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Mechanisms for Integrating AI Technologies into the Financial Management of Algerian Public Hospitals: From Routine Operations to Data-Driven Decision-Making.

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Abstract:

This study examines the core financial and accounting functions of managers in Algerian public hospitals and the potential of Artificial Intelligence (AI) to enhance them under LOLF 18-15 and Public Accounting Law 23-07. The findings highlight the importance of integrated information systems using Deep Learning to automate budgetary and accounting tasks, while Optical Character Recognition (OCR) and Intelligent Document Processing (IDP) enable automated extraction and indexing of financial data. AI-driven tools strengthen data infrastructure, supporting informed decision-making, institutional efficiency, oversight, and compliance.

Keywords: Hospital Financial and Accounting Management; Artificial Intelligence in Healthcare; Public Accounting; Accounting Process Automation; Algerian Public Hospitals.

Jel Classification Codes: H83, M41, I18, M15.

1. INTRODUCTION

The trajectory of Artificial Intelligence (AI) originated mid-20th century, specifically during the landmark Dartmouth Workshop in the United States, where the term "Artificial Intelligence" was formally coined. Since its inception, AI has undergone successive evolutionary phases, culminating in the new millennium an era characterized by exponential computational power, the emergence of Big Data, and the maturation of Deep Learning techniques. Today, AI has transcended its theoretical origins to become an indispensable catalyst in both daily life and professional sectors.

The healthcare sector, and its subsequent management, has significantly benefited from these advancements. Digital transformation has become an imperative necessity to keep pace with rapid technological shifts, leading to the proliferation of sophisticated health informatics designed to streamline clinical and organizational workflows. For instance, AI-driven speech-to-text technologies now allow clinicians to dictate medical reports, which are then autonomously transcribed into digital records. Furthermore, diagnostic support systems provide data-driven therapeutic recommendations, facilitating evidence-based clinical decision-making.

Beyond clinical practice, the administration of healthcare facilities has evolved through the automation of billing processes and the comprehensive digitization of the "patient journey" tracking every stage from admission and treatment protocols to discharge. This ensures the robust archiving of critical patient data, enabling instantaneous retrieval and continuity of care.

Recent literature reviews reveal a shift toward AI-driven predictive analytics for financial forecasting, fraud detection, and budget allocation. Advanced public health systems (UK, OECD) have leveraged real-time data integration to transition from compliance-oriented accounting to strategic, data-driven financial decision-making.

Despite Algeria's clinical digitalization (EMR, triage, e-procurement), hospital financial management remains reactive and disconnected from AI-driven decision support, risking a lag behind global governance benchmarks without a structured absorption framework.

1.1 Problem statement

In light of the aforementioned developments, this study addresses the following central problem:

How can a comprehensive conceptual framework be developed to integrate AI technologies into the financial management of Algerian public hospitals, thereby facilitating a strategic transition toward data-driven decision making?

To address this overarching question, the following sub-questions have been formulated:

- What are the insights provided by recent systematic literature regarding the primary AI tools and algorithms suitable for public sector and hospital financial management?
- What are the key structural, technical, and regulatory gaps between international AI-driven financial practices and the current state of financial management in Algerian public hospitals?
- What are the core dimensions and operational components required to construct an effective conceptual framework for adopting AI-driven financial decision-making within Algerian public health institutions?

1.2 Research hypothesis

To address the research problem, the following hypothesis is proposed:

The strategic shift of Algerian public hospitals toward data-driven financial decision-making depends on a multi-dimensional framework integrating AI technological attributes (accuracy, interoperability, security) with organizational readiness (compliance, leadership, IT infrastructure) and individual behavioral acceptance (perceived usefulness and ease of use).

1.3 Research objectives:

This study aims to achieve the following:

- ✓ To provide a conceptual overview of Artificial Intelligence, including its primary objectives and strategic importance.
- ✓ To examine the financial and accounting mandates in public hospitals under the framework of the Public Accounting Law 23-07.
- ✓ To highlight the current status of digitalization and digital transformation within the financial and accounting workflows of Algerian public hospitals.
- ✓ To identify key AI tools that can be utilized to improve the quality and efficiency of financial and institutional governance.

1.4 Research methodology

This research adopts a descriptive-analytical approach. The analytical method is employed to evaluate the content of financial and accounting operations in Algerian public hospitals, grounded in current legislation, official instructions, and formal correspondence. Subsequently, the study maps relevant AI tools onto these accounting and financial tasks to demonstrate their potential advantages and the anticipated improvements they offer to the sector.

2. Conceptual Framework

2.1 The concept of artificial intelligence

Artificial Intelligence (AI), a central focus of modern computer science, involves intelligent systems engineered to emulate human cognitive functions processing, learning, and strategic planning to execute complex tasks. By doing so, AI enhances decision-making competencies and facilitates increasingly intricate and interdependent administrative functions.

2.1.1 Defining artificial intelligence

The term "Artificial Intelligence" was first coined by John McCarthy in 1955, who defined it as "the science and engineering of making intelligent machines, especially intelligent computer programs." This field focuses on creating hardware and software capable of reasoning in a manner analogous to the human brain and simulating human behavior (Shuwaini, 2025, p. 42). Furthermore, AI is defined as "a branch of computer science dedicated to creating and designing computer programs that mimic human intelligence, enabling computers to perform tasks traditionally requiring human

cognition, such as reasoning, comprehension, auditory perception, speech, and movement" (Rawabeh, 2018, p. 93). In a more streamlined approach, Simon (1992) defined AI as "the study of how to make computers do things which, at the moment, people are better at" (Tir, 2024, p. 18).

2.1.2 Types of artificial intelligence

Based on the functional capabilities of AI-driven machines, they can be classified into three distinct categories:

A. Artificial narrow intelligence (ANI)

Also known as "Weak AI," this most common form is programmed for a specific task within a predefined scope, exemplified by mobile applications, automated email responses, and speech/image recognition software (Tir, 2024, p. 24).

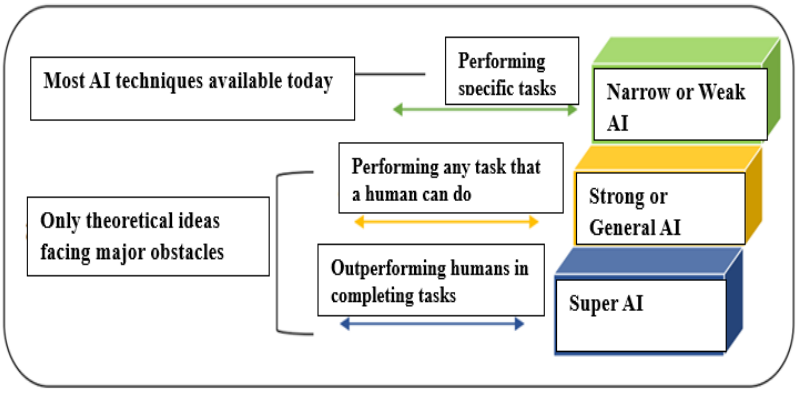
B. Artificial general intelligence (AGI)

This represents a more advanced form of AI, can perform any intellectual task a human can, aggregating and analyzing information while accumulating experiential knowledge to enable autonomous decision-making. Virtual personal assistants exemplify this stage (Afif, 2022, p. 81).

C. Artificial superintelligence (ASI)

This hypothetical form, Artificial Superintelligence (ASI), surpasses human cognitive capabilities across all domains, exceeding even specialized expertise, and is characterized by advanced communication, strategic planning, and complex judgment (Rawabeh, 2018, p. 97).

Fig.1. Types of artificial intelligence



Source: Belaïd & Ben Hawwas, 2024, p. 1037

2.1.3 Objectives of artificial intelligence

AI seeks to engineer computer systems capable of executing human tasks with superior precision and efficiency, achieved through specialized programming languages that simulate intelligent behavior via algorithms for complex problem-solving (Shaheen & Al-Dhafiri, 2025, p. 472). Furthermore, AI aims to achieve the following: (Belaid & Ben Hawwas, 2024, p. 1036)

- Mitigating Data Degradation and Information Loss: Preserves knowledge and expertise beyond human forgetfulness.
- Knowledge Base Maintenance: Ensures real-time structuring and updating of knowledge bases.
- Knowledge Synthesis and Electronic Activation: Generates and activates knowledge to optimize strategic decision-making.

2.1.4 The importance of artificial intelligence

Artificial Intelligence is of paramount importance to both individuals and organizations, given its ability to provide unparalleled speed and efficiency in task execution while significantly enhancing decision-making processes. Its significance is further highlighted by its transformative impact across all service and industrial sectors. AI serves as the fundamental engine for modern and emerging technologies, including Big Data management, intelligent robotics, and the Internet of Things (IOT) (Shuwaini, 2025, p. 53).

Moreover, intelligent machines play a crucial role in mitigating physical risks and psychological stressors on humans. They are increasingly deployed to perform arduous, hazardous, and complex tasks that demand exhaustive mental focus and rapid, continuous decision-making—tasks that would otherwise be taxing for human cognitive capacities (Belaid & Ben Hawwas, 2024, p. 1037).

2.1.5 Financial management theories (technology adoption theories)

Integrating AI into hospital financial systems requires moving beyond purely technical descriptions toward explanatory adoption models examining organizational dynamics, technology characteristics, and cognitive evaluations. This study anchors its conceptual design in two

foundational paradigms: TAM (Davis, 1989) and Rogers' (2003) DOI Theory.

While classical TAM attributes adoption primarily to Perceived Usefulness and Perceived Ease of Use, it often overlooks broader structural determinants of public sector governance (Taherdoost, 2018, p. 962). Conversely, DOI theory complements this by addressing organizational level attributes such as Relative Advantage, Compatibility, Complexity, and Organizational Readiness. Recent healthcare digitalization literature emphasizes that integrating TAM's behavioral components with DOI's structural predictors yields a robust framework for explaining complex technological transitions in public institutions (Greenhalgh & al, 2017, p. 10).

2.1.5.1 The Three-Dimensional Analytical Framework for AI Assimilation

This paper proposes a Three-Dimensional Analytical Framework integrating TAM and DOI theory to examine financial administration in Algerian public hospitals. It shifts focus from AI tools' capabilities to the organizational and human mechanisms mediating data-driven decision-making:

- **Technological Attributes (Technical Dimension - DOI Lens):** This dimension evaluates AI systems' intrinsic properties accuracy, legacy compatibility, interoperability, and cybersecurity within hospital financial management (Davenport, 2019, p. 95).

- **Organizational Context (Institutional Dimension - DOI Lens):** Adoption depends on institutional readiness infrastructure, leadership, IT funding, and regulatory alignment (Gideon & et al, 2025, p. 44). With bureaucratic rigidity and centralized accounting laws critically governing AI assimilation pace in Algerian public hospitals.

- **Individual Perception (Behavioral Dimension - TAM Lens):** This dimension examines accountants' and managers' Perceived Usefulness and training-mediated Perceived Ease of Use, alongside resistance rooted in tech-anxiety and fears of algorithmic replacement (Per Nilsen, 2026, p. 02).

2.1.6 Artificial intelligence and healthcare

AI encompasses diverse healthcare applications, notably:

Electronic Health Records management for precise, rapid clinical tracking and diagnostic analysis; Surgical Robotics, offering autonomous or assistive precision in complex procedures and reducing human exposure in infectious environments; and Administrative/Clinical Decision Support Systems (e.g., IBM Watson), which digitize records, automate prescriptions, and deliver evidence-based insights via speech-to-text and data analytics. Additionally, AI expands healthcare datasets and accessibility, with genomic sequencing, NLP, and Computer Vision advancements catalyzing Machine Learning's evolution in medicine (Bouqra, 2024, p. 806).

2.1.7 Barriers to AI Adoption

Despite AI's well-documented healthcare promise, adoption remains slower and more uneven than predicted (Ahmed & et al, 2023, p. 466). with review evidence organizing the barriers into five interrelated domains that justify this study's conceptual framework.

- Data and technological infrastructure barriers: Reviews consistently identify fragmented information systems, poor interoperability, and deficient data quality as the most frequently reported constraints. A scoping review on AI in LMIC health systems further reported reliability issues, limited user-friendliness, and poor local-context fit, identifying restricted data availability, low trust, and lacking cost-effectiveness evidence as principal barriers (Ciecierski-Holmes & et al, 2022, p. 10).

- Organisational readiness and financial capacity barriers: Reviews framed by the TOE model attribute adoption failure less to algorithmic performance than to organizational conditions absent AI strategy, weak change management, budget rigidity, and lacking business cases (Jan , Malte , & Katrin , 2021, p. 6). African evidence corroborates this, with Ugandan and Nigerian health leaders citing inadequate infrastructure, workforce capacity gaps, and weak institutional readiness "funding" (Ubalaeze & et al, 2024, p. 499).

- Human capital and workforce-related barriers: Insufficient digital literacy and inadequate staff training consistently emerge as major AI

adoption impediments, with a systematic review finding that training and infrastructure gaps hinder adoption while ease of use and organizational support significantly influence acceptance. Limited familiarity with digital health technologies, compounded by insufficient institutional support for skill development, continues to constrain effective tool use in both clinical and administrative practice (do Nascimento & al, 2023, p. 8).

- Regulatory, governance, and ethical barriers: The absence of clear regulatory frameworks and accountability mechanisms constitutes a further obstacle, with reviews grouping barriers into domains including liability, ethical considerations, and workforce/technological factors. Unresolved questions of accountability, data governance, and algorithmic transparency can delay institutional adoption even when the underlying technology is mature (ahmed & et al, 2023, p. 7).

2.2 An overview of hospital institutions in Algeria

Hospitals represent one of the most vital public utilities within any state, as their primary objective is to provide essential healthcare services to the community. Historically, these institutions have existed since antiquity, evolving through various nomenclature and conceptual frameworks.

2.2.1 A historical perspective on hospitals

Since ancient times, religious traditions have referenced dedicated spaces for healing. As early as 4000 BCE, temples such as Asklepios in Asia Minor functioned as therapeutic centers. However, hospitals specifically dedicated to patient care date back to approximately 1200 BCE within Greek temples. Such institutions also emerged in Greek and subsequently Roman civilizations, where pharmaceuticals were first introduced. Historical records further indicate that hospitals in India flourished during the reign of King Ashoka.

In the Arab world, the first hospital was established in 706 CE in Damascus by Al-Walid ibn Abd al-Malik. Arab scholars played a monumental role in the advancement of medicine, chemistry, and pharmacology (Al-Bakri, 2005, p. 11).

2.2.2 Defining the hospital

The American Hospital Association (AHA) defines a hospital as "an institution with an organized medical staff, permanent medical facilities-including inpatient beds and medical services, including physician and nursing services, designed to provide patients with necessary diagnosis and treatment" (Kafi, 2017, p. 111).

Meanwhile, the World Health Organization (WHO) defines the hospital as "an integral part of a social and medical organization, the function of which is to provide for the population complete health care, both curative and preventive, and whose out-patient services reach out to the family in its home environment; the hospital is also a center for the training of health workers and for bio-social research" (Bwa'na, 2003, p. 141).

From a legal perspective, the Algerian Legislator defines the Public Hospital Establishment (EPH) as "a public institution of an administrative nature, possessing a legal personality and financial autonomy, and placed under the tutelage of the Wali (Governor)" (Executive Decree No. 07-140 of May 2007 on the establishment, 2007).

2.2.3 Types of hospital institutions in Algeria

Public health institutions in Algeria vary according to their nature and the specific mandates entrusted to them. They are classified as follows:

- **Public Hospital Establishment (EPH):** Responsible for meeting the general healthcare needs of the population, these institutions comprise structures for diagnosis, treatment, hospitalization, and medical rehabilitation.
- **Public Healthcare Proximity Establishment (EPSP):** Composed of polyclinics and treatment rooms covering specific residential areas. Their primary objective is to provide basic care, preventive measures, and community-based health services.
- **Specialized Hospital Establishment (EHS):** Their role is dedicated to providing specialized care for specific pathologies or defined age groups.
- **University Hospital Center (CHU):** These centers are mandated with comprehensive functions, including diagnosis, screening, treatment, prevention, medical education, and scientific research.

2.2.4 Mandates of hospitals in Algeria

The Health Law 18-11 categorizes hospital mandates into three primary dimensions: Therapeutic, Educational, and Managerial (Law No. 18-11 of 2 July 2018 relating to health, 2018).

- ✓ **Therapeutic Mandates:** These involve providing essential medical care, further subdivided into:
  - Primary or Basic Care: Refers to preventive and fundamental therapeutic services and rehabilitation that address the essential health needs of individuals. This represents the first level of the "care pathway" within the national health system and is strategically located near residential clusters.
  - Secondary Care: Encompasses specialized diagnostic and therapeutic services provided within structured health facilities.
  - Palliative Care: Aimed at alleviating patient pain, reducing psychological suffering, and providing necessary companionship and support.
- ✓ **Educational and Research Mandates:** Hospitals ensure training activities for all categories of healthcare professionals. Additionally, specialized research laboratories may be established within these institutions to foster medical advancement.
- ✓ **Managerial and Administrative Mandates:** Hospitals are responsible for the creation and management of a Unified Electronic Medical Record (EMR) for each patient. These institutions are legally bound to ensure data confidentiality and the systematic management and preservation of medical archives. Furthermore, they are strategically committed to the civil registration of births and deaths in coordination with local municipal authorities.

3. Financial and Accounting Management in Algerian Hospitals and Artificial Intelligence

3.1 The hospital accounting information system

The Accounting Information System (AIS) in public hospitals differs fundamentally from its private sector counterpart. While private hospitals provide services at market rates to achieve profitable returns, public hospitals deliver essential services either free of charge or for symbolic fees. Furthermore, funding structures vary significantly; public hospitals are primarily financed by the State, social security contributions, and charitable organizations, given their status as non-profit entities. Consequently, expenditure is subject to rigorous oversight in accordance with the budgetary nomenclature (Radi, 2007, p. 25) .

The AIS in public hospitals aims to achieve the following objectives: (Hassan & Ahmad, 2014, p. 27)

- **Patient Transaction Tracking:** Maintaining detailed accounts for each patient and generating accurate medical billing.
- **Planning and Budgetary Support:** Providing the necessary data for strategic planning, budget formulation, and monitoring execution.
- **Asset Protection:** Safeguarding institutional property through robust internal control systems designed to prevent embezzlement and misuse.

3.2 Components of the AIS in Algerian public hospitals

Public hospitals in Algeria are vital utilities serving a broad demographic. Accordingly, their management is governed by specialized legislation. Administratively, the position of "Sub-Director of Finance and Resources" was established to oversee financial and accounting mandates. The AIS in these institutions comprises:

3.2.1 Public accounting

According to Law No. 23-07 concerning the rules of public accounting and financial management, public accounting is defined as: "The process of entering, classifying, recording, and auditing budgetary, accounting, and treasury transaction data. Its objective is to establish compliant and sincere accounts, present financial statements reflecting a true and fair view of assets, financial position, and year-end results, and contribute to calculating activity costs and evaluating their efficiency" (Law No. 23-07, Art. 79) (Law No. 23-07 of 21 June 2023, 2023).

To enhance the protection of public funds, Law 23-07 introduced three integrated accounting types, distinguished by their functional scope: (Bai Bumzraq, 2025, p. 82)

- **Budgetary Accounting:** This is subdivided into Commitment Accounting, which records budgetary expenditures based on the year they were committed, and Cash Accounting, which records revenues and expenditures based on the fiscal year they were actually collected or paid by public accountants.
- **General Accounting:** Representing the core of the structural reforms in Law 23-07, this system records all transactions affecting the assets, financial status, and net results of the public institution. It operates on an accrual basis and is maintained by public accountants.
- **Cost Accounting (Analytical Accounting) :**Utilizing the outputs of General Accounting, this system aims to analyze and measure the costs of activities within specific programs to evaluate their efficiency. This is maintained by Authorizing Officers (Ordonnateurs).

3.2.2 Material accounting (inventory and asset accounting)

In public hospitals, "Material Accounting" refers to the management and inventorying of public assets. These assets comprise rights, as well as movable and immovable property utilized by the public utility (the hospital). (Law No. 90-30 of 1 December 1990 , 1990). Examples include buildings, administrative facilities, ambulances, and various movable assets with a value exceeding 3,000 DZD that are not consumed upon first use.

The most critical procedure within material accounting in public hospitals is the Physical Inventory (Stocktaking). This is defined as the descriptive and evaluative recording of all private and public property belonging to the institution. The primary objectives of the inventory are the protection of national property and ensuring its utilization aligns with pre-defined institutional goals. Furthermore, the inventory tracks the lifecycle and movement of these assets (Law No. 90-30 of 1 December 1990 , 1990). The inventory process is categorized into:

- ✓ **Immovable Property Inventory:** Real estate is incorporated into the hospital's assets based on a formal report (Procès-verbal) prepared by the State Property Administration in coordination with hospital management. Acquisition occurs either through free transfer or compensation equivalent to its market value.
- ✓ **Movable Property Inventory:** This involves the faithful recording of all movable assets held by the hospital. The inventory registers must accurately document data regarding the repair, decommissioning (destruction), or loss of assets. These records carry legal weight as "probative evidence" in the context of institutional auditing and oversight.

Additionally, the management of stores and various supplies constitutes an integral part of Cost Accounting. Public hospitals typically maintain five primary inventory stores:

- The Pharmacy (Medical Supplies and Pharmaceuticals).
- General Supplies Store.
- Spare Parts and Workshops Store.
- Food and Provisions Store.
- Stationery and Office Supplies Store.

3.2.3 Cost accounting (Analytical Accounting)

Instruction No. 15, dated October 3, 2001, mandates the implementation of cost accounting across all public health institutions, including hospitals. The responsibility for these accounting functions is assigned to the "Contracting and Cost Accounting Office," which utilizes the Homogeneous Sections Method (Méthode des Sections Homogènes) for financial calculation and analysis. The determination and calculation of treatment costs within public hospitals aim to achieve the following: (Ministry of Health and Population, 2001, p. 05)

- **Development of Managerial Dashboards:** To monitor expenditures and determine the precise "cost per inpatient day."
- **Standardization and Comparability:** Ensuring that costs are comparable across different public hospitals by adopting uniform methodologies and procedures.

- **Performance Measurement:** Evaluating the operational efficiency of various hospital departments.
- **Resource Negotiation:** Accurate cost determination facilitates the precise estimation of financial requirements and strengthens the hospital's position when negotiating budgets with oversight authorities based on realistic accounting data.
- **Managerial Optimization:** Serving as a strategic tool to enhance overall institutional governance.

3.2.3.1 Methodology of cost accounting preparation

The officer in charge of cost accounting submits quarterly, semi-annual, and annual reports to the Ministry of Health and the relevant regional Health Directorate. The preparation process involves several distinct phases: (Ministry of Health and Population, 2001, pp. 07-11)

Phase I: Departmental Classification: The institution’s departments are categorized into Primary Sections and Support (Secondary) Sections. This classification is based on an analysis of the organizational structure, taking into account the hospital's specific operational patterns and clinical characteristics.

Phase II: Design and Distribution of Information Vehicles: Standardized tables and reporting forms are distributed to various administrative and clinical heads. The most critical documents include:

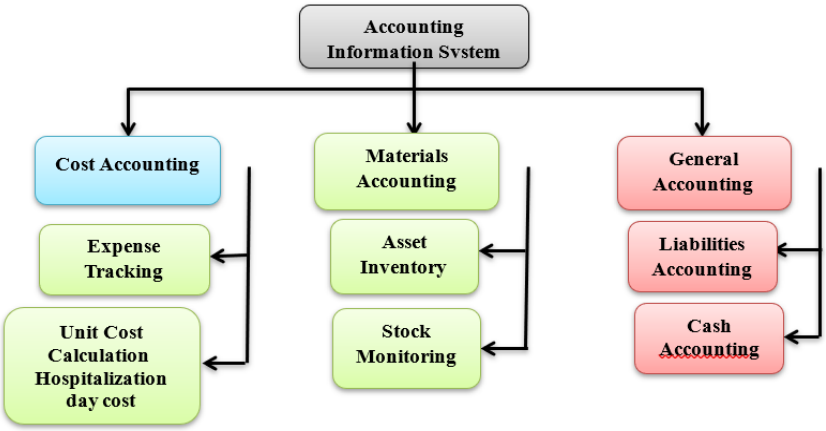
- Expense Schedules: Detailing staff wages, pharmaceutical consumption, and various operational supplies.
- Statistical Reports: Highlighting the medical and paramedical activities performed within each department for patient care.
- Allocation Tables: Designed to facilitate the initial and secondary distribution of overheads across recorded activities.

Phase III: Data Aggregation: All quantitative and financial data are consolidated from the monthly tables and statistics submitted at the end of each period.

Phase IV: Primary and Secondary Cost Allocation: This final phase involves the primary allocation of expenses (by value) to support services

(e.g., laboratory, emergency, radiology). This is followed by a Secondary Allocation, where support service costs are redistributed to the primary clinical departments to determine the total cost of care.

Fig.2. Components of the accounting information system in public hospitals



Source: prepared by the author

3.3 Drivers for digital transformation and AI integration in the financial and accounting management of Algerian public hospitals

The management of public hospital budgets (encompassing revenue collection and expenditure processing) requires specialized competencies from administrative personnel. This process relies on a combination of traditional paper-based pillars (such as ledgers, cards, and payment vouchers) and recently introduced electronic frameworks. A comprehensive analysis of hospital administration reveals several key drivers accelerating the transition toward digital transformation and the adoption of Artificial Intelligence (AI):

3.3.1 Complexity and expansion of financial and accounting mandates

The budgetary reform in Algeria, initiated by the enforcement of the Organic Law on Finance Laws (LOLF) 18-15, has significantly increased the complexity of financial tasks. This reform mandates the preparation of "Contractual Relationship Agreements," which define hospital objectives, expected outcomes, and Key Performance Indicators (KPIs). Furthermore, "Action and Performance Contracts" must be established to determine financial appropriations and target values.

These requirements, alongside new procedures for budget preparation and validation in coordination with relevant stakeholders (the Budgetary Controller and the Specialized Accounting Officer), were further consolidated by the Public Accounting and Financial Management Law 23-07. This law introduced structural changes to commitment and payment accounting, in addition to the rigorous periodic reporting required by the Ministry of Health and the Ministry of Finance. Such an intricate environment necessitates the automation of repetitive and routine tasks, allowing hospital managers to focus on strategic analysis and reform implementation rather than being overwhelmed by daily clerical operations.

3.3.2 Prior experience with integrated information systems (The 3CoH experience)

The Algerian healthcare sector previously implemented an integrated management accounting information system known as the "Triple Hospital Accounting System" (3CoH). Launched in 2014, this system was designed to handle diverse functions, including procurement management, inventory control, fixed asset tracking, medical billing, and budget monitoring.

At its inception, the 3CoH system represented a pioneering step toward total digitalization and the integration of managerial workflows under a single information architecture. Although the project faced sustainability challenges for various reasons, the experience remains a positive precursor. It has equipped public hospital managers with essential technical expertise and a profound understanding of the advantages and potential obstacles associated with sophisticated information systems, providing a solid foundation for future AI-driven initiatives.

3.3.3 Legislative and administrative orientation towards digitalization and automation

As part of the structural reform of hospital management, the relevant authorities have pivoted toward New Public Management (NPM). This conceptual framework involves adapting successful private-sector management techniques to public hospitals, thereby enhancing administrative efficiency and accountability. Within this paradigm,

digitalization, digital transformation, and task automation are prioritized as fundamental pillars of modern governance. Furthermore, the Algerian legislator has explicitly mandated this technological transition; for instance, the Public Accounting Law 23-07 explicitly stipulates that public accounting must be maintained through an Integrated Information System (Law No. 23-07 of 21 June 2023, 2023).

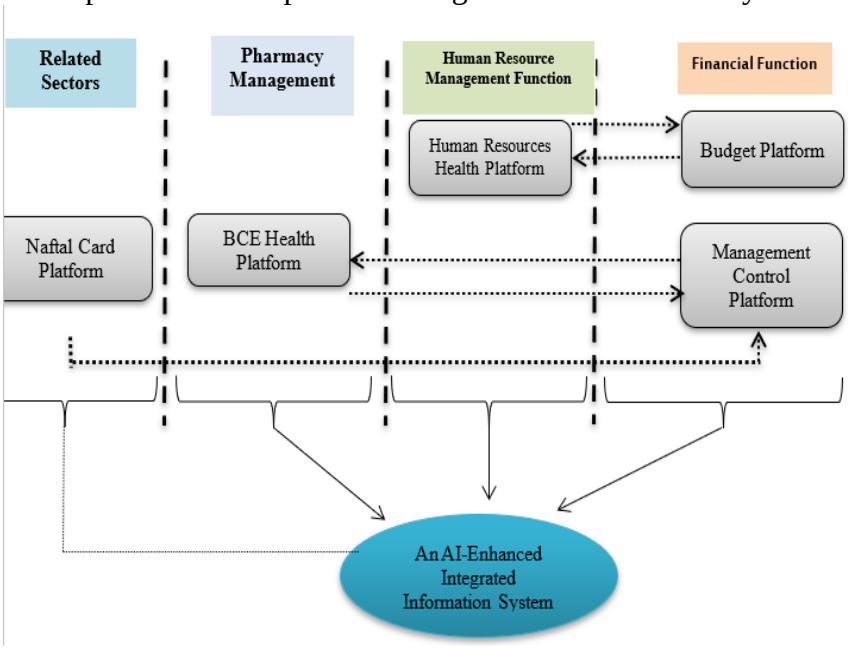
3.3.4 Proliferation of electronic platforms related to financial and accounting management

Since the inception of the healthcare sector's digitalization strategy, the Ministry of Health has developed numerous electronic platforms, with a significant portion dedicated to management and budgetary monitoring. Notable examples include:

- **Budgetary Positions Platform (Budget):** For managing financial posts and appropriations.
- **Management Control Platform (Contrôle de Gestion):** For monitoring operational performance.
- **Cross-Sectoral Platforms:** Such as the fuel card management system (Naftal Card) and the centralized pharmaceutical procurement platform (Bce.sante).

These disparate platforms present a strategic opportunity for integration into a Unified Information System. Such integration would allow for the consolidation of data into a centralized database, secured by a single-sign-on (SSO) authentication protocol. By leveraging AI-enhanced algorithms for complex data queries, the system can autonomously generate comprehensive reports and statistics. This architecture provides hospital executives with a streamlined interface featuring dynamic Managerial Dashboards, which significantly facilitate real-time oversight and evidence-based decision-making.

Fig.3. Relationship between financial and accounting digital platforms in public hospitals and their potential integration into a unified system



Source: prepared by the author

3.4 Primary AI tools and techniques supporting financial and accounting management in Algerian public hospitals

The financial and accounting mandates within public hospitals provide a fertile ground for the integration of various AI tools. These technologies offer robust solutions to longstanding operational challenges, notably:

3.4.1 Automation of hospital financial and accounting Tasks

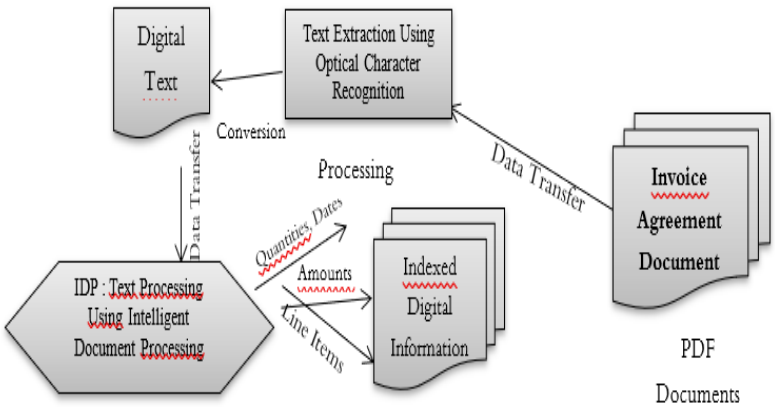
Given the nature of Algerian public hospitals as non-profit administrative public entities primarily funded by state revenues, their management is bound by numerous repetitive and routine procedures. These include critical stages of the public expenditure cycle, such as Commitment (Engagement), Liquidation (Liquidation), Payment Authorization (Ordonnancement), and the Validation of Rights (Recording of Receivables). By leveraging AI-driven automation, these procedural workflows can be streamlined, liberating hospital managers from manual processing and allowing them to focus on high-level strategic analysis and data-driven decision-making.

3.4.2 Leveraging intelligent optical character recognition (OCR) and document processing

Through AI-enhanced Optical Character Recognition (OCR), hospitals can transition from manual data entry to automated extraction of key data from physical accounting documents and invoices. When coupled with Intelligent Document Processing (IDP), this technology enables the autonomous identification and indexing of critical information, such as supplier details, document dates, line items, and VAT (Value Added Tax) calculations.

Furthermore, AI can analyze formal contracts and agreements to extract essential clauses, including delivery timelines, late-payment penalties, and settlement modalities. The implementation of these tools directly contributes to managerial optimization by significantly reducing processing time, minimizing human error, and mitigating the risk of fraudulent activities.

Fig.4. Use of Optical Character Recognition (OCR) and artificial intelligence technologies in hospitals for automated text extraction and processing



Source: prepared by the author

3.4.3 Optimizing patient life-cycle management (the patient journey)

Each patient undergoes a structured cycle within the hospital, commencing with triage and diagnosis in the emergency department, followed by formal admission (Admission), the recording of pharmacological and therapeutic interventions, and concluding with discharge and the issuance of a pro

forma invoice. AI can significantly optimize this cycle through the following applications:

- **Automated Verification:** Validating patient personal data and Social Security numbers (if available) against national databases.
- **National Health Identification:** Automated retrieval and synchronization of the National Health Number (NIS).
- **Automated Billing:** Instantaneous generation of Pro Forma Invoices based on real-time resource consumption.
- **Clinical Archiving and Summarization:** Streamlining digital archiving and the autonomous generation of Clinical Discharge Summaries.

3.4.4 Facilitating the implementation of "contractualization" (the contracting model)

The "Contracting Model" (Contractualisation) remains one of the most critical yet partially implemented files in the Algerian healthcare sector. It refers to a tripartite financial cycle involving the patient, the hospital, and the Social Security organization. In this model, the patient receives care, the hospital provides the necessary medical services, and the Social Security entity reimburses the hospital based on generated invoices. Since AI algorithms can ensure high-precision invoicing and data integrity, their integration directly facilitates the activation of this model, thereby improving the self-funding mechanisms and financial sustainability of public hospitals.

3.4.5 Enhancing the accuracy of cost accounting

Executing cost accounting in public hospitals necessitates the aggregation of massive datasets from various clinical and administrative departments. Integrating these multi-dimensional tasks into a single, unified platform allows AI algorithms to index this data autonomously. This enables the precise identification of Direct and Indirect Costs, facilitating the seamless calculation of the Cost Per Inpatient Day. Furthermore, these aggregated datasets can be visualized through dynamic, customizable Managerial

Dashboards, providing executives with robust oversight tools for enhanced institutional control and evidence-based decision-making.

4. Research Findings

The study concludes with several key findings, the most prominent of which are:

- ✓ Technological Viability: recent advancements in Artificial Intelligence (AI) have yielded a diverse array of tools and techniques that can be effectively leveraged to modernize financial and accounting management within Algerian public hospitals.
- ✓ Empirical Necessity: the monitoring and financial governance of Algerian hospital budgets are in urgent need of AI integration across various accounting procedures and regulatory frameworks. This necessity is driven by AI's capacity to offer innovative solutions while significantly optimizing time and administrative effort.
- ✓ Legislative Imperative: the increasing complexity of financial mandates following the enforcement of the Organic Law on Finance Laws (LOLF) 18-15 and the Public Accounting Law 23-07 necessitates the development of a unified information system. This system should be designed to track new accounting procedures and enhance oversight, particularly if augmented by AI technologies.
- ✓ Operational Efficiency through OCR and IDP: the integration of Optical Character Recognition (OCR) and Intelligent Document Processing (IDP) facilitates accounting workflows by autonomously extracting critical data from financial documents such as supplier information, received items, unit prices, and associated taxes. Furthermore, these technologies assist in indexing essential contractual clauses, including agreement durations, unit prices, delivery terms, penalty clauses, force majeure conditions, and termination stipulations.
- ✓ Automation via Deep Learning: AI-driven Deep Learning can be integrated into hospital information systems to transform repetitive, routine tasks into automated workflows. This includes the autonomous issuance of commitment vouchers, purchase orders,

budgetary entries, and payment warrants. Such automation simplifies accounting operations and substantially mitigates human errer.

- ✓ Enhanced Regulatory Oversight: Sophisticated informatics developed by regulatory bodies such as the Court of Auditors (Maglis al-Muhasaba) and the General Inspectorate of Finance (IGF) can be integrated into the proposed hospital accounting systems. This would allow for the seamless migration of critical audit data, the automated generation of periodic reports, and the issuance of real-time alerts regarding any potential treasury discrepancies or financial irregularities.

5. CONCLUSION

The financial and accounting function within public hospitals is no less critical than any other administrative pillar essential to the operation of these vital public utilities. Financial efficiency and operational effectiveness directly correlate with the quality of public service delivery encompassing clinical treatment, hospitalization, and associated patient care and hospitality services. Consequently, it is imperative to identify the most effective pathways to modernize this financial function by leveraging contemporary technological advancements and benchmarking successful international experiences.

Artificial Intelligence (AI) algorithms and techniques represent the most transformative developments in the current technological landscape. Their integration into existing and future information systems is essential for the evolution of accounting practices within

Algerian public hospitals. Based on the findings of this study, the following strategic recommendations are proposed:

- ✓ Capacity building and awareness: enhancing managers' understanding of the strategic importance of digital transformation in financial and accounting management through specialized scientific seminars and targeted professional training programs.
- ✓ International Benchmarking: leveraging the successful experiences of developed nations in designing and implementing advanced

financial and accounting information systems tailored for public hospitals.

- ✓ Fostering innovation and entrepreneurship: providing opportunities for youth and tech startups to develop innovative, localized information systems specifically engineered for the financial and accounting management of the Algerian healthcare sector.
- ✓ Inter-ministerial academic collaboration: establishing coordination between the ministry of health and the ministry of higher Education and scientific research to introduce specialized undergraduate and graduate programs in healthcare financial management. These programs should offer dedicated curricula in public accounting and public finance specifically oriented toward the health sector.
- ✓ Interactive governance platforms: developing interactive platforms and formal communication channels between healthcare managers and high-level policymakers. This ensures that the practical challenges and needs of practitioners are heard and subsequently translated into automated procedures and data-driven policies.

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