



Digital Accounting Prospects in Saudi Fuel Stations amid the E-Economy

Zemmouri Mounir¹ ; Rima Benbaira², imene laamari³



¹university of blida 2 (algerie), m.zemmouri@univ-blida2.dz

²university of blida 2 (algerie) + r.benbaira@univ-blida2.dz + Associate Professor.

³university of chlef (algerie)+ laamariimen988@gmail.com+ Assistant Professor.

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Abstract:

This study aims, within the context of the rapid transition toward the electronic economy, to explore the prospects of digital accounting in Saudi fuel stations by examining its role in improving accounting information quality, strengthening accounting control, and supporting decision-making. Using the descriptive-analytical approach, the study found that integrating fuel pumps, point-of-sale systems, inventory, payments, e-invoicing, fleet cards, and accounting systems contributes to improving the accuracy, timeliness, reliability, and transparency of accounting information, while enhancing transaction tracking and proactive control. The study also identified key challenges, including information security, system integration, employee training, transformation costs, and business continuity. Accordingly, the study recommends adopting integrated digital accounting systems, strengthening cybersecurity and employee training, and investing in artificial intelligence, cloud computing, predictive analytics, and real-time reporting to enhance the efficiency and competitiveness of Saudi fuel stations.

Keywords: Digital Accounting; Fuel Stations; Electronic Economy; Accounting Information Quality; Internal Control; E-Invoicing.

Jel Classification Codes : M41, M15, O33, L81

Résumé :

Cette étude vise, dans le contexte de la transition rapide vers l'économie électronique, à explorer les perspectives de la comptabilité numérique dans les stations-service saoudiennes, en examinant son rôle dans l'amélioration de la qualité de l'information comptable, le renforcement du contrôle comptable et le soutien à la prise de décision. En adoptant une approche descriptive et analytique, l'étude montre que l'intégration des pompes à carburant, des systèmes de point de vente, de la gestion des stocks, des paiements, de la facturation électronique, des cartes de flotte et des systèmes comptables contribue à améliorer l'exactitude, la rapidité, la fiabilité et la transparence de l'information comptable, tout en renforçant le suivi des transactions et le contrôle proactif. L'étude identifie également plusieurs défis majeurs, notamment la sécurité de l'information, l'intégration des systèmes, la formation du personnel, les coûts de transformation et la continuité des activités. En conséquence, l'étude recommande l'adoption de systèmes comptables numériques intégrés, le renforcement de la cybersécurité et de la formation du personnel, ainsi que l'investissement dans l'intelligence artificielle, l'informatique en nuage, l'analyse prédictive et le reporting en temps réel afin d'améliorer l'efficacité et la compétitivité des stations-service saoudiennes.

Mots-clés : Comptabilité numérique ; Stations-service ; Économie électronique ; Qualité de l'information comptable ; Contrôle interne ; Facturation électronique.

Codes de classification Jel: M41, M15, O33, L81

Introduction :

Over the past decades, the global economy has undergone profound and accelerated changes in the way economic activities are conducted and managed. These changes have been driven by the widespread adoption of information and communication technologies, cloud computing, databases, artificial intelligence, data analytics, and integrated information systems. Such developments have fundamentally reshaped the business environment. Organizations are increasingly moving away from paper-based procedures and manual data processing toward digital environments characterized by rapid information flows, timely access to data, and the integration of organizational functions through interconnected systems. Consequently, digital transformation is no longer viewed merely as a technological option intended to improve selected operational procedures; rather, it has become a strategic orientation that influences organizational efficiency, competitiveness, responsiveness to rapidly changing markets, and the development of decision-making and control mechanisms.

This transformation has also reshaped various administrative and financial functions, particularly accounting, which is inherently dependent on the generation, processing, and flow of financial data and information. Accounting has progressively evolved from a system primarily concerned with recording, accumulating, and preserving financial transactions and their supporting documents into a digital environment capable of capturing data directly from operational sources, processing, storing, and retrieving it electronically, and linking it with the different components of the administrative and financial system. Digital systems now make it possible to record transactions almost instantaneously, generate financial and managerial reports more rapidly, and trace transactions from their initial occurrence through to their recognition in financial statements and managerial reports. This enhances the ability of managers and other users to obtain relevant information when it is needed. Accordingly, digital transformation in accounting should not be understood simply as the replacement of traditional tools with electronic ones; rather, it represents a fundamental transformation in the structure of accounting systems and in the processes through which financial information is generated, communicated, monitored, and utilized for planning and decision-making.

Within this context, digital accounting has gained increasing importance as a fundamental component of the emerging electronic economic environment. Its significance derives from its ability to integrate operational and financial processes and transform data generated by economic activities into information that can be processed, analyzed, and utilized in a timely manner. A digital accounting system is not limited to recording journal entries and financial transactions. Instead, it can operate as part of an integrated system in which sales, purchases, inventory, payments, collections, accounts receivable, accounts payable, and financial reporting are interconnected. Such integration reduces repetitive data entry, limits errors associated with manual processing, and strengthens the ability to trace and monitor transactions. Digital accounting can also improve the speed and consistency of information, enhance accuracy and transparency, and strengthen internal control through authorization mechanisms, transaction logs, and audit trails. In addition, it provides management with enhanced capabilities to analyze performance, identify deviations, and make decisions based on current and relevant information.

The significance of digital transformation is not confined to organizations operating in technology-oriented or inherently digital sectors. It increasingly extends to traditional industries characterized by high transaction volumes and a strong need for rapid data processing and effective resource control. In such environments, digitalization becomes a means of reorganizing financial and accounting processes in accordance with the specific characteristics of the activity and the requirements of the evolving economic environment. This creates a need to examine how digital accounting can be effectively implemented in traditional sectors, not merely from the perspective of the availability of accounting software and technological infrastructure, but also in terms of the system's ability to accommodate the operational characteristics of the activity, integrate field

operations with accounting data, and generate high-quality information that can support control and managerial decision-making. This issue is particularly significant in sectors characterized by rapid transaction cycles, multiple sales and payment channels, and diverse data sources, where the success of digital transformation depends largely on the ability of the accounting system to integrate operational and financial processes rather than simply replacing paper records with electronic software.

Accordingly, this study seeks to explore the prospects of digital accounting in Saudi fuel stations by identifying the accounting and technological characteristics that distinguish this activity and examining the principal requirements for moving from traditional accounting procedures toward an integrated digital system. Particular attention is given to the integration of fuel pumps, point-of-sale systems, inventory management, electronic invoicing, and fleet fuel cards. The study also examines the potential contribution of these solutions to improving the quality of accounting information, strengthening control mechanisms, and enhancing decision-making efficiency. Furthermore, it seeks to identify the future requirements of accounting software in a manner that responds to the rapid development of the electronic economic environment in Saudi Arabia.

Based on the foregoing, the study addresses the following central research question:

How can digital accounting contribute to improving the quality of accounting information and strengthening control over the operations of Saudi fuel stations?

Sub-Research Questions:

- The main research question is addressed through the following sub-questions:
- What is the nature of digital accounting, and what are its main characteristics and components within an electronic economic environment?
- What are the major challenges facing the implementation of digital accounting in Saudi fuel stations?
- How can digital accounting contribute to improving the quality of accounting information and strengthening control over fuel station operations?
- What are the future prospects for developing digital accounting software in a manner that accommodates the specific characteristics of fuel stations and the requirements of the electronic economy in Saudi Arabia?

Research Hypotheses: Based on the research problem and questions, the study proposes the following theoretical hypotheses:

- The integration of digital accounting systems with operational systems in fuel stations contributes to improving the accuracy and timeliness of accounting information.
- Digital accounting enhances the effectiveness of accounting control in fuel stations through real-time monitoring of inventory, sales, and operational variances.
- The future development of digital accounting in Saudi fuel stations depends on the ability of accounting software to respond effectively to evolving operational and regulatory requirements within the electronic economic environment.

Importance of the Study : The importance of this study lies in examining the role of digital accounting in improving accounting practices in Saudi fuel stations, particularly in light of the high volume of transactions, inventory management, e-invoicing, and fleet card operations. It also highlights the importance of integrating pumps, point-of-sale systems, inventory, and accounting systems to improve information quality and strengthen control. Practically, the study may help fuel station managers and accounting software developers identify the requirements for more efficient and integrated digital accounting systems.

Objectives of the Study: The study aims to explore the prospects of digital accounting in Saudi fuel stations within the e-economy by clarifying its concept and characteristics, identifying the

requirements and challenges of its application, and examining its role in improving the quality of accounting information and enhancing control over sales and inventory. It also seeks to identify the future requirements of accounting software and its role in improving operational efficiency and supporting decision-making.

Methodology: The study adopted the descriptive-analytical approach by describing the concept of digital accounting, its characteristics, and the requirements for its application in fuel stations. It then analyzes its role in improving the quality of accounting information, strengthening control, and enhancing operational efficiency, while exploring the prospects for its application in fuel stations in the Kingdom of Saudi Arabia.

I. The Conceptual Framework of Digital Accounting:

The accounting field is undergoing a rapid transformation as a result of technological developments and the transition toward the digital economy. This has led to the emergence of digital accounting as one of the modern approaches to developing accounting practices. Accounting is no longer limited to recording and processing data using traditional methods; rather, it has become increasingly reliant on digital technologies to collect, process, and store data, as well as to provide accounting information with greater speed and accuracy. From this perspective, this chapter addresses the concept of digital accounting, its characteristics, and its main components, while highlighting its role in developing the accounting function.

I.1- The Concept of Digital Accounting

The concept of digital accounting has been addressed from several perspectives, owing to the relative novelty of the concept and the diversity of approaches used to examine it. The following are four definitions that can be presented:

-Definition 1: Digital accounting can be defined as a mechanism for preparing, presenting, and transmitting financial and accounting data and information in electronic form through the use of computers and accounting software. This definition emphasizes the transition of accounting practices from the traditional paper-based environment to a digital environment (Al-Amir & Al-Khalifa, 2021, pp. 17-54) .

-Definition 2: Digital accounting can be defined as the use of digital technologies to perform accounting operations, including the recording, processing, and storage of financial data and transactions, as well as the generation of accounting information required by users.

-Definition 3: Digital accounting refers to a system that relies on information technologies and accounting software to collect, store, process, and transform financial and accounting data into useful information that supports planning, control, and decision-making processes (Rabahi, 2025, pp. 21-262).

-Definition 4: Digital accounting can also be viewed as a modern development of the accounting system resulting from digital transformation, whereby digital technologies are employed to perform, document, and process accounting transactions, contributing to improving the quality of accounting information and enhancing the efficiency of accounting activities (Haddadi & Kheir Eddine, 2018, p. 37).

I.2- Benefits of Transitioning to Digitalized Accounting Systems

The transition to digital accounting systems offers a range of benefits that contribute to improving the efficiency, effectiveness, and quality of accounting activities. These benefits can be summarized as follows (Almhdi, Salahe, & Yousef, 2021, pp. 32-33):

Faster Accounting Cycle: Digital accounting accelerates the various stages of the accounting cycle, including credit approvals, payments and collections, transaction recording and posting, book closing, and report preparation. This increased speed also provides accounting professionals with more time to conduct financial analysis and support managerial decision-making.

-Wider Geographical Access to Information :Digital accounting enables accounting information to be accessed continuously and remotely, regardless of geographical location. The availability of accounting services around the clock and throughout the week contributes to improving the accessibility of information and increasing the satisfaction of both internal and external users.

-Reduced Error Rates: The use of digital technologies in accounting helps minimize errors in financial reporting by reducing manual intervention and automating data-processing procedures. This contributes to improving the accuracy and reliability of accounting information.

-Improved Performance and Workforce Efficiency :Digital accounting contributes to improving organizational performance through more effective cash management, efficient payment procedures, and enhanced collection processes. It may also reduce the need for certain routine accounting tasks by automating repetitive activities and allowing employees to focus on more value-adding functions.

- Cost Savings:Digital accounting can generate significant cost savings by reducing expenditure on paper, physical document storage, and the delivery or transmission of accounting information. The reduction in manual and paper-based procedures also contributes to lowering administrative and operational costs.

-Improvement of Audit and Review Procedures :Digital accounting systems facilitate the development and implementation of more efficient audit and review procedures. The availability of organized and accessible accounting data enables auditors to perform their work more efficiently and enhances the overall effectiveness of the auditing process.

-Information Security and Confidentiality :Digital accounting systems incorporate various mechanisms designed to protect accounting information and preserve its confidentiality. Access controls, authentication procedures, passwords, and other security measures can help prevent unauthorized access to sensitive financial information.

I.3- Components of Digital Accounting

Digital accounting relies on a set of interconnected components that work together to ensure the effective collection, processing, storage, management, and dissemination of accounting information. The principal components are as follows (Merghi, Zerman, & Anis Klibat, 2023, pp. 84-85):

- Hardware:Hardware represents the physical infrastructure supporting a digital accounting system. It includes computers, storage devices, monitors, printers, and other peripheral equipment used to process and manage accounting data. These devices are generally connected through networks that facilitate the efficient sharing of information and resources among authorized users.

Network connectivity is an essential element of digital accounting systems because it allows auditors and accounting professionals to access relevant financial information from different locations. As a result, auditing procedures can be performed more efficiently while reducing the time and costs associated with traditional accounting and auditing practices.

-Software:Accounting software consists of specialized digital applications designed to perform and support a wide range of accounting functions. These applications enable users to enter, modify, process, and store financial transaction data, while also generating the accounting and financial reports required by management for planning, monitoring, and decision-making.

Within many organizations, accounting software operates as an integrated component of the broader information system and can interact with other business and technological applications.

- **Human Resources:** Human resources constitute a fundamental component of the successful implementation and operation of digital accounting systems. Employees are responsible for operating, supervising, and managing the system and ensuring that accounting activities are carried out correctly.

Modern digital accounting systems may also provide authorized non-accounting employees with access to specific areas of the system according to their professional responsibilities. Effective management of digital accounting therefore requires careful planning regarding data protection, access privileges, and user monitoring.

Information security can be strengthened through authentication mechanisms such as passwords, access codes, and other control procedures designed to prevent unauthorized access to accounting records and confidential financial information.

I.4- Characteristics of Digital Accounting

Digital accounting is distinguished from traditional accounting systems by a number of characteristics that enhance the efficiency and effectiveness of accounting practices. The most important characteristics include the following (Rabahi, 2025, pp. 261–262):

- **Simplicity and Integration:** Digital accounting facilitates the integration of various organizational activities within a unified digital environment. It allows accounting data and related information to be organized, classified, and processed systematically, thereby simplifying accounting procedures and improving the accessibility and usability of information.

- **Accuracy and Speed:** Digital accounting systems provide standardized interfaces and data-entry templates that enable employees to record financial information rapidly and accurately. These systems can also process data automatically, retrieve relevant information, and generate accounting reports, thereby reducing manual intervention and minimizing the likelihood of human error.

- **Flexibility and Responsiveness :** Digital accounting systems are characterized by their ability to adapt to changes in accounting transactions and operational requirements. Their flexibility enables organizations to process and record transactions effectively even when the volume or nature of business activities changes substantially.

- **Confidentiality :** Digital accounting contributes to protecting accounting data and financial information within a controlled and secure technological environment. Through access restrictions, authentication mechanisms, and security controls, sensitive information can be protected against unauthorized access, use, or disclosure.

- **Faster Decision-Making:** By providing comprehensive accounting reports and relevant financial information in a timely manner, digital accounting supports management in making faster and more effective decisions. The availability of updated information enables decision-makers to respond promptly to operational and financial developments.

- **Reliability:** Digital accounting enhances the reliability of accounting information by facilitating access to transparent, consistent, and accurate outputs. Automated data processing and standardized

procedures can reduce distortions and inconsistencies, thereby increasing the credibility of information used by managers and other stakeholders.

I.5- Objectives of Digital Accounting

The fundamental purpose of accounting remains largely unchanged within a digital accounting information environment. However, the adoption of digital technologies significantly changes the way financial information is processed, stored, retrieved, and communicated. Accordingly, the main objectives of digital accounting can be summarized as follows (Latif Haddadi & Eddine Wassif, 2018, p. 37):

- Improving the Efficiency of Accounting Operations :Digital accounting aims to organize accounting activities in a more systematic, efficient, and effective manner. The automation of routine procedures facilitates the coordination of accounting activities and improves the overall efficiency of the accounting function.
- Reducing Paper-Based Activities and Costs: The adoption of digital accounting reduces dependence on paper documents and manual records. This contributes to accelerating accounting procedures, reducing administrative and operational costs, and limiting the environmental impact associated with paper consumption and waste.
- Accelerating Data Entry and Error Reporting: Digital systems facilitate the rapid recording of accounting transactions and enable errors to be identified and reported more efficiently. This allows corrective measures to be taken promptly and contributes to improving the quality of accounting records.
- Facilitating Data Transmission and Accessibility :Digital accounting enables financial and accounting information to be transmitted rapidly among authorized users and organizational units. It also facilitates timely access to relevant information whenever required, subject to appropriate access authorization.
- Enhancing Accuracy and Reducing Audit Time:An important objective of digital accounting is to improve the accuracy of accounting procedures while reducing the time required to review and audit financial records. Automated processing and systematic controls can also help reduce opportunities for fraud, manipulation, and intentional misrepresentation. By automating routine accounting procedures and reducing unnecessary manual intervention, accounting professionals can devote more time to data review and analysis, while auditors can benefit from more organized, accessible, and reliable accounting records

II- Digital Accounting in Saudi Fuel Stations

Fuel stations have a distinctive operational and accounting nature due to the high volume of daily transactions, the variety of sales and payment methods, and the direct relationship between sales and inventory movements. In light of the digital transformation taking place in the Kingdom of Saudi Arabia, the use of digital systems to manage these operations has become an important means of achieving integration between operational and accounting processes, improving the accuracy and speed of information processing, and strengthening internal controls. Accordingly, this theme examines the nature of accounting operations in Saudi fuel stations, the requirements for transitioning

to digital accounting, and the importance of integration among fuel pumps, point-of-sale systems, inventory, e-invoicing, and fleet cards.

II.1-The Nature of Accounting Operations at Fuel Stations

Accounting operations at fuel stations are characterized by the high volume and rapid pace of transactions, as well as their direct connection to daily operational activities. The operating cycle typically begins with the receipt of fuel, recording the quantities supplied, and updating inventory records. The fuel is then transferred to the station's storage tanks and dispensing pumps, followed by the sales process, during which the quantity sold, sales value, and payment method are recorded.

Accounting activities are not limited to fuel sales; they also include sales related to the convenience store and ancillary services, as well as purchases, expenses, and transactions involving commercial customers and fleet operators. Consequently, accounting treatment in this sector requires continuous consistency between operational and financial data, particularly with regard to the quantities dispensed and sold, inventory movements, sales values, and amounts collected. The importance of this integration increases due to the high volume and frequency of transactions throughout the day. This makes reliance on manual data entry susceptible to delays and errors and limits management's ability to obtain real-time information. Literature on fuel station technology indicates that the modern fuel station environment relies on integration among pump controllers, point-of-sale systems, payment terminals, servers, and commodity management systems. Such integration helps improve operational efficiency and provides electronic, traceable, and auditable transaction trails (Today, 2007, pp. 14-16).

II.2-Requirements for the Transition to Digital Accounting in Saudi Fuel Stations

The transition to digital accounting in fuel stations requires moving from the use of separate accounting systems to an integrated information environment capable of receiving data from its operational sources, processing it, and subsequently utilizing it in accounting and control activities. This first requires the provision of a technological infrastructure capable of operating point-of-sale, accounting, inventory management, and electronic invoicing systems and linking them to unified databases, in addition to providing stable communication networks and appropriate mechanisms for data protection, backup, and business continuity. The transition also requires flexible accounting systems that can be integrated with operational systems, as well as training and developing employees to use digital systems, manage access permissions, and review data. Studies concerning the implementation of digital systems in the Saudi environment confirm that successful digital transformation does not depend on technology alone; rather, it is also influenced by top-management support, system integration, change management, employee training, system testing, data migration, and post-implementation support. From a regulatory perspective, compliance with e-invoicing requirements represents one of the fundamental components of digital transformation in the Saudi environment. The Zakat, Tax and Customs Authority (ZATCA) has required entities subject to the e-invoicing regulations to issue and retain invoices electronically. E-invoicing requirements also include technical and security controls concerning the integrity of invoices and records and the prevention of their manipulation. Furthermore, the second phase of e-invoicing is based on integration and connectivity between taxpayers' systems and the FATOORA platform, in accordance with the requirements and specifications established by the Authority (Alharbi, 2023).

II.3-Integration Between Pumps, Point-of-Sale Systems, Inventory, E-Invoicing, and Fleet Cards

Electronic integration between fuel pumps, point-of-sale (POS) systems, inventory management, e-invoicing, and fleet cards represents one of the most important foundations upon which digital accounting in fuel stations can be built. When a fueling transaction is carried out, the quantity dispensed and its value are recorded through the pump system. The transaction data are then transferred to the POS system, which determines the transaction value, payment method, and customer-related information. Subsequently, these data can be used to update inventory records, recognize the transaction for accounting purposes, and issue the electronic invoice.

This integration reduces the need for manual data re-entry and minimizes the likelihood of discrepancies between operational and financial data. It also enables the transaction to be traced from the moment it occurs at the pump through to its reflection in accounting records and reports.

Specialized literature on the fuel sector has indicated that the effective operation of modern fuel stations depends on the integration of pump control units, POS systems, payment terminals, servers, and product management systems. Such integration provides a foundation for generating more interconnected data and enables their use in monitoring and control activities (Today, 2007, pp. 14-16).

In the Saudi environment, integration with e-invoicing takes on an additional dimension. The e-invoicing system aims to transform the issuance of invoices and credit/debit notes into a structured electronic process that enables their exchange and processing in an integrated electronic format. Furthermore, the second phase requires taxpayers' e-invoicing systems to be connected to the FATOORA platform operated by the Zakat, Tax and Customs Authority (ZATCA). Accordingly, e-invoicing can be viewed as a fundamental link in the chain of integration between the operational process, the accounting system, and the regulatory environment, rather than merely as a means of issuing an electronic invoice instead of a paper one.

II.4-The Relationship Between Digital Integration and Accounting Information Quality

The importance of integration among the various systems within a fuel station is not limited to accelerating the recording of transactions; rather, it extends to improving the quality characteristics of the accounting information generated from these transactions. When sales transaction data are automatically transferred from the fuel pump to the point-of-sale system and then to inventory, e-invoicing, and the accounting system, the need for manual data re-entry is reduced. This makes it possible to minimize discrepancies resulting from manual errors and improve the timeliness of transaction recording. Integration also enables the provision of more consistent information regarding sales volume, revenue value, inventory movements, payment methods, and customer accounts, thereby enhancing management's ability to monitor performance and make timely decisions. Recent literature in the Saudi context supports the importance of digital accounting information systems. A recent study on cloud-based accounting information systems in Saudi Arabia demonstrated the importance of adopting modern digital solutions in supporting organizational performance, while other studies have examined security risks associated with computerized accounting information systems in Saudi organizations. This confirms that the quality of digital information depends not only on processing speed but also requires data security, access controls, and system integrity (Jaradat, 2026, pp. 39-60) (Ahmad .A, 2006, pp. 1-30).

III -Prospects and Challenges of Digital Accounting

Digital accounting offers broad prospects for developing accounting practices through automation, artificial intelligence, data analytics, and cloud computing, thereby enhancing operational efficiency, improving the quality of accounting information, and supporting decision-

making. At the same time, its implementation faces several challenges, including information security, data protection, the costs of digital transformation, infrastructure development, human resource training, and the need to keep pace with evolving regulatory and technological requirements. Accordingly, this chapter examines the main future prospects of digital accounting, as well as the major challenges that may affect its effective implementation in Saudi fuel stations.

III -1.The Role of Digital Accounting in Improving the Quality of Accounting Information and Strengthening Control

Digital accounting contributes to improving the quality of accounting information by automating the processes of collecting, recording, processing, and storing data, thereby enabling information to be provided more quickly and consistently compared with manual procedures. In Saudi fuel stations, this is particularly important due to the high volume of daily transactions and the diversity of data sources. A digital system can integrate fuel sales data with point-of-sale systems, inventory, payments, and e-invoicing, thereby reducing duplicate data entry and limiting errors resulting from manual processing. A recent study of Saudi companies showed that the efficiency of accounting information systems is positively associated with information quality and system effectiveness. Another study examining Saudi listed companies also found a positive relationship between digital accounting and the quality of financial reporting, particularly in terms of accounting information characteristics (Zohry & Al-Dhubaibi, 2024; Kerrouche & Belouadah, 2025).

From a control perspective, digital accounting enables transactions to be tracked from the moment they are executed until they are recorded in the accounting system, providing the ability to reconcile operational and financial data. At a fuel station, for example, the quantities dispensed by fuel pumps can be compared with the quantities recorded at the points of sale and changes in inventory balances. The value of sales can then be reconciled with cash and electronic collections, as well as amounts receivable from fleet customers. Digital systems also allow organizations to define user access rights and maintain records of transactions and modifications made within the system, thereby enhancing the ability to detect errors or unusual transactions at an early stage. The importance of these controls is particularly evident in the Saudi environment as businesses transition toward more integrated electronic systems, with e-invoicing becoming an integral part of the regulatory environment for taxpayers subject to the E-Invoicing Regulation (Abu-Musa, 2006; ZATCA, 2026).

III-2. Key Challenges Facing the Implementation of Digital Accounting in Saudi Fuel Stations

-A. Information Security and Data Protection :Information security is one of the major challenges facing digital accounting, as reliance on network-connected systems exposes accounting data to risks such as unauthorized access, modification, loss, and misuse of access privileges. This challenge is particularly important in fuel stations because accounting systems are connected to several operational systems, such as fuel pumps, point-of-sale systems, inventory, electronic payments, and e-invoicing. Therefore, any weakness in one component may affect the integrity of data transferred to other components. An empirical study on the risks of computerized accounting information systems in Saudi organizations emphasized the importance of security controls in protecting accounting information from various threats. Saudi e-invoicing requirements also include security and technical measures aimed at maintaining the integrity of electronic invoices and records (Abu-Musa, 2006; ZATCA, 2026).

B. System Integration: Effective digital transformation cannot be achieved merely by using electronic accounting software; it also requires different systems to exchange data automatically. In fuel stations, the challenge involves integrating fuel pumps, point-of-sale systems, inventory management, e-invoicing, payment systems, fleet cards, and accounting systems. If these systems operate separately, the need for manual data entry and reconciliation may continue, limiting the benefits of digitalization and increasing the possibility of discrepancies between operational and accounting data. System integration is also important under the Saudi e-invoicing system, as the second phase requires e-invoicing solutions to be integrated with ZATCA systems according to specific technical requirements (ZATCA, 2026).

C. Human Resources Training and Change Management: Human resources are a critical factor in the success of digital accounting. Having advanced technological systems does not, by itself, guarantee the desired results if employees lack the knowledge and skills required to operate the systems and review their outputs. Digital transformation therefore requires training accountants and employees in point-of-sale operations, inventory, and management on system usage and electronic control procedures, as well as improving their ability to analyze reports rather than simply enter data. Recent studies in Saudi Arabia emphasize that system quality, user competence, and information quality are important factors in the effectiveness of accounting information systems and their use in decision-making (Zohry & Al-Dhubaibi, 2024)

D. Transformation Costs and System Continuity :Investment in infrastructure, software, system integration, upgrades, and training may represent a challenge for some fuel stations, particularly when connecting a large number of stations to a centralized system. Increasing reliance on digital systems also makes service continuity more important, as network, hardware, or system failures may affect sales and accounting processes. Therefore, digital transformation should include plans for data backup, recovery, and business continuity, in addition to continuous system maintenance and updates. Digitalization should not be viewed merely as the cost of purchasing software, but rather as a continuous investment in infrastructure, security, integration, and human resources.

III-3. Prospects for the Development of Accounting Systems in Saudi Fuel Stations

Accounting systems in Saudi fuel stations are expected to evolve from programs focused mainly on recording transactions into integrated digital platforms that combine operational, accounting, and control functions. This development involves linking fuel pumps, tanks, point-of-sale systems, inventory, payments, e-invoicing, fleet cards, and accounting systems within a single information environment. Such integration enables automatic data transfer from operational transactions to accounting records and supports timely financial and operational reporting, helping management monitor performance, identify discrepancies, and make informed decisions. This direction is consistent with the regulatory development of e-invoicing in Saudi Arabia, which has progressed from the electronic creation and storage of invoices to integration and connectivity with ZATCA systems (ZATCA, 2026).

A. Use of Artificial Intelligence and Predictive Analytics :Artificial intelligence represents one of the most important future prospects for developing digital accounting. It can enable systems to move beyond recording transactions and analyzing historical data toward detecting unusual patterns and predicting future needs. In fuel stations, AI and analytics can be used to forecast fuel demand, improve inventory management, detect unusual discrepancies between sales and inventory movements, analyze customer behavior, and monitor transactions that may require review. Recent Saudi literature supports this direction, with studies examining the impact of artificial intelligence on accounting information quality and the relationship between AI, ERP accounting systems, and cybersecurity governance (Barakat, 2026).

B. Cloud Computing and Data Centralization :Cloud computing is an important direction for developing accounting systems, particularly for companies operating multiple fuel stations. It can provide a centralized database containing financial and operational information from different stations, allowing management to access and continuously compare reports. Cloud-based systems can also reduce reliance on local infrastructure at each station and facilitate centralized software updates and data management, while requiring attention to security, privacy, and service continuity. A recent study of Saudi enterprises highlights the importance of system quality and information quality in the use of digital accounting systems and decision-making (Zohry & Al-Dhubaibi, 2024).

C. Moving Toward Real-Time Accounting and Proactive Control:One of the most important future prospects is making accounting information available almost instantly rather than waiting for period-end closing and report preparation. In an integrated fuel station model, a sale can be recorded immediately, inventory updated simultaneously, an e-invoice issued, the payment method recorded, and the data transferred to accounting and management systems. This enables management to continuously monitor sales, inventory, collections, and discrepancies, shifting from reactive control to proactive control based on early warnings when unusual deviations occur. This direction is further

supported by the Saudi e-invoicing system, which provides a regulated electronic environment for issuing, processing, and exchanging invoices according to specific requirements.

IV- Results Analysis and Discussion

Based on the descriptive and analytical review presented in this study, the results indicate that the integration of digital accounting systems with operational systems in Saudi fuel stations contributes significantly to improving the accuracy, reliability, and timeliness of accounting information. The integration of fuel pumps, point-of-sale systems, inventory, payments, e-invoicing, and accounting systems reduces manual data entry and inconsistencies, while enabling information to be generated and transferred more rapidly. Accordingly, the first hypothesis is supported. The analysis also shows that digital accounting strengthens accounting control by enabling continuous monitoring and reconciliation of sales, inventory movements, payments, and operational variances, in addition to user-access controls and transaction tracking. Therefore, the second hypothesis is also supported, as digital integration facilitates a shift from traditional retrospective control toward more continuous and proactive control. Finally, the analysis confirms that the future development of digital accounting in Saudi fuel stations depends on the ability of accounting systems to adapt to technological and regulatory developments, particularly through artificial intelligence, predictive analytics, cloud computing, real-time accounting, and integration with the Saudi e-invoicing system. Thus, the third hypothesis is supported, while the effectiveness of these developments remains dependent on addressing challenges related to information security, system integration, employee training, transformation costs, and business continuity. Overall, the findings confirm that digital accounting represents an important foundation for improving accounting information quality, strengthening control, and supporting decision-making in Saudi fuel stations within the evolving electronic economy.

V-Conclusion and Recommendations

This study concludes that digital accounting represents an important pathway for developing accounting systems in Saudi fuel stations within the evolving electronic economy. The analysis indicates that integrating fuel pumps, point-of-sale systems, inventory, payments, e-invoicing, fleet cards, and accounting systems contributes to improving the accuracy, timeliness, reliability, and transparency of accounting information, while strengthening internal control and supporting decision-making. The study also shows that the successful implementation of digital accounting requires attention to information security, system integration, employee training, change management, business continuity, and compliance with Saudi e-invoicing requirements. Accordingly, the study recommends that Saudi fuel stations adopt integrated digital accounting systems that connect operational and financial processes, strengthen cybersecurity and data protection measures, provide continuous training for employees, and develop backup and business continuity plans. It also recommends investing in cloud computing, artificial intelligence, predictive analytics, and real-time reporting to improve operational efficiency and enable proactive control. Finally, accounting software developers should design flexible and scalable solutions capable of adapting to the specific characteristics of fuel stations and keeping pace with technological and regulatory developments in Saudi

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