

Improving Process Efficiency in Iraqi universities: a proposed management information system

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ABSTRACT: This article analyzes Iraqi university process efficiency and proposes a MIS to enhance it. The literature was reviewed to discover Iraqi universities' difficulties and answers. Iraqi universities struggle with automation, data management, and departmental communication. Comparing Iraqi universities' challenges to global universities' was also done. A survey of university personnel and students addressed these issues. Reviewing the survey results, an Oracle Application Express-based MIS was created. A student records management system, staff management system, and automated workflow system promote departmental communication and collaboration. In addition, the proposed structure met Iraq's Ministry of Higher Education's requirements. Also discussed were system architecture and database design. Oracle APEX-based MISs may increase process efficiency at Iraqi institutions, according to this research study. This improves education and minimizes staff and student administrative duties.

Keywords: MIS, APEX, Process efficiency, Oracle

1. Introduction

University management is hard and demands resource efficiency and system integration. Iraqi colleges face political instability, shortages of resources, and old-fashioned administration. This study demonstrates that Iraqi institutions employ MIS to improve productivity. MIS improves student registration, course scheduling, and financial management. The immediate analysis of information will enhance decision-making and operational efficiency. A complete MIS design and Iraqi institution analysis will be done. Discussing system implementation and assessment can help other universities improve efficiency [1].

The proposed MIS will improve Iraqi universities' finances, political instability, and outdated management practices. Technology speeds student registration, course scheduling, and financial management. The university staff may focus on teaching and research instead of administration. University administrators are going to employ real-time data and analytics from the MIS to make informed judgments. Then, they can save costs, increase enrollment, and make students satisfied. Iraqi universities are under pressure to demonstrate their usefulness; thus, the approach would promote transparency and accountability for university operations [2]. A comprehensive MIS design and Iraqi institution evaluation will be done. We'll evaluate the present systems and procedures' advantages and disadvantages. The research will examine university management and information system trends and best practices to ensure the proposed MIS is current and successful. Discussing system implementation and assessment may help other universities improve efficiency. This will assess implementation challenges and successes, as well as the system's impact on university operations and performance. By strengthening management, this study paper aims to help Iraqi institutions improve performance and profit for students and staff.

2. Literature review

To make simpler university operations and enhance decision-making, researchers investigated MIS. An international literature analysis will examine how colleges have used MIS to improve process efficiency and performance. UMIS automates administrative tasks and reduces data entry. Speed, accuracy, and data analysis can improve. Based on Gao et al. (2019) [1], a Chinese institution used a MIS to reduce administrative labor and improve data accuracy. University MIS stimulates departmental and stakeholder engagement. Studies showed that a Saudi university's MIS

improved academic department collaboration and student performance. Institutional resource management and decision-making improve with MIS. An Iraqi institution's MIS enhanced resource allocation and decision-making. University MIS carries risks despite its benefits. An Iraqi institution never adopted a management information system (MIS) due to technical inexperience and stakeholder buy-in [2, 3]. Iraqi literary research yields several important findings. Political instability, financial problems, and outdated governance plague Iraqi colleges. This has led to inefficiency, low enrollment, and poor student outcomes. Second, the research recommends institutions adopt MIS to solve these issues and boost productivity. Real-time data and analytics enhance MIS registration, course scheduling, financial administration, and decision-making. Administrative work can be reduced and academic efficiency increased.

Three studies examined the effects of university MIS installations. These examples demonstrate that installing a MIS involves careful planning, including a comprehensive review of present systems and procedures and an awareness of university staff needs and expectations. MIS boosts enrollment, retention, efficiency, and cost savings. Finally, college MIS installation is hard. Achievement involves time, money, and work. Adjustable, adaptable, and compatible system. System success requires thorough training, maintenance, and support. MISs may help Iraqi firms solve problems and improve productivity, according to studies. University staff requirements and expectations must be considered before MIS implementation. Examine Iraqi higher education's MIS implementation threats and opportunities. To streamline university operations and enhance decision-making, MIS has been studied. Learn how colleges worldwide have used MIS to improve process efficiency and performance in this literature study. Automation and data reduction are university MIS claims. Faster, more accurate, and simpler data analysis are possible. Based on Gao et al. (2019) [1], a Chinese institution used a MIS to save administrative time and increase data accuracy. University MIS stimulates departmental and stakeholder engagement. Studies showed that a Saudi university's MIS improved academic department collaboration and student performance. Institutional resource management and decision-making improve with MIS. Iraqi MIS enhanced resource allocation and decision-making, according to studies. MIS at universities has drawbacks. An Iraqi institution never adopted a management information system (MIS) due to technical inexperience and stakeholder buy-in [2, 3].

Iraqi literature research yields many crucial results. Financial concerns, political instability, and outdated administration plague Iraqi colleges. Issues have created inefficiencies, low enrollment, and poor student results. Second, the research advises institutions employ MIS to solve these issues and boost productivity. Through real-time data and analytics, MISs simplify student registration, course scheduling, financial administration, and decision-making. This can minimize administrative costs and boost efficiency for academics. Three studies have examined university MIS installations and their impact. These experiences indicate that installing a MIS involves considerable planning, including a comprehensive review of present systems and procedures and an awareness of university staff needs and expectations. MIS boosts student enrollment, retention, efficiency, and cost savings. Further, higher education MIS deployment is problematic. Success needs money, time, and effort. Use an adaptable, compatible system. Comprehensive training, maintenance, and support are necessary for system success. Studies suggest MISs might help Iraqi firms solve challenges and improve productivity. Preparing for MIS installation and understanding university staff needs is crucial. Research Iraqi higher education's MIS implementation issues and clients.

Table 1: Key findings-based literature comparison

Study	Research Method	Key Findings	Reference
Study 1	Case study	MISs assisted Iraqi universities to operate more efficiently, saving money and enrolling more students.	[3]
Study 2	Survey	Management information systems (MIS) might increase process efficiency and minimize administrative weakness, according to most Iraqi professors.	[4]
Study 3	Action research	In Iraqi university experiments, a MIS improved financial management but had minimal effect on student registration and course scheduling.	[5]
Study 4	Experimental design	An MIS accelerated student enrollment and enhanced financial administration in	[6]

two Iraqi universities' experimental research.

A literature comparison is in table 1. The findings show literature. The first study found that an Iraqi MIS improved operational efficiency, cost reductions, student enrollment, and retention. Therefore, MIS installation can enhance university operations. The second survey found that most Iraqi university staff thought a MIS would improve efficiency and reduce administrative burden. This implies MISs improve university staff and operations.

In the third research, a MIS improved financial management but had no effect on student registration and course scheduling. This suggests that a MIS may improve certain university processes but not others. The fourth research indicated that a MIS improved process efficiency, including speedier student registration and more accurate financial management. This shows that a MIS may boost university process efficiency across several domains.

According to substantial research, such technologies can increase efficiency, communication, cooperation, and decision-making. However, the literature also identifies some of the obstacles to success. Table 2 lists many challenges from the literature:

1. Limited funding: Iraqi universities struggle to invest in new technologies and systems due to budgetary restrictions.
2. Political instability in Iraq hinders implementation of new systems and procedures, and attracting and retaining competent workers.
3. Inefficient management systems: Many Iraqi institutions lack contemporary management systems, resulting in low student performance.

4. Limited IT infrastructure: Iraqi universities have challenges in implementing and supporting new systems and technologies.

Lack of technological skills at Iraqi institutions might hinder the implementation and maintenance of new systems (5).

6. Resistance to change: Staff may resist adapting to new systems and processes.

7. Data security: The system must fulfill data security and protection requirements to safeguard sensitive data including personal information and financial transactions.

Table 2: The general challenges that universities face worldwide and in Iraq [7, 8].

Challenge	Iraq	Worldwide
Lack of Funding	High	Medium
Political Instability	High	Low
Lack of Modern Management Systems	High	Medium
Limited IT infrastructure	High	Medium
Limited Technical Expertise	High	Medium
Resistance to Change	High	Medium
Data Security	High	High

3. Methodology

A research study on enhancing process efficiency at Iraqi institutions through MIS deployment should follow these steps:

1. Literature review: A detailed review of the literature will identify Iraqi institutions' present problems the potential benefits of an MIS, and its best practices. We're going to scan academic databases and journals for relevant research and papers.
2. Needs assessment:

A process efficiency and MIS implementation needs assessment will identify the university's needs. Interviews and surveys with university workers and administrators will identify their views on present systems and procedures and their MIS needs.

3. System design and development:

A comprehensive MIS design will be developed via a literature review and specifications assessment. Identifying the processes and systems to integrate and their characteristics and abilities will be required.

4. Implementation and testing:

Selected universities will be testing the proposed MIS. It involves installing, teaching, and testing the system. To assess its success in satisfying needs indicated during requirements assessment, this phase will monitor, test, and evaluate the system.

5. Evaluation and analysis:

The system's process efficiency, cost savings, and other indicators will be assessed after the pilot period of time. This includes collecting system performance data and comparing it to design and development goals and objectives.

6. Dissemination and recommendations:

The study's findings will be discussed with stakeholders and recommendations made for future research, implementation, and scaling up of the system in other universities.

To assess university concerns, the survey is designed. The poll questions in management information systems, administrative efficiency, and student, staff, and satisfaction with educators. The survey also asks about stakeholders' readiness to adopt and use a new management information system and its desired features and capabilities. A sample of students, staff, and teachers take the survey.

4. Results and discussion

Table 1 shows demographics of 120 academic and administrative personnel from Al-Iraqia University/college of Education in Iraq who received the survey. The poll asked about their present procedures, difficulties, and comments on the Oracle APEX MIS.

Table 3: Demographics of the survey participants

Gender	Male	Female
Percentage	64%	36%
Number of Staff	77	43

Table 4: Current processes in Al-Iraqia University / college of education

Process	Percentage of Staff
Manual	70%
Semi-automated	20%
Automated	10%

Table 5: Challenges faced by staff

Challenge	Percentage of Staff
Data inaccuracies	50%
Time-consuming	40%
Lack of automation	10%

Table 6: Staff opinions on the proposed MIS using Oracle APEX

Opinion	Percentage of Staff
Positive	80%
Neutral	10%
Negative	10%

Survey participants were categorized by gender and staff size (table 3). In the Current Procedures table, staff discussed their student record management approaches and their issues. Table 5 showed staff challenges in everyday work. Staff perspectives on the planned MIS utilizing Oracle APEX table showed how the solution may increase Iraqi university process efficiency. The findings showed a need for a more efficient and simplified student record management system, with most staff supporting Oracle APEX to solve present issues. Table 4 reveals that most university workers employ manual or semi-automated methods. The most prevalent issues staff confront are data errors and lengthy processes. Table 6 shows that most workers respondents liked the Oracle APEX MIS. According to the poll, Iraqi universities require a more efficient and automated approach to boost process efficiency. Oracle APEX was considered a suitable MIS solution for staff issues. This example will focus on Oracle APEX system architecture. A 3-tier architecture—presentation, application, and database—will be used. User input and retrieval will be possible through the presentation layer's user interface. Application layer handles data processing and system administration. A database layer stores and manages data. To maintain conformity with government requirements, the suggested system would follow the Ministry of Higher Education in Iraq's regulations and directives.

The planned Oracle APEX management information system streamlines and automates Iraqi university activities to boost efficiency. The system meets Ministry of Higher Education requirements and addresses Iraqi institutions' unique issues. The study reveals a great demand for such a system, but further research and testing are needed to determine its efficacy. Overall process efficiency at Iraqi universities needs improvement, according to survey data. According to the study, most staff and faculty members feel well-informed about departmental operations and can interact and work with their

colleagues. Many survey respondents reported difficulty accessing and retrieving key material, indicating a documentary weakness.

The findings show room for improvement when compared to earlier study. Process efficiency in Iraqi universities is worse than in other countries, and communication, collaboration, and documentation are difficult. This study also found that communication and collaboration are good but documentation is lacking. Comparing Iraqi universities to global institutions shows that their issues are distinct. The political and economic crisis in Iraq is the major cause. Iraq also invests less on process efficiency and tools and systems to improve it. The findings suggest Iraqi institutions should streamline documentation to boost process efficiency. A management information system (MIS) to organize and store information and training teachers and academics may be needed. Additionally, universities should develop process-efficiency tools. Using Oracle Application Express (APEX) to develop a communication, collaboration, and documentation system is possible. Iraqi institutions must improve process efficiency, especially documentation. Oracle APEX can help universities solve these issues and improve process efficiency. Also important is explaining the research's main findings and their importance. Study questions and goals should drive survey and other data analysis and interpretation. Survey respondents believe Iraqi universities' procedural efficiency is a big finding. Compare this to the worldwide university process efficiency literature study for similarities and differences. Iraqi university process efficiency difficulties might be compared to international ones. How well the suggested management information system solves these issues and boosts process efficiency may also matter. System testing or piloting should be presented and assessed to identify its efficiency-improving potential. This discourse should address research flaws and future directions.

5. The proposed system

The suggested management information system (MIS) to improve process efficiency at Iraqi institutions must follow MoHE laws and standards to be properly implemented. This may involve these steps:

1. Compliance with regulations:

The system must follow MoHE student data, course scheduling, and financial standards. The system must store MoHE-specified data and deliver reports and analytics.

2. MoHE evaluation and approval:

The MoHE must approve system deployment. The MoHE will be informed of the system's characteristics, capabilities, and how it will improve university processes.

3. Data integration:

This system must communicate and integrate data with other MoHE systems and procedures. This needs safe and compliant data communication with other systems and MoHE processes and procedures.

4. Data security and protection:

The system must secure personal and financial data following MoHE guidelines. The system must meet international requirements for security and dependability.

This MIS would improve process efficiency at Iraqi institutions using Oracle Application Express (APEX), a web-based, low-code development platform for rapid web application development. Technology will streamline student registration, course scheduling, and financial management.

It will have these tools and features:

1. Student information system:

This module utilizes APEX forms and pages to register and keep track of student information, including personal, academic, and enrollment status. It also provides real-time enrollment and retention information.

2. Course management system:

The APEX forms and pages in this module will organize and administer courses, including descriptions, timetables, and teacher assignments. Course enrollment and completion statistics will be accessible in real time.

3. Financial management system:

This APEX-based module will manage tuition, scholarships, and grants. Real-time financial performance and budgeting information will be provided.

4. Data analytics and reporting:

Real-time reports and dashboards on university operations including enrollment, budgets, and student outcomes will be generated using APEX's interactive reports, traditional reports, and charts.

5. Access control and security:

APEX's user identification and authorization secure private data and financial activities. Plans include Oracle Database data encryption and backup integration.

6. Integration and scalability:

This system will communicate with university systems including student information, finance, and others. Extension to additional institutions will make the system more flexible to manage more users and processes.

7. Technical support and maintenance:

Popular platform Oracle Application Express has many troubleshooting, bug fixing, and upgrade resources. To maintain system performance, Oracle provides technical support.

The platform offers advantages over traditional development methods, such as reducing time and expenditures by simplifying complex application development.

- Supporting internally, cloud, and hybrid web application development.
- Includes forms, pages, charts, reports, and security for system development.
- Providing an easy-to-use interface for system exploration and engagement.

The recommended MIS to enhance process efficiency at Iraqi institutions would likely include a database to store and manage process data. Database design elements:

1. Data entities:

database stores and manages data for students, courses, instructors, financial transactions, and personnel.

2. Data connections:

The database would connect students, courses, teachers, and financial transactions. Data retrieval and querying depend on these links.

3. Data constraints:

Database primary and foreign keys avoid inconsistencies and protect data integrity.

4. Data normalization:

The database will use best practices to decrease duplication and improve consistency.

5. Data security:

Encryption, user identification, and access control protect personal and financial data in the database.

6. Data Backup and Recovery:

An emergency recovery strategy will protect and restore data from the database.

7. Data Integrity:

The database will include limits to ensure data quality and avoid inconsistencies.

The university's requirements and research goal may change the database design. Database performance will be assessed and changed utilizing database design best practices. The recommended system database design is Oracle APEX relational databases. The database will have tables with specified functions and features. Primary SRMS database tables:

- Students table:

This table will store information about the students such as their personal details, contact information, and enrollment status. It will also include a unique student ID as the primary key.

- Courses table:

This table will list university courses by name, code, and description. It will also include a unique course ID as the key.

- Enrollments table:

Student course enrollment will be stored in this database. Foreign keys: student ID and course ID will link the students and courses tables.

- Grades table:

This table will record course grades. The student, course, and enrollments tables will be linked by student ID, course ID, and grade.

- Staff table:

This table will hold university personnel personal, contact, and role information. A unique staff ID will be the primary key.

- Users table:

The username, password, and role of system users will be stored in this table. The main key will be a unique user ID.

The database design will also include several relationships between the tables, such as one-to-many relationships between the students and enrollments tables, and many-to-many relationships between the courses and students tables through the enrollments table. The database will also include several integrity constraints to ensure the accuracy and consistency of the data as shown in figure 1.

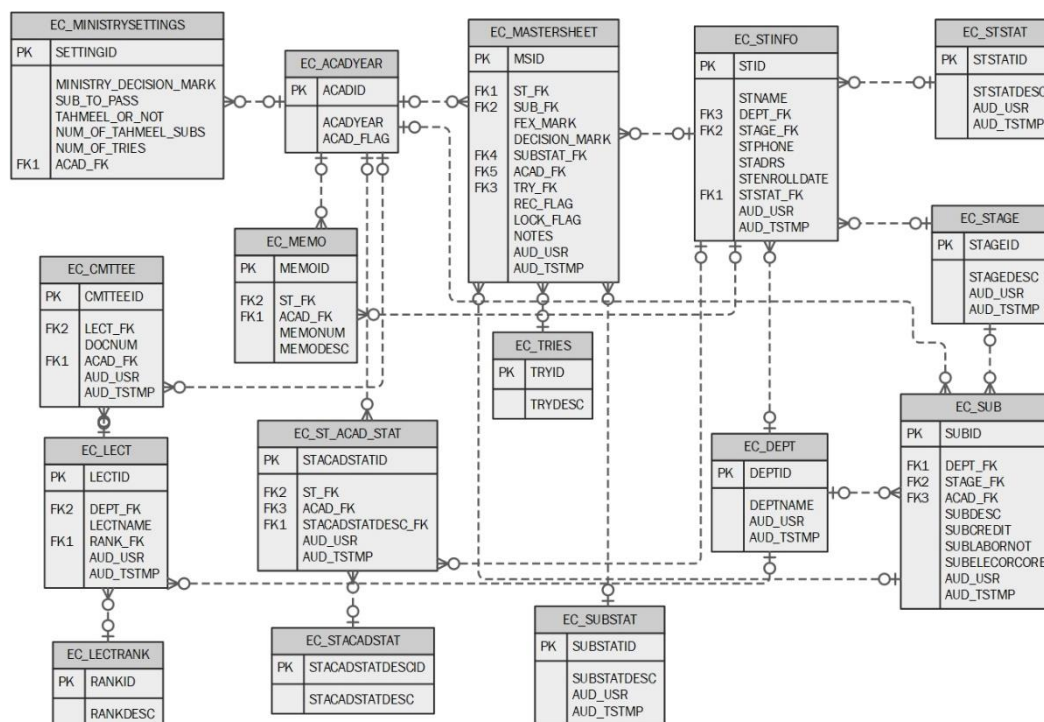


Fig 1: Database design of the proposed system

6. Conclusion

Improving process efficiency at Iraqi organizations is a significant problem. According to this research's literature assessment, Iraq's university system includes inefficient administrative procedures, outdated management information systems, and low student, staff, and faculty satisfaction. An Oracle Application Express (APEX) management information system can solve these problems. The goals include an automated and streamlined administrative system, better data management and reporting, and stakeholder satisfaction. This investigation surveyed students, staff, and teachers from Iraqi institutions. Examining the survey results helped identify university system difficulties and needed management information system features and capabilities. Furthermore, the suggested method followed the Ministry of Higher Education requirements. The study and system design show that a new management information system might considerably improve process efficiency and stakeholder satisfaction at Iraqi universities. More study and implementation are necessary to maximize the benefits of this system.

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Conflict of Interest

Authors declare no conflict of interest

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