

Orchestrating National Healthcare Transformation: A Data-Driven Model for System-Wide Productivity and Access Enhancement, Derived from the King Salman Specialist Hospital Experience

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Abstract

Background: Healthcare systems worldwide are undergoing significant structural reform driven by rising costs, demographic change, digital disruption, and increasing demand for equitable access. There is a need for a structured framework that integrates institutional performance management with national health system objectives.

Aim: This comprehensive literature review aimed to develop a data-driven National Healthcare Orchestration Model for system-wide productivity and access enhancement from the experience of King Salman Specialist Hospital (KSSH) and supported by contemporary healthcare reform literature.

Methods: A comprehensive literature review was conducted examining peer-reviewed studies and policy reports published between 2015 and 2025. Resources addressed healthcare orchestration, digital governance, value-based healthcare, and performance management. A structured analytical synthesis was applied to identify recurring structural principles and interdependencies across governance, digital systems, leadership culture, and performance metrics.

Results: The review identified core mechanisms associated with sustainable healthcare transformation, including executive-led governance alignment, real-time data transparency, and integrated performance monitoring. The findings indicated that digital infrastructure, incentive alignment, and leadership engagement function as mutually reinforcing components rather than isolated reform tools. The synthesis informed the development of a scalable National Healthcare Orchestration Model linking institutional performance systems with national policy objectives.

Conclusion: The proposed framework provides a structured foundation for institutional and national reform efforts in order to enhance productivity while securing equitable access to national healthcare records.

Keywords: Orchestration, Health Care Reform, Organisational Innovation, Productivity, Efficiency, Enhancement

1. Introduction

The global healthcare systems are experiencing a structural pressure that has never been witnessed before due to the impact of demographic change, epidemiological change, financial strain, technological change, and increased societal expectations (Yeganeh, 2019). It has been reported that the overall health care spending has been growing steadily over the past ten years in both high- and middle-income countries (Jakovljevic & Getzen, 2016). However, the lack is still recorded in the productivity, efficiency, and equitable access for the existing healthcare system, which can provide access for the existing healthcare system (Slawomirski et al., 2023). The increasing life expectancy, ageing populations, and increasing burden of chronic diseases have changed the

pre-existing patterns that have been implemented over the past several years. The current healthcare system is now experiencing a paradigm shift towards advanced and exclusive healthcare transformation in order to improve operational efficiency, financial performance, and patient outcomes long-term, coordinated (Kruk et al., 2018).

The COVID-19 pandemic also emerged as the downfall of the healthcare system, which completely shattered the national health systems of various countries (Filip et al., 2022). These preexisting systems were not linked with digital platforms, real-time surveillance, and synchronised governance, which caused delays in their process of reconstructions, resource allocation, and continuity of care delivery (Keesara et al., 2020). On the other hand, those nations that operated with digital health systems stayed

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well established, well organised, and functioning with more flexibility and resilience. The pandemic consequently increased the awareness regarding the requirement of digital modification in the healthcare system; more than incremental changes were required (Organization, 2021). Contrary, other than the hazards of COVID-19 following undercurrents were already impacting health systems long before the pandemic such as aging and growing populations. Additionally, increased non-communicable disease burden, economic inequality, reliance on outdated technology, and long-standing workforce supply and well-being issues.

Over the past few years, several countries have initiated and planned national healthcare reforms. The Health Sector Transformation Program under the Vision 2030 in Saudi Arabia is one of the most wholesome reform programs in the Middle East that entails structural clustering, redesigned Model of Care, pathways to privatisation, and digital integration programs (Chowdhury et al., 2021). Saudi Vision 2030 represents Saudi Arabia's strategic socio-economic plan that primarily aims to promote the emerging economic diversification and enhance living standards in Saudi arab. The advanced vision 2023 was launched in April 2016 and comprehensively describes an initiative for innovation in healthcare plans to improve services and outcomes (Suleiman & Ming, 2025).

In addition, Saudi Vision 2030 provides a well-organised pathway for introducing an improved public healthcare system within the country. This allows for an enabling policy and institutional environment that actively opens new pathways for orchestrating national healthcare transformation. Both frameworks are aligned with strategic governance, digital infrastructure, financing reform, and local delivery innovation under a single national roadmap. The Vision's Health Sector Transformation Program (HSTP) and the national "Model of Care" (MoC) provide a clear mandate for shifting from episodic, hospital-centred services toward preventive, primary-care-led pathways, while reorganising service delivery into health clusters that combine central oversight with regional operational autonomy (Chowdhury et al., 2021). Other than that, countries like Europe, Estonia, and Rwanda had already restructured their healthcare framework in order to shift from fragmented, reactive systems to a unified, proactive, and intelligent ecosystem that coordinates people, processes, technology, and data to deliver improved patient outcomes.

The purpose of England Integrated Care Systems (ICS) is

to decrease fragmentation in the National Health Service (NHS) by developing collaborative governance among providers and local authorities (Alderwick & Dixon, 2019; Alderwick et al., 2021). Estonia has prepared a highly interoperable digital health ecosystem based on national electronic health records and secure digital identity systems (Oja et al., 2023). Rwanda has been able to practice long-term health systems resilience by centralising stewardship, integrating community health workers, and financing on performance (Uwishema, 2023). At the same time, value-based healthcare (VBHC) programs have attempted to restore financial incentives to patient outcomes as opposed to service volume (Porter & Lee, 2015; Van Staalduinen et al., 2022).

There is an ongoing debate in the literature about the best collaboration models and their improved health care management in network and ecosystem contexts (Pikkarainen et al., 2017; Tsujimoto et al., 2018). Although valuable new research insights have been introduced, conceptual confusion still exists. Despite the fact that these initiatives and collaborative healthcare models are seen as a great step towards the National Healthcare Transformation, the literature is still conceptually insufficient to discuss the implementation of Orchestrating National Healthcare Transformation. In the majority of studies, the digital transformation, financing reform, or government restructuring were discussed. Few studies formulate the concept of national healthcare transformation as a symphony procedure that formulates governance, data infrastructure, financing, workforce development, and productivity measurement in the national strategy (Althuwaybi et al., 2025).

The emerging concept of Orchestrating National Healthcare Transformation is derived from the theory of innovation ecosystem, as it offers an effective framework in explaining the coordinated change (Pikkarainen et al., 2017). Orchestration is defined as the alignment and coordination of several independent factors to pursue mutual goals through the use of hierarchical command structures only (Harima et al., 2024; Pikkarainen et al., 2017). In addition, the orchestration engines can also effectively manage resource allocation, triage, and scheduling patient information in real time (Amanna, 2023). The Orchestrating National Healthcare Transformation has optimised the workflow by continuously learning from operational feedback, adjusting task priorities according to real-world conditions (Chattu, 2021). In many cases, the type of the orchestrator and the innovation network or

ecosystem are decisive for the emergence of specific roles (Pikkarainen et al., 2017).

1.1 Objective and Scope of the Review

This comprehensive literature review aimed to discuss the need for Orchestrating National Healthcare Transformation, which is a data-driven model to enhance the system-wide productivity and access enhancement in the Saudi Arab healthcare system. The reforms in Saudi Arabia in the Vision 2030 depict centralised strategic planning with progressive decentralisation in clusters of healthcare (Chowdhury et al., 2021). This study also motivates hospital representatives to participate in collaborative initiatives by highlighting the potential to reduce costs and improve the overall patient experience through the adoption of technological innovations.

The previous literature highlights the need to employ a sustainable healthcare transformation in order to change the existing national healthcare system. In this sense, orchestration is described as policy guidance, digital infrastructure, financing systems, workforce planning, and service delivery models in a common strategic context backed by constant performance measurement. The national orchestration model presented in the review is a data-driven model, which combines all these elements into a single architecture. This data-driven model is the conceptualisation of transformation not as a chain of reforms but as an ecosystem alignment with the help of real-time performance measurement of all medical records and progress. This combined approach goes beyond value-based healthcare and entails outcome measurement as part of national governance and digital ecosystems. It also further integrates the literature of integrated care through the incorporation of financing and productivity analytics into collaborative governance frameworks.

1.2 Study Design and Analytical Framework

This study adopted a comprehensive literature review research design. Based on developing a structured framework for national healthcare transformation derived from the documented experience of King Salman Specialist Hospital (KSSH). The methodological approach involved a systematic analysis of peer-reviewed resources, policy documentation, and strategic reports published over the period of 2015-2025. It addresses the issues of national health system reform, ecosystem orchestration, performance measurement, and digital transformation. The transformation experience of King Salman Specialist

Hospital (KSSH) is incorporated with an integrated, executive-led performance management act of managing a complex environment operating in a complicated healthcare setting. Through this comparative examination, shared structural principles were identified and synthesised into a proposed National Healthcare Orchestration Model. The study further focused on clarifying the strategic relationships among digital infrastructure, governance alignment, leadership culture, and performance measurement systems. Additionally, demonstrated how these interdependent components were collectively supported and coordinated for the sustainable healthcare transformation.

This review is primarily based on the analytical concern for the workforce transformation that is considered a structural pillar of healthcare orchestration, partly informed by accumulated experience in the operational field of the National Guard health institution in Saudi Arabia. The initiative of implementing a practitioner-level workforce transformation program at King Salman Specialist Hospital highlighted the actual issues of internationalization in the context of recruiting, credentialing, and onboarding highly-qualified professionals to a setting with high-complex healthcare. These realistic experiences have highlighted that workforce capability not only plays an administrative role but is also a core facilitator of system-level reform. As a result, this study potentially represents a combination of peer-reviewed evidence and valuable insights for healthcare practitioners regarding operational limitations of the institutional healthcare transformation procedure.

Additionally, this study was performed under the analytical perspective of operational familiarity for the processes of governance and workforce-management activities in a national healthcare institution. These processes involve the practices for projects involving international fellowship pipelines, onboarding processes, and credentialing workflows. This practitioner setting was not a primary source of data, but acted as an interpretivism guideline that analytically emphasized the concept of workforce capability as a main feature of healthcare orchestration.

2. Global Drivers of National Healthcare Transformation

There are several converging global forces that drive healthcare transformation that threaten the sustainability of current health system architectures. One of the most important causes is demographic ageing (Yeganeh, 2019). With an ageing population, the proportion of chronic, multi-morbid illnesses is extensively growing,

highlighting the need for long-term management instead of acute treatment that is provided to the general public (Kruk et al., 2018). However, it has been stated that the conventional hospital models do not fit well into advanced and adaptive trends. Therefore, it results in unnecessary hospital admissions, poor usage of resources, and rising expenditures (Theodorakis et al., 2025).

Transformation imperatives are further enhanced by economic pressures. In most OECD countries, the rate of health spending is still higher than the rate of economic growth (Publishing, 2022). With this growth of expenditure, particularly in the comparison analysis, many differences in the results among those countries that have equal amounts of expenditure point to other countries (Papanicolas et al., 2018). The rate of productivity in the healthcare sector has traditionally increased at a slower rate than in other industries due to labour intensity and regulatory complexity (Russo, 2022). Therefore, change should be targeted not only for cost management but also to improve the structural productivity of the healthcare system.

Another revolutionary force needed for the transformation of the healthcare system is technological innovation in terms of digitalisation (Sætra & Fosch-Villaronga, 2021). In terms of electronic health records, digital health platforms, artificial intelligence, predictive analytics, and telemedicine, which have enlarged the possibilities of real-time decision-making and population management in healthcare (Contino, 2019). Nevertheless, the digital adoption is not a sufficient factor that can ensure better results; there are other factors that have a major impact on the transformation. The absence of interoperability and governance integration may result in disturbance of digital systems. Research also shows that the productivity advantages of digital health depend on the fact of integration as a part of the more comprehensive approach of system reform (Adler-Milstein & Jha, 2017).

Additionally, other challenges that are also aligned are workforce dynamics. The problem of physician, nurse, and allied health professional deficit is experienced by many countries with a growing geographic disparity and burnout levels (Aiyer et al., 2025). An advanced and improved transformation is needed that involves the redesign of the workforce, digital enhancement, and the creation of new skills and patterns to convert the healthcare system into a sustainable healthcare system (Al-Hanawi et al., 2019). There are also equity implications that support the reasoning of coordinated transformation. The presence

of persistent gaps in access and outcomes of healthcare across socioeconomic and geographic populations poses a threat to the functioning of health systems (Saadati, 2025). The quality of health systems should focus on equity and efficiency to eliminate the escalation of inequalities (Kruk et al., 2018). All these forces, together, require a national strategy of transformation to collectively oppose the gradual reforms.

3. Existing National Healthcare Transformation Models

3.1 Saudi Arabia's Health Sector Transformation Program

The Vision 2030 agenda in Saudi Arabia presented a Health Sector Transformation Program to be implemented to reform governance, funding, and service delivery. The major concern of this initiative is to create healthcare clusters that will decentralise the healthcare services, but at the same time ensure strategic oversight across the country (Chowdhury et al., 2021). The Model of Care focuses on preventive services, strengthening primary care, and patient-centred pathways. Empirical literature assessing the initial stages of the change shows that professionals in healthcare are more conscious, and the structure is reorganised to provide integrated care delivery (Althuwaybi et al., 2025). Workforce development is another important aspect, which can eliminate the decades-long dependence on the expatriate professionals and help to strengthen the capacity of the nation (Al-Hanawi et al., 2019). Nevertheless, structural reforms are extensively documented, but long-term productivity and access outcomes still need to be further systematically evaluated.

3.2 England's Integrated Care Systems

Integrated Care Systems (ICS) were introduced by the NHS Long Term Plan to minimise the disintegration of the health and social care sectors of the English healthcare system (NHS England, 2021). ICS structures involve commissioners, providers, and local authorities working together to plan and coordinate resources in order to improve and advance the healthcare protocols. The results of policy analyses show the possibility of positive outcomes through collaborative governance and population health management (Alderwick & Dixon, 2019).

However, financial responsibility complexities and the barrier of sharing data are some of the challenges involved in implementation. Research has shown that though integration enhances coordination, quantifiable productivity gain is based on digital interoperability and

aligned incentives (Lørum, 2023).

3.3 Estonia's Digital Health Ecosystem

The health system transformation in Estonia is founded on the integration of digital infrastructure. Real-time access to patient information across providers is only possible because of the implementation of national electronic health records that secure digital identity systems and interoperable data exchange platforms (OECD, 2023). It can be seen that in the case of the transition of Estonia to standardised data models, digital backbone infrastructure carries out the functions of policy analytics and data coordination of services (Oja et al., 2023). As the example of Estonia demonstrates, digital integration can make the entire system change, but the aspects of scalability vary when it involves a larger population.

3.4 Rwanda's Health System Strengthening

The transformation model of Rwanda is focused on the centralised stewardship, community networks of health workers, and performance-based financing. In the last ten years, covering and improving health outcomes in Rwanda have made significant progress due to national-level planning (Uwishema, 2023). As a result, the implementation of the Orchestration healthcare transformation will surely be effective in increasing access and equity, as shown through the combination of community-level services and national structures of governance.

3.5 Workforce Pipelines and Organisational Capability in National Transformation

Although national healthcare transformation models majorly emphasise on governance reform, digital infrastructure, and financing redesign, workforce capability is often treated primarily as a contextual constraint rather than as a strategically designed mechanism of transformation. Similarly, the literature in human resources for health increasingly highlighted that sustainable reform required extensive workforce development that integrates recruitment, training, professional integration, and long-term capacity building (Al-Hanawi et al., 2019). On the other hand, employee transitions across different health sectors further complicate the transformation efforts. Internationally recruited professionals frequently face delays in credential recognition, institutional onboarding, and adaptation to local clinical governance frameworks. Consequently, workforce strategies increasingly extend recruitments toward structured preparation mechanisms

that support professional integration and operational readiness.

Therefore, the operational experience within the National Guard health system provides an illustrative example of this approach. Practitioner-developed initiatives have explored structured fellowship partnerships with international academic institutions, internship programs designed to familiarize professionals with the operational environment of King Salman Specialist Hospital, and digital tools aimed at streamlining credential documentation and verification. These mechanisms suggested that workforce development design not only assisted in administrative recruitment strategies but also acted as an enabling component for broader healthcare transformation. Additionally, these results showed that workforce strategies should be considered a structural element of healthcare orchestration. It further shapes the capacity of governance reforms and digital infrastructures that support improvements in healthcare delivery.

3.6 Value-Based Healthcare Initiatives

All the existing national health care systems further require value-based healthcare initiatives to ensure financial and patient results that should be met without excessive attention to extensive services provided (Porter & Lee, 2015). According to scoping reviews, it is increasingly being adopted in Europe and North America, but implementation is heterogeneous (Van Staaldunin et al., 2022). Although VBHC enhances outcome measurement and accountability, its effectiveness is reliant on its combination with governance and digital infrastructure.

4. Comparative Analysis of National Transformation Approaches

Though several nations have proceeded to take vigorous health system reform agendas, the change strategies vary significantly in the scope, sequence, and disposition of transformation. The comparative synthesis of Saudi Arabia, England, Estonia, Rwanda, and systems of value-based healthcare has provided insights into similarities and structural loopholes.

The Transformation Program of the Health Sector of Saudi Arabia is a centrally organised reform program, which is based on plan-based national planning and gradual decentralisation via healthcare clusters (Chowdhury et al., 2021). The formation of semi-autonomous clusters is designed to enhance efficiency in the operations and

national policy coherence. This framework is similar to a mixed form of governance by integrating central coordination and regional responsibility. Nevertheless, the empirical assessment indicates that the restructuring of governance is advanced and requires extensive change on both personal and professional levels. Thus, detailed productivity measurement regimes are yet to be developed (Althuwaybi et al., 2025). Furthermore, the integration of digital infrastructure, despite its growth, can use more interoperability standardisation to accommodate real-time national performance patterns.

England offers a different example of collaborative governance that has been incorporated into a long-standing universal health system in terms of its Integrated Care Systems. ICS models have been made to be effective by allowing service providers and local government to come together to address the population health (England, 2021). In spite of the focus of policy documents on integration, independent research shows financial alignment and data-sharing mechanisms to be still uneven across the regions (Alderwick & Dixon, 2019). The difficulties around national NHS policy coordination with local autonomy are an example of how difficult change coordination is within established systems, which are often clustered and destroy the institutional cultures.

The integration of infrastructure has the facilitating role of digital-first transformation in Estonia. In contrast to other governments that focused on securing digital identity systems and building interoperable electronic health records after structural reform, Estonia focused on these two systems as the backbone infrastructure (OECD, 2023). The conversion of the national datasets into standardised models, including the OMOP Common Data Model (Oja et al., 2023). Nonetheless, the relatively small population of Estonia and the government, which is purely centralised, prevents direct generalisation to larger and more decentralised nations.

Rwanda is another model that is based on centralised stewardship and community integration. Post-conflict reconstruction in Rwanda focused on the development of primary healthcare, performance-based financing, and networks of community health workers (Uwishema, 2023). In addition, in the new healthcare system, the coverage and mortality reduction have been proposed to have improved in the last ten years. The example of Rwanda shows that balanced and updated coordination does not always demand highly technological infrastructure in the early phases, but sound governance alignment and an accountability

system may create change even in a situation with limited resources. However, the sustainability that is required in the long term will rely more on digital integration and data governance.

Another aspect of change is represented by value-based healthcare projects. VBHC resolves the issue of poor compensation between payments and patient value by changing incentives to focus on volume to outcome (Porter & Lee, 2015). According to scoping reviews, the use of VBHC has grown beyond the US, although the applications of VBHC are still limited to certain clinical pathways and not the entire overhaul of the systems (Van Staalduinen et al., 2022). VBHC will face the risk of remaining a single financing reform approach and not a holistic transformation framework unless integrated into a wider governance system and digital structures.

In these instances, there are three themes that keep recurring in the transformation procedure of the healthcare system, such as governance alignment, productivity in infrastructure, and reform financing. Comparative analysis of the existing national healthcare system highlighted the necessity of a combined orchestrating national healthcare transformation for system-wide productivity and access enhancement. As this model aligned with governance, digital infrastructure, financing, workforce development and equity safeguards to a concerted national strategy.

5. Theoretical Foundations of Healthcare Orchestration

Healthcare systems are complicated when it comes to adaptive systems with nonlinear relations between various factors (Braithwaite et al., 2017). The systems theory lays stress on interdependence: transformations within a given subsystem produce an effect in the other subsystem. Dynamic systems such as Orchestrating National Healthcare Transformation need adaptive governance, continuous feedback loops, and performance metrics to evaluate the change (Publishing, 2022). In this regard, orchestration does not mean centralised micromanagement but, on the contrary, staged consistency ensured by the transparency of data. All these theoretical bases bring together the idea of orchestration in the form of a systematic coordination between subsystems that are upheld by ongoing information-driven control.

5.1 Innovation Ecosystem Theory

Innovation ecosystem theory provides valuable insights. Ecosystems are composed of a group of semi-autonomous actors whose concerted effort produces shared

value (Pikkarainen et al., 2017). Examples of ecosystem players in healthcare are the ministries of the populace, the private providers, the insurers, the digital vendors, the academic institutions, and the civil society. Orchestration entails setting up of similar objectives, incentive alignment, and information and interdependence management.

5.2 Value-Based Healthcare Theory

The value-based healthcare theory brings a normative element of defining value by specifying health outcomes relative to cost (Porter & Lee, 2015). Nonetheless, an operational scale depends on the national level of coordination rather than on the independent provider initiatives. The key performance indicators of productivity should include capturing the outcome indicators, cost, and equity indicators.

5.3 Theory of Digital Transformation

The theory of digital transformation focuses on such enablers as interoperability, data governance, and analytics capacity to support strategic decision-making

(Adler-Milstein & Jha, 2017). It has been shown that the adoption of health IT leads to improvements in quality only in cases when the use of the latter is incorporated into workflow redesign and alignment of incentives (Cristina, 2019). Thus, the digital infrastructure is seen as a sufficient but necessary condition of change.

Additionally, the complementary perspective emerges from workforce capability theories, further clarifying the relationship between governance, digital systems, and organisational performance. Workforce capability theories explained in this review transform strategies and technologies into operational outcomes that depend fundamentally on the knowledge, skills, and adaptive capacity of the professionals delivering care. In ecosystem terms, workforce capability functions as the mechanism through which orchestration becomes operational, enabling coordination between governance decisions, technological systems, and clinical practice.

Figure 1 shows the theoretical framework for Orchestrating National Healthcare Transformation.

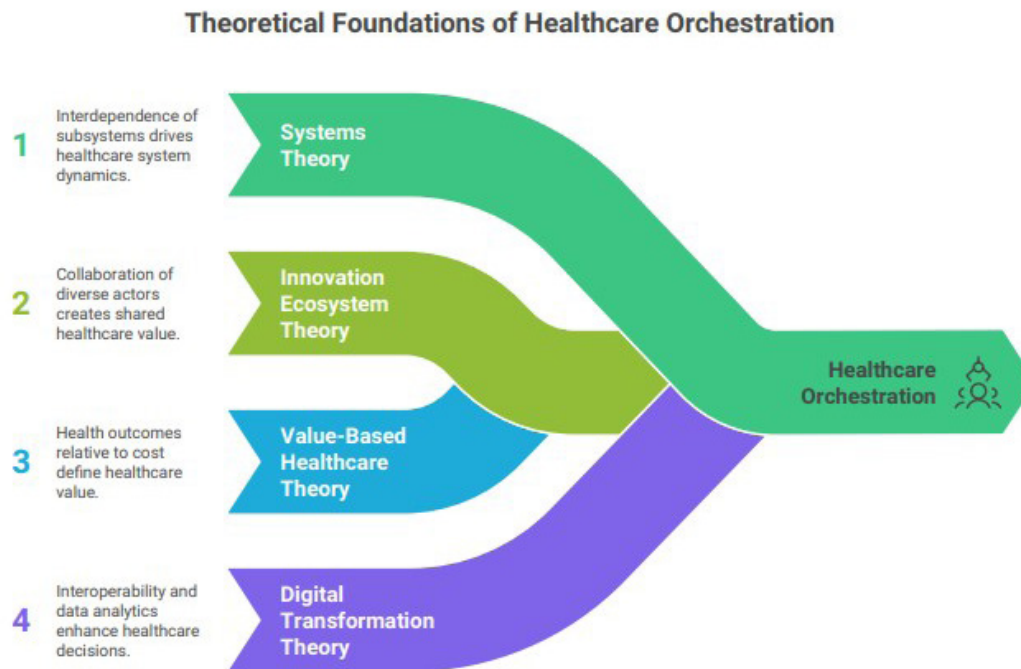


Figure 1. Theoretical Foundation of Orchestrating National Healthcare Transformation

6. Data-Driven National Healthcare Orchestration Model

Based on comparative evidence and theoretical evaluation, the proposed study is a Data-Driven National Healthcare Orchestration Model that optimises system-

wide productivity and equal access. This model is structured around 6 pillars, which are interdependent and are entrenched in a centralised data governance architecture. Additionally, all these pillars do not work sequentially but in a synergistic way. They are all independent of each other

as the digital investment and financing reform is made possible with governance alignment, financing reform, and workforce adaptation. Thus, workforce transformation with productivity, and inclusiveness with performance feedback make it a continuous improvement.

6.1 First Pillar: Strategic Governance Alignment

The first and foremost pillar is the strategic alignment of governance. The national leadership should present explicit transformation goals that are related to quantifiable productivity and equity deliverables. The structure of governance must define positions within the ministries, regions and providers as well as maintain accountability systems. The examples of Saudi Arabian and Rwandan healthcare systems explain the need to implement high central stewardship and decentralised operational flexibility in the existing national healthcare systems (Chowdhury et al., 2021; Uwishema, 2023).

6.2 Second Pillar: Digitalisation

The second pillar is the focus on the integration of digitalisation in medical records. The basis of performance analytics is the interoperable electronic health records, standard data models, and secure digital identity systems. The examples of the digital transformation in Estonia demonstrate the use of national data platforms to conduct policy review and monitor it in real-time (Oja et al., 2023). The required expansions should be accompanied by interoperability standards and cybersecurity safeguards.

6.3 Third Pillar: Financing and Incentive Realignment

The third pillar defines the importance of financing and incentive realignment. The payment systems should be compensated on results, prevention, and care coordination instead of the volume of services provided. The models can promote integration through value-based reimbursement models, bundled payments, and population-based financing mechanisms (Van Staaldin et al., 2022). Financial reform should be aligned with data systems that can gauge results effectively.

6.4 Fourth Pillar: Workforce Transformation

The fourth pillar is dedicated to the transformation of the workforce. Efforts to finance and adopt digital necessitate a synergistic approach to the workforce. Sustainable transformation depends on investments in training and digital literacy, as well as leadership capacity (Al-Hanawi et al., 2019). Redesigning the workforce

between disciplines and task reallocation should receive a focus so as to maximise productivity.

6.5 Fifth Pillar: Access and Equity Safeguard

The fifth pillar values the protection of access and equity. Geographic inequalities, waiting, and outcome inequities should be tracked on national dashboards. Any effective system should follow good-quality health with efficiency and equity of service distribution (Kruk et al., 2018).

6.6 Sixth Pillar: Performance Feedback Loops

Continuous performance feedback loops are implemented in the sixth pillar. Having national health dashboards that combine cost, outcome, and utilisation data allows positive policy changes. The experience of OECD countries proves that transparency and benchmarking enhance accountability of the system (Publishing, 2022). Figure 2 depicts the sixth pillar of the Orchestrating National Healthcare Transformation model discussed in this comprehensive literature review.

Practitioner Illustration: Orchestration Mechanisms at King Salman Specialist Hospital

The orchestration pillars described above can also be observed in institutional initiatives undertaken within the King Salman Specialist Hospital context. For instance, digitalisation efforts have included the development of recruitment platforms designed to collect and verify professional credential documentation before staff deployment. Workforce transformation initiatives have also explored structured onboarding processes aligned with the hospital's operational environment in order to reduce the gap between professional qualification and institutional readiness. Additionally, HR capacity assessments evaluating operational workflow efficiency provide a mechanism for monitoring organisational performance and workforce deployment capability. These initiatives are not presented as validated empirical outcomes but rather as practitioner-level illustrations of how orchestration principles may be successfully implemented in a real institutional setting.

7. Implementation Roadmap for Data-Driven National Orchestration

Although conceptual models offer theoretical clarity, national healthcare change needs a systematic implementation roadmap that can overcome political,

Data-Driven Healthcare Orchestration



Figure 2. Step of the Data-Driven National Healthcare Orchestration Model

institutional, and operational complexity. The experience of massive reforms indicates that sequencing and alignment are essential factors of success (Berwick, 2016; Frenk et al., 2019). According to the comparative analysis and the systems theory, the proposed orchestration model can be operationalised by means of the gradual implementation and keeping the inter-pillar alignment. Thus, the development of digital infrastructure can be initiated at the same time as the governance alignment and workforce transformation should be implemented during the process of reform. The orchestration model is thus the sequencing of constructive action as opposed to step progression.

7.1 First Stage

The first stage involves strategic alignment on the national level. The transformation should be embedded in the legally endorsed national strategy that permanently shows quantifiable productivity, quality, and equity targets. In the absence of clear outcome targets, transformation will degenerate into administration restructuring without performance accountability. Both the NHS Long Term Plan and the Saudi Arabia Vision 2030 show that it is essential to formulate multi-year strategic goals that are connected with various indicators that can be measured

(Chowdhury et al., 2021; England, 2021). The national transformation authorities must therefore integrate performance frameworks that embrace cost, outcome, and access measures.

7.2 Second Stage

The second stage includes consolidation through a digital platform. The digital transformation is not only for the upgrade of technology but also for the development of advanced and digitalised infrastructure. The transparency in performance after digitalisation of medical records presupposes interoperability standards, cybersecurity protection, and uniform data models (OECD, 2023). Nevertheless, workflow redesign should be implemented simultaneously with the digital adoption to ensure that there is no further increase in the administrative burden (Alderwick & Dixon, 2019).

7.3 Third Stage

The third stage focuses on funding and motivation coordination, which is an important contribution by the higher authorities. All the reforms on payment should be aligned with digital capabilities to measure outcomes appropriately. Orchestrating National Healthcare

Transformation, which is a data-driven model for system-wide productivity and access enhancement. Also, involves the use of strong data infrastructure to monitor the clinical outcomes, patient-reported measures, and the use of costs (Van Staalduinen et al., 2022). Integration may be affected due to a fragmented system of poor financing strategies, where volume is encouraged at the expense of coordination. Consequently, population-based funding and shared savings schemes with alignment to the measurable health outcomes should gradually replace the national transformation strategies towards bundled payments.

7.4 Fourth Stage

The fourth stage focuses on the change of workforce and culture. Healthcare professionals are major players in transforming workforce ecosystems and their working cultures. Sometimes, the initiatives are unsuccessful because the frontline professionals consider the policy initiatives as a non-essential force that imposes a mandate that is not operationally relevant (Braithwaite et al., 2017). Thus, the engagement of change in the workforce and existing culture needs to be employed in leadership

training, digital literacy, and models of multidisciplinary collaboration. The case of workforce nationalisation in Saudi Arabia helps understand that the human resource policy should be aligned with the transformation objectives of orchestrating national healthcare transformation (Al-Hanawi et al., 2019).

7.5 Fifth Stage

The fifth phase is a continuous check on the performance feedback. Adaptive governance is possible with the help of national dashboards that combine utilisation, outcome, cost, and equity data. According to OECD analyses, performance transparency promotes accountability and cross-regional benchmarking (OECD, 2022). Correct and timely feedback mechanisms should be used in facilitating the changes of policies in repetition without any delays. The new and improved models emphasise the adaptive systems' need to undergo learning cycles instead of having strict policy patterns (Braithwaite et al., 2017). Figure 3 describes the fifth stage of the cycle for the implementation of a data-driven healthcare orchestration model in the national healthcare system.

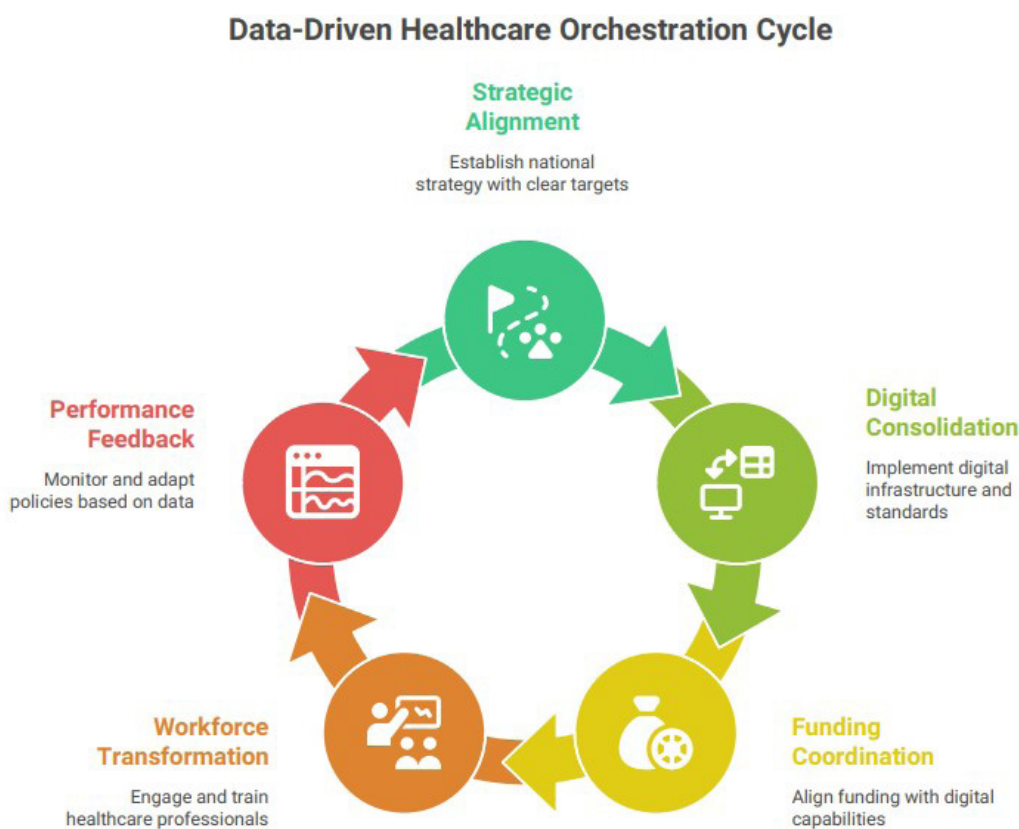


Figure 3. Implementation Roadmap of Orchestrating National Healthcare Transformation

8. Measuring System-Wide Productivity and Access

One of the main aims of national orchestration is to be productive and protect equitable access. It also offers actionable components for governance, technology adoption, leadership development, and cultural transformation for the national healthcare system. Nevertheless, healthcare productivity is a complex methodology. Contrary to other manufacturing industries, the healthcare system requires strong and dominant multidimensional policies that support quality work. Traditional productivity indicators that only consider the cost per service incentive encourage under-provision or compromise in quality (Cylus et al., 2016).

The overall productivity measurement has to incorporate three dimensions, which include technical efficiency, allocative efficiency, and quality-adjusted results. Technical efficiency is the idea of ensuring that outputs are maximised with the use of inputs, whereas allocative efficiency deals with the distribution of resources among the services and populations (Cylus et al., 2016; Smith, 2009). Quality-adjusted productivity extends outcome measures to make sure that value is created but not volume growth.

International expenditures indicate a very wide range of health expenditures as compared to health outcomes. Indicatively, the United States has high expenditures on a per-capita scale as compared to the rest of the high-income nations without commensurate population health improvements (Papanicolas et al., 2018). These findings highlighted the importance of an advanced national data-driven health care system that could combine expenditure, utilisation, and outcome data.

Access measurement should also be beyond the insurance coverage rates. The dimensions of access of importance include timeliness, geographic distribution, waiting times, and service affordability (Kruk et al., 2018). Digital media can be used to improve transparency by monitoring the real-time waiting time and service availability in various regions.

Performance evaluation can be further enhanced with the introduction of patient-reported outcome measures (PROMs) and patient-reported experience measures (PREMs). VBHC initiatives show that outcome measurement systems enhance accountability and collaborative decision-making (Porter & Lee, 2015). Nonetheless, a standardised data infrastructure and privacy protection are required to nationalise PROMs.

9. Application of the Orchestration Model: Practitioner Evidence from KSSH

The operational initiatives that have been discussed in this study, within the context of King Salman Specialist Hospital, offered a practitioner-level standard guideline on how the proposed orchestration model can be implemented in realistic settings. While such initiatives do not represent a formal empirical case study, they recommend a pattern in which the transformation of the workforce relates to the structure of governance, digital infrastructure, and performance management systems.

From a governance perspective, institutional initiatives such as the formation of international academic partnerships and advanced training pathways are seen to be strategic in nature, with a connection to broader national workforce development goals. These initiatives are aimed at building institutional capability in support of long-term national goals, coming with healthcare transformation with Saudi Arabia's Vision 2030. The digitalisation mechanisms are also important in the processes of workforce deployment. Digital recruitment platforms and credential verification tools have been discussed as a way around the administrative delays that are usually associated with international workforce integration. By allowing the earlier verification of professional documentation and licensing requirements, such systems may help translate workforce policy to deployable clinical capacity more efficiently.

Workforce transformation is the visible part of these initiatives. Structured fellowship pathways, internship programmes linked with institutional clinical environments, and the focus on onboarding frameworks aim to minimise transition periods between professional qualification and operational readiness in the hospital setting. Additional initiatives, such as HR operational capacity assessments, provide guidelines for monitoring the efficiency of the deployment of the workforce and identifying organisational bottlenecks that may affect healthcare delivery.

Collectively, these practitioner-level initiatives showed the potential interactions between transformation mechanisms at the job market level, such as workforce transformation, and alignment between governance, digital infrastructure, and monitoring of performance systems. While systematic empirical evaluation is still necessary, this example leads to the hypothesis that workforce capability must no longer be conceived as a supporting administrative function, but as a key operational mechanism that makes healthcare transformation a reality in practice.

10. Implementation Challenges

The implementation of national healthcare transformation occurred with several implications, challenges, and barriers. The transformation of national healthcare faces both political and institutional as well as operational opposition. Political turnover can have a disruptive effect on the continuity of reform, especially in decentralised systems. Income constraints to digital infrastructure investment are posed by the fact that the digital infrastructure requires investment, which is particularly limited in the middle-income environment. One constant obstacle is data interoperability. The barrier to integration is legacy systems, vendor proprietary platforms, and unintegrated standards. The threat of cybersecurity increased the centralisation of data even more, which essentially needs very strict regulation for the protection of national healthcare records. Resistance to change among the workforce is also a major problem. The initiatives causing burnout and disengagement require extensive, transformational efforts, time, and resources that add more administrative burden without a clear clinical benefit. Furthermore, the digital transformation can be unintentionally discriminatory against those populations that are not digitally literate and have no access to electronic infrastructure.

11. Policy Implications

This comprehensive literature review discussed that the change in the healthcare system, specifically at the national level, must be organised and coordinated and cannot be achieved through solitary reform projects. The policymakers are advised to focus on combined governance frameworks that can align financing, digital infrastructure, labour enhancement, and equity surveillance. However, the basic infrastructure is an investment in interoperable digital backbone systems. Nevertheless, the digital adoption should be integrated into incentive realignment and capacity-building of the workforce. Adaptive governance and cross-regional benchmarking should be guided by transparent performance dashboards. International cooperation can enable the sharing of knowledge and benchmarking of different health systems.

Additionally, the workforce recruitment, integration, and retention should also be incorporated directly into national healthcare orchestration strategies rather than being managed and operated separately. Fragmented workforce planning frequently reduces the broader initiatives by delaying their implementation of governance reforms into

operational healthcare capacity. Structured educational partnerships, international fellowship pipelines, and coordinated onboarding frameworks can help professionals to prepare before recruitment. As it reduces the integration gap that often limits workforce deployment efficiency. Similarly, improvements in credential recognition systems and digital recruitment platforms may reduce administrative constraints associated with international workforce mobility. Aligning workforce strategies with national transformation objectives, including localisation and capability development goals, represents an essential component of sustainable healthcare system reform.

12. Future Research Directions

Although the literature on national healthcare transformation is expanding, important gaps remain that require further empirical investigation. There is a clear need for longitudinal studies that examine whether large-scale transformation initiatives lead to sustained improvements in productivity and system performance over time. Much of the current evidence emphasises structural reforms such as governance redesign or digital system implementation rather than measurable changes in costs, service utilisation, clinical outcomes, and equity indicators. Long-term evaluation using integrated datasets that combine financial, operational, and outcome measures is essential to determine whether transformation efforts produce durable value rather than short-term operational gains.

Additionally, the comparative cross-national research also remains limited. Existing case studies provide valuable insights into individual country experiences; however, systematic comparisons across different income levels and governance structures are still underdeveloped. Therefore, broader comparative analyses are needed to identify which elements of orchestration are context-specific and which can be generalised across diverse health systems. The governance of digital transformation presents another critical research priority highlighted in this comprehensive literature review. As artificial intelligence and predictive analytics become increasingly embedded in national health planning and resource allocation, concerns related to algorithmic transparency, accountability, and bias mitigation require careful examination. Future studies should explore regulatory frameworks that can ensure responsible data use while maintaining efficiency gains. The balance between data-driven productivity enhancement and protection of equity represents a particularly important

area for ongoing inquiry.

Workforce transformation also warrants deeper investigation. Healthcare professionals play a central role in implementing reform, and changes in digital systems, financing models, and governance structures may significantly influence professional identity, workload, and job satisfaction. Understanding how orchestration strategies affect organisational culture and staff well-being is essential for ensuring sustainable transformation. Advancing these research priorities will require interdisciplinary collaboration across health economics, governance studies, digital ethics, and organisational research. Strengthening the empirical foundation in these areas is critical for guiding future efforts to orchestrate sustainable national healthcare transformation.

13. Theoretical Contribution

This comprehensive literature review should be considered a massive contribution to the research on health systems, as it combines the ecosystem orchestration theory with the literature on healthcare transformation. Past research has focused on individual aspects, including digital health modernisation (Adler-Milstein & Jha, 2017), value-based funding (Van Staaldunin et al., 2022), or combined governance (Alderwick et al., 2021). The concept of change of the health care system as data-driven orchestration bridges the gap between systems theory, complexity science, and innovation ecosystem governance (Braithwaite et al., 2017; Pikkarainen et al., 2017). The model recognises healthcare as an elaborate adaptive ecosystem that needs to be synchronised and not only implemented. Moreover, the adaptation of efficiency in measuring productivity and equity protection moves normative discussions of efficiency and equity.

14. Conclusion

This comprehensive literature review discussed the updated evidence and suggested a data-based model of national orchestration that aimed to increase the productivity of the healthcare system and accessibility. Orchestrating the National Healthcare Transformation model allows strategic governance alignment, interoperable digital infrastructure, realignment of incentives, transformation of the workforce, equity monitoring, and on-the-fly performance feedback to be combined into a single framework. This study advanced a consistent analytical basis for future research and policy formulation by understanding the concept of transformation as ecosystem orchestration. The evidence synthesised in

this review demonstrated that sustainable system-wide improvement now requires coordinated alignment across governance, digital infrastructure, financing mechanisms, workforce capacity, and performance measurement. Fragmented interventions may produce localised gains; however, stable transformation depends on structured orchestration that integrates these components within a unified national framework. However, the introduction of sustainable healthcare transformation is therefore not a matter of isolated reform, but of coordinated, data-driven system redesign capable of delivering measurable value at scale. Governance reforms, digital infrastructure investments, and financing redesign can only generate improved system improvement. The findings underscored in this review suggested that initiatives such as structured workforce pipelines, credentialing reforms, and institutional onboarding frameworks may serve as practical mechanisms through which orchestration principles are operationalised. However, the understanding of the healthcare transformation acts as a coordinated ecosystem process by highlighting the importance of integrating governance, technology, financing, and workforce capability within a unified strategic architecture. Future research should further evaluate how these interdependent components interact across diverse health system contexts.

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