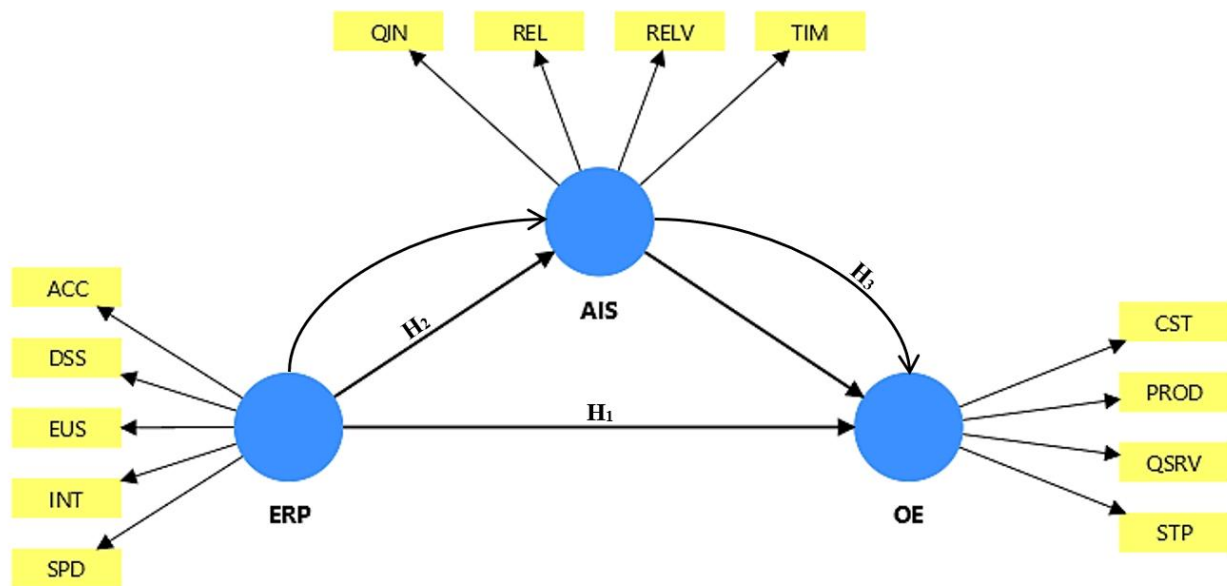
Figure 1: Conceptual Model

Partial Least Squares Structural Equation Modeling (PLS-SEM) was used to estimate the model and test the hypotheses. This method allows for the simultaneous evaluation of both the standard (external) and structural (internal) models. The model employs a reflective measurement approach, where observed indicators are reflections of underlying variables, thus reinforcing the validity of the model's theoretical structure. The mathematical models upon which the relationship's effect will be tested are outlined below:

$$\mathbf{OE} = a_0 + \beta_1 ERP + \varepsilon\ldots\ldots\ldots\ldots\ldots\ldots\ldots.\ldots(1)$$
$$\mathit{AIS} = a_0 + \beta_2 ERP + \varepsilon\ldots\ldots\ldots\ldots\ldots\ldots(2)$$
$$\mathbf{OE} = a_0 + \beta_1 AIS + \beta_3 ERP + \varepsilon\ldots\ldots\ldots(3)$$

To ensure the validity and reliability of the measurements, the model incorporated indicators such as Outer Loadings, Outer Weights, Composite Reliability, Cronbach's Alpha, Mean Extracted Variance (AVE), and Variance Amplification Factor (VIF). Indicators with high loadings (>0.7) and acceptable VIF values (<3.3) were retained to ensure the pooled and discriminant validity of the measures. Structural pathways between ERP → AIS, AIS → OE, and ERP → OE were also tested using bootstrapping with 5000 retested samples to determine the significance of the pathway coefficients.

8- SAMPLE DESCRIPTION AND DEMOGRAPHIC CHARACTERISTICS

Table (2) presents the descriptive distribution of the study sample according to a set of demographic and professional variables, revealing the key characteristics of the research participants.

Regarding the gender variable, the vast majority of participants were male (91%), while females constituted only (9%), reflecting the gender composition of the study sample.

As for the occupational nature variable, the largest percentage was concentrated among academic staff (40%), followed by financial accountants (30%), then IT staff (14%), financial analysts (6%), and finally financial auditors (9%). This indicates the diversity of participants' roles across the academic, financial, and technical professions, with a greater inclination towards the academic and accounting fields.

Regarding the academic degree variable, the majority of participants were in the professional category (60%), compared to (40%) in the academic category, reflecting strong participation from professionals specializing in the financial and administrative fields. Looking at years of work experience, we find a relatively balanced distribution, with participants having less than five years of experience (37%), 5–10 years (24%), 11–15 years (13%), and more than 15 years (25%). This indicates that the sample includes a mix of entry-level, intermediate, and advanced experience, providing diverse coverage of different expertise in accounting system analysis and ERP systems.

Regarding academic rank, the highest percentage of participants were without a rank (44%), followed by lecturers (20%), assistant professors (21%), and professors (7%), reflecting the diversity of academic experience levels within the sample.

As for educational qualifications, those with a professional degree or diploma constitute 24%, bachelor's degree holders 35%, master's degree holders 15%, and doctoral degree holders 25%, indicating that the sample included different levels of academic achievement. This provides a comprehensive view of the impact of experience and academic qualifications on performance and operational efficiency. Conclusion: The table indicates that the sample represents

good diversity in terms of gender, nature of work, experience and academic qualification, with a clear bias towards males, academic workers and professional practitioners, which enhances the credibility of the results and allows for an accurate analysis of the different effects of ERP systems and the accounting system on operational efficiency in Iraqi universities.

Table 2: Demographic characteristics of the sample.

Variable	Categories	Number	Percentage (%)
Gender	Males	90	%91
	Females	9	%9
Nature of work	Financial Auditor	9	%9
	Financial Accountant	30	%30
	financial analyst	6	%6
	IT Employee	14	%14
	Academic	40	%40
Type of academic degree	Academic	40	%40
	Professional	59	%60
Years of Experience	Less than 5 years	37	%37
	5–10 years	24	%24
	15-11 years	13	%13
	Over 15 years	25	%25
Academic title	Assistant Professor	21	%21
	Lecturer	20	%20
	Assistant Professor	7	%7
	Professor	7	%7
	Without a Title	44	%44
Academic qualification	Diploma	24	%24
	Bachelor's	35	%35
	Master's	15	%15
	Doctorate	25	%25
Total		99	

9- DATA ANALYSIS
9-1 Measurement Model Evaluation
External model evaluation is a crucial step in structural model analysis using PLS-SEM. This stage aims to verify the quality of the measurement tools and their ability to represent the theoretical concepts of the main variables in the study (ERP, AIS, OE).

The results of the outer loadings show that all indicators achieved values exceeding the statistically acceptable minimum (0.70), indicating strong convergent validity between the items and the underlying concept of each variable. The results showed that the (EUS → ERP) dimension achieved the highest loading value at (0.912), followed by (DSS → ERP) at (0.922), confirming that ease of use and decision support are at the heart of enterprise resource planning systems in the public university environment. Furthermore, the (SPD → ERP) dimension, with a value of (0.855), indicates that speed in processing operations and outputs is one of the most prominent operational advantages offered by the system. As for the indicators of the Government Accounting System (AIS), all values were statistically significant and at high levels. The (RELV → AIS) dimension had the highest load (0.853), followed by (REL → AIS) (0.745), reflecting the

importance of relevance and reliability as the most influential dimensions of the accounting system on the quality of financial and administrative information within government universities. Similarly, the (QIN → AIS) (0.732) and (TIM → AIS) (0.640) dimensions showed that the quality and timeliness of information play a complementary role in enhancing the system's effectiveness.

Regarding the operational efficiency (OE) variable, the loads showed that the most influential indicator was (QSRV → OE) with a value of (0.752), indicating that improving the quality of services provided is one of the most prominent aspects of operational efficiency in universities. This was followed by the (STP → OE) dimension with a value of (0.750), which underscores the importance of speed in performing administrative and academic processes. The results of the (CST ← OE) and (PROD ← OE) dimensions also indicate that cost reduction and productivity improvement are key components within the operational efficiency architecture, although their effects are relatively less significant (See Table 3).

Table 3: Results of Outer Loading Analysis

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
ACC <- ERP	0.861	0.860	0.035	24.690	0.000
CST <- OE	0.726	0.717	0.101	7.158	0.000
DSS <- ERP	0.922	0.920	0.019	47.523	0.000
EUS <- ERP	0.912	0.912	0.016	57.068	0.000
INT <- ERP	0.744	0.744	0.049	15.178	0.000
PROD <- OE	0.511	0.499	0.127	4.030	0.000
QIN <- AIS	0.732	0.723	0.097	7.569	0.000
QSRV <- OE	0.752	0.753	0.051	14.606	0.000
REL <- AIS	0.745	0.738	0.070	10.688	0.000
RELV <- AIS	0.853	0.851	0.042	20.348	0.000
SPD <- ERP	0.855	0.853	0.032	26.856	0.000
STP <- OE	0.750	0.749	0.054	14.002	0.000
TIM <- AIS	0.640	0.640	0.097	6.620	0.000

9-2 External Weights Analysis: Identifying the Most Influential Dimensions

The results of the external weights reinforce the preceding conclusions, showing that the most influential dimensions within each variable were as follows:

• In the ERP variable, the dimensions of Decision Support (DSS), Ease of Use (EUS), and Process Acceleration (SPD) had the highest relative weights (0.245, 0.244, and 0.229, respectively). This indicates that the system's efficiency in supporting decisions, speed of performance, and ease of use are the elements that most contribute to explaining the concept of ERP in the government environment.

• In the AIS variable, the dimension of Timeliness of Information (TIM), related to the timeliness of information, emerged as the strongest relative indicator (0.359), followed by the dimension of Quality of Information (QIN), related to data quality (0.311). This suggests that timeliness and accuracy are the most important factors in the effectiveness of the accounting system.

• In the operational efficiency (OE) variable, the STP dimension had the highest weight (0.463), followed by QSRV (0.396) and CST (0.353), indicating that speed of process execution and service improvement are the two most influential components in building operational efficiency, while the productivity (PROD) dimension remains complementary (0.194).

These results demonstrate that the measurement model has a convincing structural balance; each variable is built on a coherent and internally correlated set of indicators, and all statistical values were highly significant (P = 0.000), thus reinforcing the validity and reliability of the external model (See Table 4).

Table 4: Results of Outer Weight Analysis

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
ACC <- ERP	0.248	0.248	0.019	12.886	0.000
CST <- OE	0.353	0.350	0.047	7.445	0.000
DSS <- ERP	0.245	0.245	0.011	22.709	0.000

EUS <- ERP	0.244	0.244	0.014	16.896	0.000
INT <- ERP	0.192	0.192	0.022	8.618	0.000
PROD <- OE	0.194	0.190	0.053	3.650	0.000
QIN <- AIS	0.311	0.308	0.054	5.759	0.000
QSRV <- OE	0.396	0.395	0.051	7.783	0.000
REL <- AIS	0.290	0.283	0.060	4.851	0.000
RELV <- AIS	0.383	0.383	0.056	6.899	0.000
SPD <- ERP	0.229	0.228	0.017	13.543	0.000
STP <- OE	0.463	0.460	0.056	8.295	0.000
TIM <- AIS	0.359	0.362	0.072	4.959	0.000

9-3 Model Validity and Reliability Analysis

These results were supported by the extracted mean variance (AVE) values, which exceeded 0.50 for all variables, confirming that most of the variance in the indicators is explained by the underlying variable itself. Furthermore, the reliability indices (Cronbach's Alpha and Composite Reliability) were within excellent limits, exceeding 0.90 for the ERP variable and 0.83 for the AIS variable, reflecting a high degree of confidence in the measurement instruments (See Table 5).

Table 5: AVE AVERAG VARIANCE EXTRACTED

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
AIS	0.557	0.557	0.052	10.660	0.000
ERP	0.741	0.741	0.030	24.306	0.000
OE	0.479	0.481	0.051	9.452	0.000

These results confirm that the external model has convergent validity and good discrimination between variables, and there are no overlapping indicators or conceptual discrimination problems between dimensions, which makes the transition to structural model evaluation reliable and based on a solid statistical foundation.

9.4 Structural Model Validity

The values of the coefficient of determination (R^2) showed that Enterprise Resource Planning (ERP) systems explain 23% of the variance in the Government Accounting System (AIS), while the independent variables (ERP and AIS) explained approximately 60% of the variance in operational efficiency (OE). This is a strong percentage that reflects the model's ability to predict operational efficiency in Iraqi universities. Furthermore, the adjusted values of R^2 were close to the original values, confirming the structural model's stability and its lack of impact from the number of indicators (See Table 6 and 7).

On the other hand, the results of the Variable Inflation Factor (VIF) showed values below 2, indicating the absence of multicollinearity among the independent variables and, consequently, the validity of the estimated statistical relationships.

Table 6: r-squared test results

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
AIS	0.233	0.256	0.098	2.377	0.017
OE	0.603	0.616	0.052	11.585	0.000

Table 7: r-squared adjusted test results

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
AIS	0.226	0.248	0.099	2.273	0.023
OE	0.594	0.608	0.053	11.193	0.000

9-5 Internal Reliability and Internal Consistency

The reliability indices (Cronbach's Alpha, Composite Reliability, and Rho-A) showed high levels for all variables, exceeding 0.70 in most cases, reflecting strong internal consistency among the components of each variable. The ERP variable achieved the highest level of consistency (Rho-C = 0.934, Alpha = 0.911), indicating the homogeneity of the Government Resource Planning (ERP) indicators and the clarity of their concept among the sample. The AIS and OE

values were also within acceptable limits, further enhancing the reliability and statistical stability of the measurement instruments (See Table 8 and 9).

Table 8: RHO-C test results

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
AIS	0.833	0.829	0.033	24.855	0.000
ERP	0.934	0.934	0.010	93.636	0.000
OE	0.783	0.778	0.043	18.346	0.000

Table 9: RHO-A test results

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
AIS	0.737	0.747	0.064	11.593	0.000
ERP	0.919	0.921	0.014	64.185	0.000
OE	0.674	0.676	0.066	10.278	0.000

Table 10: Cronbach's Alpha Test Results

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
AIS	0.730	0.725	0.059	12.341	0.000
ERP	0.911	0.910	0.015	62.734	0.000
OE	0.648	0.642	0.071	9.091	0.000

The results of the Variance Amplification Factor (VIF) test indicate that the structural model is free from multicollinearity among the independent variables, as the values showed that all pathways fell within statistically acceptable limits. The VIF value for both the (AIS → OE) and (ERP → OE) pathways was approximately 1.305, with a sample mean of 1.370. Confidence limits ranged between 1.091 and 1.865, which are low values indicating a very limited degree of correlation between these variables. The (ERP → AIS) pathway recorded a constant value of 1.000, which means there is no variance inflation, as this pathway includes only one independent variable, thus making the probability of multicollinearity inherently zero (See Table 11).

These results show that all values are significantly lower than the critical thresholds adopted in statistical literature. According to Hair et al. (2021), threshold 5 is the level at which multicollinearity begins to appear.

Table 11: VIF test Results

	Original sample (O)	Sample mean (M)	2.5%	97.5%
AIS -> OE	1.305	1.370	1.091	1.865
ERP -> AIS	1.000	1.000	1.000	1.000
ERP -> OE	1.305	1.370	1.091	1.865

10- Direct and indirect Effects and hypothesis testing results.
10-1 Direct Path Analysis

Table (12) and Figure 2 show the results of the direct path analysis between the main variables in the study model, which revealed statistically significant positive effects at the (P ≤ 0.01) level. The results indicated that the application of Enterprise Resource Planning (ERP) systems in the government accounting system has a direct and strong impact on the effectiveness of Accounting Information Systems (AIS), with a path coefficient of ($\beta = 0.483$, $P = 0.000$). This positive correlation suggests that the use of ERP systems effectively contributes to improving the performance of the accounting system by increasing the integration of financial and accounting processes and enhancing the quality and accuracy of the information generated, thus strengthening the ability to make sound and timely decisions.

The results also showed that ERP systems have a direct and positive impact on operational efficiency (OE) in Iraqi universities, with a path coefficient of ($\beta = 0.589$, $P = 0.000$). This demonstrates that the shift towards automating and integrating administrative and financial activities through an ERP system leads to enhanced operational efficiency and reduced waste of time and resources, which in turn improves institutional and administrative performance.

Regarding the relationship between AIS and OE, the results showed that the effectiveness of the accounting system significantly contributes to improving operational efficiency ($\beta = 0.295$, $P = 0.000$). This means that the quality, speed,

and accuracy of accounting information are crucial factors in supporting decision-making processes and improving the operational performance of public universities.

Based on these results, it can be concluded that the first three hypotheses have received strong statistical support. The data confirms that ERP systems play a pivotal role in enhancing the efficiency of the accounting system on the one hand, and in improving operational performance on the other, whether directly or through the accounting intermediary.

Table 12: Path coefficient

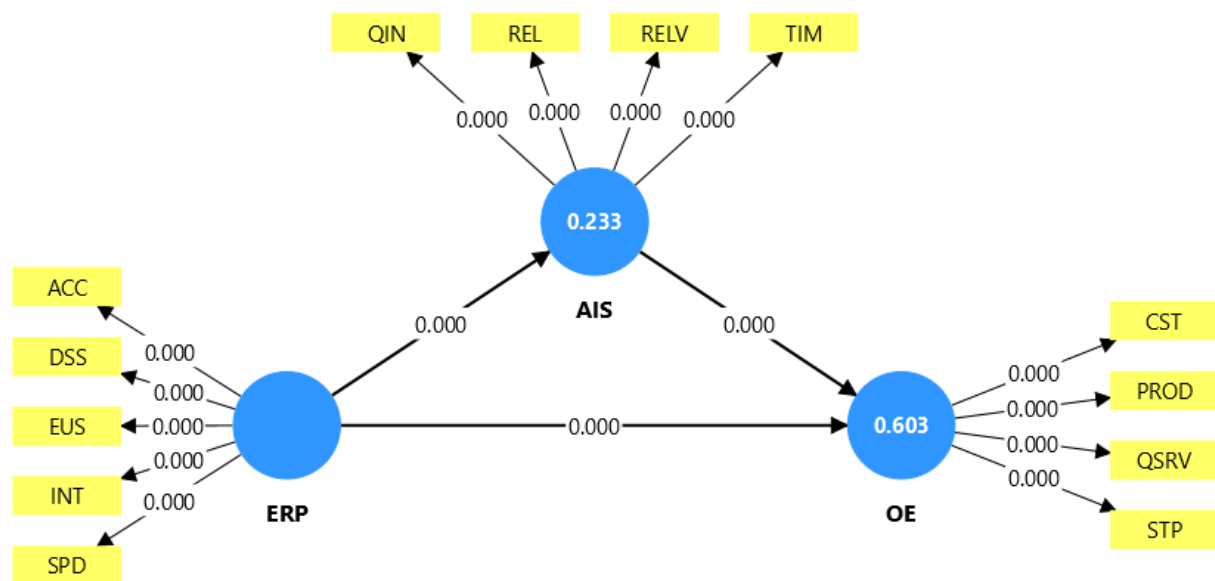|	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
AIS -> OE	0.295	0.299	0.074	3.971	0.000
ERP -> AIS	0.483	0.496	0.100	4.817	0.000
ERP -> OE	0.589	0.589	0.069	8.486	0.000

Figure 2: Direct and indirect Effects results

Table (13) illustrates the results of the indirect effect analysis and the mediating role of the Accounting Information Systems (AIS) effectiveness variable in the relationship between Enterprise Resource Planning (ERP) systems and operational efficiency (OE). The indirect effect was found to be (β = 0.143), which was highly statistically significant (P = 0.005). This result indicates that the government accounting system acts as a partial mediator between the implementation of ERP systems and the improvement of operational efficiency in Iraqi universities.

In other words, part of the impact of ERP systems on operational performance is not achieved directly, but rather through improving the quality and effectiveness of accounting information systems. These systems act as the link that translates the impact of technological transformation into tangible operational results. This demonstrates that the success of ERP systems implementation depends not only on technical aspects, but also on their integration within the government accounting system, which serves as the supporting structure for generating accurate and reliable information that contributes to improving administrative and operational performance and achieving sustainability in institutional performance.

Table 13: Specific indirect effect

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
ERP -> AIS -> OE	0.143	0.149	0.051	2.819	0.005

11. DISCUSSION OF RESULTS

The statistical analysis revealed that the items with the greatest impact on explaining the relationships between variables were those reflecting the core of integration, accuracy, and processing speed within the government accounting system. Respondents indicated that the items "Unifying administrative and financial databases into a unified electronic system" and "Linking administrative and academic units within a single central system" represented the highest levels of impact

within the system's integration dimension, due to their role in reducing duplication and achieving a high degree of efficiency in the flow of information between university units. The items "Improving the accuracy of financial and administrative data entry" and "Reducing errors resulting from manual processing" were among the items most closely associated with improving the effectiveness of accounting information systems, reflecting the ERP system's ability to enhance data reliability and standardize its recording criteria.

Regarding the processing speed dimension, the items "Accelerating the preparation of financial and administrative reports" and "Facilitating immediate access to information" were among the most influential factors in enhancing operational efficiency, given the time and effort they save in completing transactions. In the Decision Support dimension, the item "Providing accurate indicators to support strategic decisions" received the highest response, confirming that ERP systems have become an effective tool in supporting university leadership in the financial and administrative planning process.

Conversely, some items showed a relatively lower impact, such as the item "System flexibility in meeting changing reporting requirements" in the Relevance dimension, and "Facilitating electronic transaction tracking" in the Transaction Speed dimension. Some respondents felt that these aspects still require technical and administrative development to ensure maximum benefit from the system's capabilities. The item "Using technology to reduce administrative costs" was among the least impactful in the Cost Reduction dimension, perhaps due to the limited utilization of technological capabilities in some university units.

In general, these results indicate that the most influential items were those related to integration, accuracy, speed, and decision support, dimensions that reflect the essence of digital transformation in university administration, while items related to operational flexibility and reducing direct costs contributed less to explaining the overall impact of the relationships between variables.

CONCLUSION AND RECOMMENDATIONS

This research addresses the application of Enterprise Resource Planning (ERP) systems in government accounting, highlighting the impact of these systems on the operational efficiency of Iraqi universities and the role of the effectiveness of accounting information systems as a mediator in this impact. The study employed a quantitative analytical approach using path analysis within a structural equation model, based on field data from Iraqi universities. The results showed that ERP systems have a direct and strong impact on the effectiveness of accounting information systems and on operational efficiency, and that the quality of accounting information contributes to enhancing institutional performance. The questionnaire highlighted that system integration, information accuracy, speed of accounting processes, and efficiency of report preparation were the most influential factors, while training, technical support, and user acceptance had the least impact, indicating the importance of strengthening both the human and technical aspects.

In conclusion, the study affirms that adopting ERP systems is a strategic step for improving financial and administrative performance in universities. Maximizing the benefits requires enhancing accounting information systems, providing a supportive environment for technological change, increasing training and development opportunities, expanding integration between departments, and adopting e-governance to ensure sustainability and transparency. Furthermore, future research recommends investigating the long-term impact of these systems on institutional performance, while also examining additional mediating and control variables such as digital transformation, administrative innovation, and the quality of strategic decisions.

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