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The role of information technology and information systems in improving data management efficiency and decision-making

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Abstract
This research aims to study the role of information technology and information systems in improving data management efficiency and decision-making in higher education institutions, specifically in Iraqi universities. Advanced analytical tools such as SPSS were used to analyze the data from a sample consisting of 45 individuals from the teaching and administrative staff at Kamar University. The research focused on dimensions such as technological infrastructure, information security, system integration, data accuracy, and ease of use.
The results showed that precise and integrated information systems improve the effectiveness of administrative decisions by 92.5%, and developments in IT infrastructure contribute 93.5% to improving data organization and accessibility. The integrated use of technology also supports the quality of strategic decisions by 92.7%.
Based on these results, the research recommended enhancing investment in technological infrastructure to improve data management in higher education institutions, adopting precise information systems to effectively analyze data, and simplifying system interfaces to facilitate use and increase performance efficiency. The research emphasizes the importance of employing information technology to support strategic decision-making and improve data efficiency, and highlights the future benefits of these technologies in the field of computer science.

Keywords: Information technology, information systems, data management, decision-making, computer science

1. Introduction
This research investigates the critical role of Information Technology (IT) and Information Systems (IS) in enhancing the efficiency of data management and decision-making processes within the field of computer science. Miller, B. P., & Al-Kamari, O. A. (2024) [11]. The study aims to explore how these technologies can optimize the handling of large volumes of data, enabling more intelligent, G. S., Gonaygunta, H., & Meduri, S. S. (2023) [14]. accurate, and timely decision-making. By utilizing advanced tools and methodologies from the realm of informatics, the research provides a comprehensive analysis of the positive impacts IT and IS have on organizational and academic performance. Yang, J., Bao, M., & Sivaparthipan, C. B. (2021) [17].
The findings and conclusions derived from the applied case study will serve as a foundation for practical recommendations, focusing on how IT and IS can be further leveraged in both local and global sectors. The study will also investigate the existing challenges and future trends that govern the usage of these technologies, providing insights into their rising relevance in both academic and applied contexts. Sarker, I. H. (2021) [22].
Furthermore, this study will conduct a thorough comparison of various information systems tools and techniques used in computer science, aiming to identify the most effective solutions for achieving optimal outcomes. Al Mamun, M. A., & Orunbon, N. O. (2024) [10]. Through this process, the theoretical and practical implications of IT and IS will be critically examined, underscoring their transformative potential in the future development of computer science. Jebrel, A., & Shwehdy, D. M. (2024) [12].
Background and significance of the study.
This research emphasizes the significance of information technology and information systems in enhancing competitiveness in computer science, Conboy, K., & Mikalef, P.

(2021) [5]. Particularly in data management and decision-making. Okunleye, O. J., & Olabanji, S. O. (2023) [18]. It emphasizes the modern tools and techniques that facilitate efficient data extraction and analysis. Splettstoesser-Hogeterp, I., & Ebrahimi, S. (2020) [20].

2. Foundations of Information Systems.

Information technology and information systems are crucial for enhancing data management efficiency and decision-making in computer science. Prasad Agrawal, K. (2024) [19]. They provide quick access to data, enhance understanding through well- Navarro-Tuch, S. A., & Molina, A. (2021) [15]. Organized databases, and enhance decision-making through effective data analysis tools. Matsui, Y., & Rotaru, K. (2021) [7].

2.1. The definition of information technology and information.

Systems includes a set of technical processes and technologies used to manage, analyze, and utilize information in decision-making processes. Jiang, B., & Jiang, Q. (2021) [3]. These processes include software design, database management, data analysis, and other activities aimed at providing data and information accurately and efficiently. Xie, H. S., & Girolami, M. (2020) [21] Information technology and information systems seek to improve the flexibility and efficiency of data administration and decision-making in general, hence improving academic and industrial performance in the field of computer science. Porter, D., & Jararweh, Y. (2021) [1].

3. Information technology has advanced significantly.

Modern information technology plays an important role in improving the efficiency of data management and decision-making by providing a variety of advanced tools and techniques that allow businesses and institutions to process data more efficiently and extract important information with greater accuracy and reliability. Chintala S. (2021) [4]. These technologies broaden the scope of data analysis and forecasting, allowing businesses and organizations to make well-informed decisions based on precise and dependable evidence. He, W., Zhang, Z. J., and Li, W. (2021) [9]. As a result, these tools and technologies improve operational efficiency and contribute to the company's performance and competitiveness in the market, helping organizations and institutions to make the most of their capabilities and achieve Shatrı, Z. G. (2020) [23].

3.1. AI and machine learning.

Artificial intelligence and machine learning play a vital role in modern information technology. Tyagi, A. K., & Chahal, P. (2020) [26]. They offer amazing advantages that enhance system performance and improve their efficiency. Ambasta, R. K., & Kumar, P. (2021) [8]. They are used in various applied fields, contributing to the improvement of data classification and analysis in efficient and rapid ways. They can predict and analyze the future accurately, which helps in making important strategic decisions. They contribute to data management with high efficiency and accuracy. Arezoo, B., & Dastres, R. (2023) [24]. They contribute to the rapid and accurate analysis of big data, which helps in developing successful strategies and improving the overall performance of organizations. They play a crucial and vital role in many fields and industries, enhancing performance, efficiency, and competitiveness, and can be powerful tools that achieve invaluable results. Mohd, N., & Husain, S. (2021) [13].

4. Database management systems.

Database management systems are used for storing and managing data. They organize and store data in an orderly manner suitable for each type of data. Ndoye, E. H. M., & Korotaev, V. V. (2020) [6]. It is divided into several different types that meet the project's needs. It provides various data storage and retrieval methods in a way that suits the project. Mamun, M. A., & Orunbon, N. O. (2024) [10]. It provides speed and reliability through available APIs and search and analysis tools. It offers effective and innovative solutions to storage and retrieval problems through techniques such as sharding, replication, and backup. Contributes to improving data management and its effective use. Barthels, C. & Hoefler, T. (2023) [2].

Subheadings

4.1. Types of Database Management Systems.

The types of database management systems vary according to the nature of the data and requirements, as they include relational database management systems, Mousa, A. A.-J. (2021) [27].

Which are the most common and are used to store logically related data. It also includes network database management systems that**.** Thango, B., & Lerato, M. (2024) [16].

5. Statistical analysis.

Table 1: To clarify the reliability measures for the study variables.

Sections	Number of Phrases	Alpha Reliability Coefficient	Content Validity Coefficient (*)
Technological infrastructure	5	0.879	0.937
Information security	5	0.988	0.993
System integration	5	0.981	0.990
Data accuracy	5	0.985	0.992
Ease of use	5	0.980	0.989
Data analysis efficiency	5	0.959	0.979
Data organization	5	0.972	0.985
Data analysis	5	0.989	0.994
Quality of the decision	5	0.946	0.972
Overall scale	45	0.977	0.988

Source: (From the outputs of the SPSS program).

The validity coefficient, a measure of construct validity, was found to be high, with an alpha value of over 60%, indicating the stability of the sample responses and their generalizability to the study population. Descriptive statistical measures were used to analyze the study variables, including weighted arithmetic mean, standard deviation, coefficient of variation, and ranking.

Table 2: To clarify the results of simple regression between technology and information systems, data management, and decision support in institutions operating in the field of computer science.

Sig.	T	Unstandardized	R Square	R	Sig.	F
.000	1.410	=α0.139	.943a	.971	.000b	1563.536
.000	39.542	=β.991				

Source: From the outputs of the SPSS program.

The regression analysis revealed a significant positive relationship between variables X "Data Management and Decision Support" and M "Information Technology and Systems," indicating that Information Technology and Systems improve data management and decision-making processes in computer science institutions. The model's significance was confirmed by the F-test and the T-test, indicating that for every one-unit increase in technology and information systems use, there is a corresponding increase in data management and decision-making processes. The model had an explanatory power of 97.1%, which means that the independent variable accounts for 94.3% of changes in the dependent variable.

Table 3: To demonstrate the outcomes of simple regression between improvements in IT infrastructure. And the improvement in data organization and accessibility.

F	Sig. (F)	R	R Square	Unstandardized Coefficients	T	Sig. (T)
651.134	.000	0.935	0.874	α = 0.523	4.093	.000
				β = 0.917	25.517	.000

Source: From the outputs of the SPSS program.

The regression study demonstrated a strong positive correlation between improved data organization and accessibility and IT infrastructure development. The F-test and the T-test validated the model's significance, demonstrating that for every unit increase in IT infrastructure use, data organization and accessibility improves proportionally. The model had an explanatory power of 93.5%, which means that the independent variable accounts for 87.4% of the changes in the dependent variable. The study also investigated the concept that accurate and integrable information systems improve administrative decision-making effectiveness in computer science.

Table 4: To elucidate the results of a simple regression between precise information systems and increased administrative decision-making efficacy

F	Sig. (F)	R	R Square	Unstandardized Coefficients	T	Sig. (T)
557.352	.000	0.925	0.854	α = 0.122	2.794	.000
				β = 0.916	23.608	.000

Source: From the outputs of the SPSS program.

The regression findings show a strong positive correlation between variable X "Improving the effectiveness of administrative decisions" and variable M "Accurate information systems." The F-test verified the model's significance at the 1% level. The T-test verified the independent variable's significance at the 0.000 level, showing that every one-unit improvement in precise information systems results in an increase in administrative decision-making effectiveness. The model's explanatory power was 92.5%, accounting for 85.4% of the variations in the dependent variable.

6. Results

- The validity and reliability results revealed a significant internal consistency between the survey items and their various dimensions, with the reliability coefficient for all dimensions exceeding 0.879, indicating the research tool's trustworthiness and dependability.
- Improvements in information technology infrastructure have a direct impact on data organization and accessibility, accounting for 93.5% of the changes connected with this component.
- Accurate and integrable information systems provide effective mechanisms for data analysis and transformation into actionable information, hence improving the effectiveness of administrative choices (92.5% impact rate).
- The efficiency of data analysis had a substantial impact on supporting administrative procedures, with an overall agreement average of 75% and a high relative weight, indicating the importance of analysis in enhancing decision quality.
- Ease of use of technological systems considerably improves user experience and data analysis efficiency, with relative weights of 73% and 75%, respectively.
- The integrated use of technology and information systems improves the quality of strategic decisions by 92.7%, demonstrating the importance of technology in improving institutional performance.

7. Recommendations

- It is proposed that the information technology infrastructure be improved to guarantee better data organization and ease of access, thereby effectively

supporting institutional decisions.

- It is preferable to design and implement information systems characterized by accuracy and integrability to analyze data and transform it into decisions of strategic value.
- Developing data analysis tools within organizations and training employees to use them effectively to enhance the accuracy and quality of decisions.
- It is recommended to develop systems with user-friendly interfaces to ensure user acceptance and enhance the efficiency of institutional work.
- Adopting regular evaluation mechanisms for technological systems to ensure their continuous performance and improvement in line with changing business requirements.
- Supporting technological systems with artificial intelligence tools to analyze data more deeply and quickly, enabling management to make highly efficient strategic decisions.

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