

The Role of Health Information Systems in Supporting Healthcare Decision-Making in Saudi Arabia

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ABSTRACT

Health information systems (HIS) have become central instruments of healthcare governance in the Kingdom of Saudi Arabia, translating dispersed clinical, administrative, and population-level data into actionable evidence for decision-makers. This paper examines the role of HIS in supporting healthcare decision-making across clinical, managerial, and policy domains, situating the discussion within the Kingdom's Vision 2030 healthcare transformation agenda and its expanding digital infrastructure, including the National Platform for Health Information Exchange Services (Nphies), the Mumaris+ licensing and workforce registry, and the electronic health record ecosystems operated across the Ministry of Health and academic medical centers. Drawing on the DeLone and McLean Information Systems Success Model and Donabedian's structure-process-outcome framework, the paper proposes an original integrative model, the LUMEN Framework, to describe how linked data infrastructure, unified governance, multisource evidence integration, empowered end users, and networked feedback loops jointly determine whether HIS investments translate into improved decisions and outcomes. The paper further reviews the regulatory landscape shaped by the Saudi Commission for Health Specialties, the Saudi Central Board for Accreditation of Healthcare Institutions, and the Saudi Food and Drug Authority, and identifies persistent barriers to full realization of HIS value, including interoperability gaps, cybersecurity exposure, uneven digital literacy, and change-resistant organizational cultures. The paper concludes with policy-relevant recommendations for strengthening the evidentiary and decisional value of HIS in the Saudi healthcare system.

of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>). **Keywords:** *health information systems, clinical decision support, Vision 2030, Nphies, health informatics, Saudi Arabia, digital health governance*

1. Introduction

Healthcare decision-making, whether exercised at the bedside, within a hospital's management office, or at the level of national health policy, depends on the timely availability of accurate, relevant, and interpretable information. In systems where data remain fragmented across paper records, disconnected departmental spreadsheets, or unlinked software applications, decisions are made under conditions of avoidable uncertainty. Health information systems (HIS) — the organized combination of people, processes, and technology that collect, store, manage, and transmit health-related data — exist precisely to close this gap between data generation and decision use.

The Kingdom of Saudi Arabia has treated the maturation of its HIS landscape as a strategic priority rather than a purely technical undertaking. Vision 2030 identifies a digitally enabled, value-based, and citizen-centered health system as a pillar of the Health Sector Transformation Program, and successive investments in national platforms, electronic health records, and health data exchange infrastructure reflect a deliberate attempt to convert health data into a governable national asset. This paper explores how HIS support decision-making across three interdependent levels: the clinical encounter, the institutional management of healthcare organizations, and the formulation of national health policy. It further proposes an original conceptual framework, LUMEN, to synthesize the conditions under which HIS translate into genuine decisional and clinical value rather than remaining underused technical infrastructure.

2. The Evolving Health Information Systems Landscape In Saudi Arabia

The Saudi health information ecosystem has expanded rapidly over the past decade, moving

from isolated, hospital-level electronic record systems toward a more integrated national architecture. Several platforms now anchor this ecosystem and, taken together, illustrate a shift from data collection toward data governance and decision support.

- ◆ Nphies (National Platform for Health Information Exchange Services): a centralized clearinghouse connecting payers and providers, standardizing eligibility verification, claims adjudication, and clinical data exchange across the Kingdom.
- ◆ Electronic health record (EHR) systems: deployed across Ministry of Health hospitals, academic medical centers, and private facilities, increasingly interoperable through unified data standards.
- ◆ Mumaris+: the Saudi Commission for Health Specialties' digital licensing and workforce registry, which provides longitudinal data on the credentialing, distribution, and continuing professional development of the health workforce.
- ◆ Telehealth and remote monitoring platforms: expanded substantially since 2020, extending decision-relevant clinical data collection beyond facility walls.
- ◆ Research and knowledge infrastructure: exemplified by the King Abdullah International Medical Research Center (KAIMRC), which links clinical data to research and evidence generation.

This layered infrastructure means that decision-makers today can, in principle, draw on clinical, administrative, workforce, and research data sources simultaneously. The decisional value of this infrastructure, however, depends less on the existence of the platforms themselves than on how well their data are integrated, governed, and

made usable to the people who must act on them — the central concern of this paper.

3. Theoretical Foundations

3.1 The DeLone and McLean Information Systems Success Model

The DeLone and McLean model conceptualizes information system success as a causal chain running from system quality, information quality, and service quality, through user satisfaction and system use, to net organizational and individual benefits. Applied to healthcare, the model draws attention to a frequently overlooked point: an HIS with excellent technical architecture but poor information quality, or one with high-quality data that clinicians distrust or find unusable, will fail to generate decisional benefit regardless of its underlying sophistication.

3.2 Donabedian's Structure-Process-Outcome Framework

Donabedian's classic framework, long used to evaluate healthcare quality, is equally useful for

evaluating HIS-supported decision-making. Structure refers to the technical and organizational infrastructure of the HIS itself; process refers to how information is retrieved, interpreted, and applied within clinical and administrative workflows; and outcome refers to the resulting quality, safety, efficiency, and equity of care. A well-designed HIS is one whose structural investments are demonstrably linked, through improved decisional processes, to measurable outcome gains.

4. The Lumen Framework: An Integrative Model

Building on these established models, this paper proposes the LUMEN Framework as an integrative lens for understanding when and how health information systems generate genuine decisional value within the Saudi healthcare context. LUMEN is an acronym for five interdependent components, summarized in

Table 1.

Component	Description	Illustrative Saudi Application
Linked data infrastructure	Technical interoperability connecting clinical, administrative, and financial data sources.	Nphies-mediated exchange between payers and providers
Unified governance	Consistent data standards, stewardship rules, and accountability structures spanning organizations.	SFDA and Ministry of Health data governance mandates
Multisource evidence integration	Combining clinical, workforce, and population data into decision-relevant evidence.	Linking Mumaris+ workforce data with facility-level performance indicators
Empowered users	Clinicians and managers equipped with the training, trust, and authority to act on system-generated information.	Clinical decision support alerts integrated into physician workflow
Networked feedback loops	Mechanisms that return outcome data back into the system to refine future decisions.	Accreditation review cycles informed by longitudinal quality data

The central proposition of the LUMEN Framework is that these five components function as a chain: weakness in any single component — for example, rich linked data undermined by poor user trust, or empowered users starved of multisource evidence — constrains the decisional value of the system as a whole. The framework therefore reframes HIS investment decisions away from a narrow focus on technology acquisition and toward a balanced portfolio of infrastructure, governance, evidence integration, workforce capability, and feedback design.

An HIS is not decisional infrastructure merely because it stores data; it becomes decisional infrastructure only when linked data, unified governance, integrated evidence, empowered users, and functioning feedback loops operate together.

5. Supporting Clinical Decision-Making

At the point of care, HIS support clinical decision-making primarily through clinical decision support systems (CDSS), computerized physician order entry, e-prescribing safeguards, and integrated laboratory and radiology reporting. These tools reduce reliance on clinician memory, surface relevant patient history at the moment of decision, and generate automated alerts for drug interactions, allergy conflicts, and abnormal results requiring urgent action.

The value of these tools for patient safety is well documented in the international literature and is increasingly reflected in Saudi hospital accreditation standards, which require demonstrable evidence of electronic safety-checking mechanisms as a condition of CBAHI accreditation. Beyond safety alerts, integrated EHR data increasingly support more sophisticated clinical reasoning: longitudinal

patient records allow clinicians to track disease trajectories across multiple encounters and providers, while population-level dashboards allow specialists to benchmark their practice patterns against institutional and national norms.

Nonetheless, clinical decision support is only as valuable as the quality and completeness of the underlying data, and as the willingness of clinicians to trust and act on system-generated recommendations — a direct application of the empowered-users component of the LUMEN Framework. Alert fatigue, poorly calibrated warning thresholds, and workflow disruption remain recognized risks that can erode this trust if not carefully managed.

6. Supporting Administrative And Policy Decision-Making

Beyond the clinical encounter, HIS increasingly underpin administrative and policy decisions at the institutional and national levels. Hospital and health-system managers rely on HIS-generated dashboards to plan bed capacity, staff rosters, and procurement; to monitor quality and safety indicators required for CBAHI accreditation; and to track workforce licensure and competency data drawn from the Saudi Commission for Health Specialties' Mumaris+ platform.

At the national level, aggregated HIS data support the Ministry of Health and allied bodies in surveillance of communicable and non-communicable disease trends, allocation of health workforce and capital investment across regions, and evaluation of progress against Vision 2030 healthcare transformation indicators. The Nphies platform, by standardizing claims and eligibility data across payers and providers, additionally generates a national-scale dataset with considerable potential for utilization review, cost containment analysis, and value-based payment design.

Decision Level	Primary HIS Inputs	Representative Decisions
Clinical	EHR history, lab/radiology results, CDSS alerts	Diagnosis, treatment selection, medication safety checks

Decision Level	Primary HIS Inputs	Representative Decisions
Institutional/managerial	Quality dashboards, staffing and licensure data, accreditation records	Resource allocation, staffing plans, quality improvement priorities
National/policy	Aggregated claims data, surveillance data, workforce registries	Health workforce planning, disease surveillance response, payment policy

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. Interoperability And Regulatory Governance

The decisional value of HIS depends heavily on regulatory and governance structures that ensure data can move safely and meaningfully across organizational boundaries. In Saudi Arabia, this governance function is distributed across several bodies. The Saudi Food and Drug Authority establishes standards relevant to pharmaceutical and medical device data, including e-prescribing and traceability requirements. The Saudi Central Board for Accreditation of Healthcare Institutions embeds information management standards within its accreditation criteria, incentivizing hospitals to maintain functioning, auditable HIS as a condition of accreditation. The Saudi Commission for Health Specialties governs the workforce data that populate Mumaris+, ensuring that licensure and competency information used in staffing and credentialing decisions remains current and verifiable.

Nphies plays a distinct but complementary governance role by imposing common data exchange standards on payers and providers who would otherwise operate on incompatible legacy systems. Its emergence reflects a broader recognition, consistent with the unified-governance component of the LUMEN Framework, that interoperability is a governance achievement as much as a technical one: shared data standards, clear stewardship accountability, and enforced compliance mechanisms are preconditions for data to be trustworthy enough to underpin decisions of consequence.

8. CHALLENGES AND BARRIERS

Despite substantial progress, several barriers continue to limit the decisional value that Saudi HIS infrastructure could otherwise generate.

- ◆ Interoperability gaps: legacy systems in some facilities remain incompletely integrated with national platforms, producing fragmented patient records.
- ◆ Cybersecurity exposure: the consolidation of sensitive health data within centralized platforms increases the consequences of any security breach and requires continuously updated safeguards.
- ◆ Uneven digital literacy: variation in clinician and administrator comfort with digital tools can suppress system use even where technical infrastructure is adequate.
- ◆ Change-resistant organizational cultures: workflow disruption during HIS implementation can generate resistance that undermines the empowered-users component of decisional value.
- ◆ Data quality and completeness: incomplete or inconsistently coded data limit the reliability of dashboards and analytics used for higher-level decisions.
- ◆ Rural-urban disparities: infrastructure maturity and connectivity remain uneven across regions, constraining equitable access to HIS-supported care.

9. ALIGNMENT WITH VISION 2030 AND RECOMMENDATIONS

Vision 2030's Health Sector Transformation Program explicitly envisions a digitally enabled,

integrated, and value-based health system, positioning HIS not as auxiliary infrastructure but as a central mechanism through which the broader transformation agenda is to be realized. The analysis in this paper suggests several priorities for strengthening the decisional value of HIS going forward.

- ◆ Accelerate full interoperability between remaining legacy hospital systems and national platforms such as Nphies, closing residual data fragmentation.
- ◆ Invest in continuing digital literacy training for clinicians and managers, ensuring that system use keeps pace with technical capability.
- ◆ Strengthen data governance frameworks that specify clear stewardship, quality assurance, and accountability roles across ministries and institutions.
- ◆ Design feedback mechanisms that systematically return outcome and quality data to frontline decision-makers, closing the networked-feedback-loop component of the LUMEN Framework.
- ◆ Extend HIS-supported decision infrastructure equitably to rural and underserved regions as part of Vision 2030's equity objectives.

References

- Alharbi, T. S. J., & Ekman, I. (2020). Health information systems and the utilization of electronic health records for chronic disease management in Saudi Arabia. *Journal of Medical Systems*, 44(6), 112–120.
- Alkrajji, A. (2020). An examination of factors influencing electronic health information exchange adoption among healthcare organizations in Saudi Arabia. *International Journal of Medical Informatics*, 141, 104192.
- Aldosari, B. (2017). Rates, levels, and determinants of electronic health record system adoption: A study of hospitals in Riyadh, Saudi Arabia. *International Journal of Medical Informatics*, 84(5), 330–339.
- Almalki, M., Fitzgerald, G., & Clark, M. (2018). Health care system in Saudi Arabia: An overview. *Eastern Mediterranean Health Journal*, 17(10), 784–793.
- Donabedian, A. (2005). Evaluating the quality of medical care. *The Milbank Quarterly*, 83(4), 691–729.
- DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems*, 19(4), 9–30.
- Ministry of Health, Kingdom of Saudi Arabia. (2023). Health sector transformation strategy overview. Riyadh: MOH Publications.
- National Platform for Health Information Exchange Services (Nphies). (2023). Nphies overview and technical documentation. Riyadh: Council of Health Insurance.

10. Conclusion

Health information systems have moved from a peripheral administrative function to a central pillar of healthcare decision-making in Saudi Arabia, supporting clinicians, managers, and policymakers alike. Platforms such as Nphies, Mumaris+, and an increasingly integrated EHR ecosystem illustrate the scale of this transformation, while established models such as DeLone and McLean's IS Success Model and Donabedian's structure-process-outcome framework provide theoretical grounding for understanding when these investments translate into genuine decisional value. The LUMEN Framework proposed in this paper synthesizes these insights into an integrative model emphasizing that linked infrastructure, unified governance, multisource evidence, empowered users, and functioning feedback loops must operate together for HIS to fulfill their decisional promise. Realizing this promise fully will require sustained attention to interoperability, governance, digital literacy, and equity — consistent with, and indeed central to, the ambitions of Vision 2030's health sector transformation.

- Saudi Central Board for Accreditation of Healthcare Institutions (CBAHI). (2022). National hospital accreditation standards (5th ed.). Riyadh: CBAHI.
- Saudi Commission for Health Specialties (SCFHS). (2023). Mumaris+ digital licensing platform: User and policy guide. Riyadh: SCFHS.
- Saudi Food and Drug Authority (SFDA). (2022). Regulatory framework for health data and pharmaceutical traceability. Riyadh: SFDA.
- World Health Organization. (2021). Global strategy on digital health 2020–2025. Geneva: WHO Press.