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Navigating The Challenges of Health Information Systems in The Saudi Healthcare System

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Abstract

The adoption of Electronic Medical Records (EMR) systems in Saudi Arabia is a critical component of the nation's Vision 2030 healthcare transformation agenda. Despite significant progress in digitizing healthcare delivery, the implementation of EMR systems faces multifaceted challenges. This comprehensive literature review explores the technical, financial, human, cultural, and policy-related barriers, as well as privacy and security concerns, that impede the successful adoption of EMR in the Saudi healthcare context. The review also highlights the systemic challenges surrounding medical coding, including workforce readiness, technological infrastructure, and regulatory coherence. Success stories and case studies offer valuable insights into effective EMR deployment strategies, emphasizing strong leadership, user engagement, vendor support, and culturally attuned implementation approaches. Emerging trends, such as the integration of artificial intelligence, telemedicine, and blockchain technologies, present promising opportunities to enhance EMR functionality and trust. To realize the full potential of EMR systems, a holistic and coordinated approach is necessary, aligning technological innovation with human factors, policy reform, and cultural sensitivity. By addressing the identified barriers and building on current research, Saudi Arabia can achieve a digitally empowered healthcare system that delivers efficient, equitable, and patient-centered care in line with its national vision.

Keywords: Saudi Arabia, Medical Coding, EMR, Electronic Medical Records

Introduction

Amid the ongoing digital transformation, the transition from conventional paper-based health records to electronic medical records (EMR) signifies a profound advancement in healthcare delivery. EMRs, which digitize patient medical histories, facilitate rapid access to clinical information, thereby improving care coordination and operational efficiency—markedly differing from the restricted accessibility inherent to paper records. This digital shift is a cornerstone of healthcare modernization on a global scale, with the Kingdom of Saudi Arabia (KSA) emerging as a regional leader in this domain as part of its Vision 2030 healthcare objectives (A. Alhur, 2023).

The deployment of EMR systems in KSA is essential for achieving the targets set by Vision 2030, underscoring the nation's commitment to leveraging technological innovation to elevate healthcare standards. Nevertheless, this transformation is accompanied by distinct challenges and prospects shaped by the country's unique healthcare infrastructure, socio-cultural dynamics, and technological environment.

Central to this digital healthcare evolution are initiatives such as telemedicine, health information exchange, and mobile health platforms, which are pivotal in enhancing patient care, optimizing efficiency, and achieving cost reductions. Research conducted by Alzghaibi et al. in 2023 underscores the significance of electronic health records (EHRs) in improving patient outcomes, streamlining healthcare processes, and minimizing expenditures, thereby highlighting the critical role of digital records in advancing healthcare systems.

Public perceptions in Saudi Arabia regarding expanded community pharmacy services (ECPSs), as investigated by Alghamdi et al. (2023), shed light on the broader context of healthcare digitalization. The findings reveal a generally favorable outlook but also identify notable obstacles, including concerns about privacy and challenges in communication with healthcare professionals.

Personal health records (PHR), which represent an extension of EMR, are instrumental in contextualizing the broader landscape of EMR adoption. The study by Alanazi et al. (2023) demonstrates a strong intention among Saudi patients to utilize PHRs, though persistent apprehensions about privacy and the accuracy of information remain. These observations are consistent with the results reported by Alhur in 2022, further substantiating the prevailing trends in patient attitudes towards PHR adoption.

Moreover, the integration of telehealth services with EMR systems constitutes a vital component of digital healthcare. Evidence suggests a substantial willingness and positive attitudes toward telehealth within Saudi Arabia, indicating an increasing acceptance of this technology in the healthcare sector. Research by Wali et al. (2023) in Jeddah, Saudi Arabia, evaluating clinicians' perceptions and satisfaction with telehealth integrated with electronic medical records (EMR), reported high satisfaction with virtual consultations, although barriers such as patients limited technical competence and access to digital resources persist.

Investigations into digital health literacy and online health information-seeking behaviors among the Saudi population by Alhur et al. (2023) highlight the critical role of digital literacy in healthcare, emphasizing the necessity for enhanced digital health literacy to ensure the effective implementation of EMR systems.

The COVID-19 pandemic has accentuated the importance of public health informatics in crisis management. Analyses of the COVID-19 dashboard in KSA demonstrate the essential role

of digital platforms in disseminating and visualizing health data, which is vital for the successful adoption of EMR systems (A. A. Alhur, 2023).

Finally, the incorporation of artificial intelligence (AI) in healthcare, particularly within mental health services, represents a significant dimension of digital transformation. Studies examining the knowledge and attitudes of Saudi individuals towards AI-enabled tele-mental health services reveal both potential challenges and opportunities related to the adoption of AI in EMR systems.

This paper seeks to undertake a comprehensive literature review centered on the challenges associated with EMR adoption in KSA. By exploring technical, financial, human, cultural, and policy-related obstacles, as well as privacy and security concerns, this review aims to deliver an in-depth understanding of the factors impeding EMR implementation in the Saudi healthcare context. The overarching objective is to provide insights that can support policymakers, healthcare practitioners, and stakeholders in formulating effective strategies for the successful integration of EMR, thereby advancing the healthcare delivery system in KSA in alignment with Vision 2030.

Technical barriers

Recent scholarly investigations have yielded significant insights into the technical challenges associated with EMR adoption in Saudi Arabia. Almazroi et al. (2022) carried out a foundational empirical study that explored the determinants influencing the uptake of eHealth services, including EMR systems. Their research extended the traditional technology acceptance model by integrating factors such as trust, privacy, and system quality, highlighting the considerable influence of perceived usefulness and privacy concerns on the adoption of eHealth solutions. This research offers valuable direction for healthcare policymakers in Saudi Arabia, providing a framework for optimizing the advantages of eHealth services (Almazroi et al., 2022).

In a similar vein, Alateyah's 2014 study concentrated on the evolution and broad implementation of e-government services within Saudi Arabia, which closely mirrors the challenges encountered in eHealth initiatives like EMR. The study identified critical elements such as trust, privacy, security, and cultural considerations, all of which are equally relevant in the context of EMR adoption. These findings present a comprehensive model that could assist the Saudi government in addressing public apprehensions regarding the utilization of online services, including EMR platforms.

Moreover, the research conducted by Alssbaiheen and Love in 2015 on the adoption of m-government services in Saudi Arabia—specifically by the Ministry of Higher Education and the Technical and Vocational Training Corporation—uncovered comparable obstacles. Their findings pointed to barriers such as insufficient infrastructure and a limited understanding among students, which are reflective of the challenges faced in the implementation of EMR systems.

Additionally, Alsharif's 2020 review of the National eHealth Strategy in Saudi Arabia introduced an integrated eHealth framework designed to enhance the management of healthcare operations during pandemics. The review identified perceived deficiencies in the existing eHealth framework and emphasized the necessity for additional elements centered on information management and stakeholder engagement, both of which are highly relevant to addressing the challenges of EMR adoption (Alsharif, 2020).

Financial barriers

Recent research has expanded the understanding of the financial obstacles related to EMR adoption in Saudi Arabia, offering perspectives that extend beyond those presented by AlGhamdi et al. (2015) and Alqahtani et al. (2015). A significant 2023 study conducted by a group of researchers examines the economic implications of implementing electronic attendance systems within the healthcare sector, drawing parallels to the deployment of EMR systems. This investigation highlights the advantages of digital integration in healthcare, particularly in terms of cost savings and more effective resource management—factors that are equally pertinent to the successful implementation of EMR systems.

Aljohani's (2018) study on the adoption of health information technology (HIT) related to EHRs/EMRs provides a comparative evaluation of private and public hospitals in Saudi Arabia. The research emphasizes the capacity of EHRs/EMRs to lower medical expenditures while also discussing the obstacles encountered during implementation, with a particular focus on interoperability issues. The findings from this study are particularly relevant for EMR adoption, as they underscore the importance of establishing a unified health information system to address these challenges.

Moreover, the study by Aleid et al. (2023) identifies barriers to accessing neurosurgical services in Saudi Arabia, concentrating on financial limitations and extended waiting periods for appointments. The insights from this research shed light on the financial barriers present within healthcare services, which can be extrapolated to the difficulties encountered in EMR implementation, especially regarding cost-related challenges and the allocation of resources.

In addition, Al-Baity's comprehensive review (2023) of the AI revolution in digital finance in Saudi Arabia provides important perspectives for the healthcare sector. The review introduces a framework for the advancement and integration of AI into the financial sector, emphasizing the potential of AI to improve financial management practices in healthcare, including within the context of EMR adoption. This analysis highlights the role of AI in promoting cost efficiency and enhancing financial management in healthcare settings (Al-Baity, 2023).

Human factors and resistance to change

Recent scholarly work has shed light on the multifaceted human factors and resistance to change impacting EMR adoption in Saudi Arabia. For example, Alhur (2023) conducted a study examining nurses' attitudes toward EMR, with a particular focus on perceived usefulness and ease of use. The results demonstrated a strong association between these perceptions and the willingness to adopt EMR, highlighting the critical role of intuitive and user-friendly systems in promoting acceptance among healthcare staff.

In a similar vein, research by Hasanain, Vallmuur, and Clark (2015) assessed healthcare professionals' knowledge and preferences regarding EMR systems within Saudi public hospitals. Their findings indicated a significant relationship between English language proficiency, educational attainment, and EMR literacy. This suggests that improving computer literacy and targeted educational initiatives could enhance staff inclination to utilize EMR systems, emphasizing the necessity for robust training and professional development programs to foster greater acceptance.

Amid the COVID-19 pandemic, Alzahrani et al. (2022) investigated the usability of telehealth platforms among healthcare providers in Saudi Arabia. The study revealed that higher engagement with telehealth correlated positively with usability ratings, pointing to the importance of further training in telehealth to support the broader acceptance of digital health solutions, including EMR.

Additionally, Abdulaziz et al. (2023) examined the swift integration of new technologies within the Saudi healthcare sector during the COVID-19 crisis. Their research underscored the importance of ongoing evaluation and educational efforts concerning emerging healthcare delivery models, which are essential for the effective implementation of EMR (Abdulaziz et al., 2023).

Taken together, these investigations underscore the importance of addressing human factors and resistance to change in the context of EMR adoption in Saudi Arabia. They collectively emphasize the need for systems that prioritize user experience, comprehensive staff training, and a culture of adaptability toward technological advancements among healthcare professionals.

Cultural and organizational barriers

When analyzing the cultural and organizational obstacles to EMR adoption in Saudi Arabia, it is essential to account for the distinctive societal norms and values that influence the healthcare environment. A 2022 investigation into gender integration within traditionally male-dominated workplaces provides valuable insights into the broader cultural dynamics at work, illustrating how societal views and managerial perspectives on gender roles impact organizational transformation, including the uptake of new technologies. These findings highlight the importance of developing EMR implementation approaches that are attuned to gender-related issues and the wider cultural setting.

Additional research into telemedicine services by Baradwan and Al-Hanawi (2023) identifies resistance from both patients and healthcare providers, indicating deeper cultural reservations regarding digital healthcare solutions. This reluctance parallels the barriers faced in EMR adoption, implying that effective implementation requires a sophisticated understanding of cultural perceptions towards healthcare technologies (Baradwan & Al-Hanawi, 2023).

Studies examining the adoption of e-government services further elucidate the significant influence of cultural factors on employee attitudes toward technological innovation. These results are directly relevant to the context of EMR adoption, suggesting that promoting a cultural transformation within healthcare institutions is crucial for the successful integration of digital records.

Moreover, the work of Alateeg and Alhammadi (2023) on e-commerce adoption among traditional retailers offers pertinent analogies, particularly in understanding how cultural and organizational factors shape perceptions of usefulness, ease of use, and financial concerns. These considerations are equally relevant to EMR adoption, underscoring the necessity for change management strategies that are sensitive to cultural contexts.

Taking these factors into account, this analysis seeks to investigate how specific cultural dimensions—such as perspectives on gender roles, technological hesitancy, and organizational resistance—uniquely affect EMR adoption in Saudi Arabia. By incorporating these cultural considerations, the paper aims to recommend EMR implementation strategies that are not only

technologically robust but also culturally aligned, thereby facilitating smoother integration within the Saudi healthcare sector.

Privacy and security concerns

In evaluating privacy and security issues related to EMR systems in Saudi Arabia, it is crucial to consider the wider context of technological trust and perceptions of privacy. Alqarni, Timko, and Rahman (2023) conducted a study centered on the privacy and security aspects of facial recognition technology (FRT). Although FRT was the primary focus, the study's observations regarding privacy concerns and trust in technology are highly relevant to EMR systems, as they reflect the public's cautious approach to privacy and security in digital healthcare environments (Alqarni et al., 2023).

Expanding this perspective, research informed by Everett Rogers' "Diffusion of Innovation" theory offers a valuable lens for understanding the societal adoption of new technologies. According to this framework, technology uptake is shaped by factors such as perceived innovation attributes, communication channels, temporal considerations, and the broader social system. When this theory is applied to EMR systems, it becomes clear that privacy concerns serve as a significant barrier to the adoption of smart government services, including EMR, due to persistent worries about data security and confidentiality.

The importance of these concerns is further highlighted by Alharbe's 2021 study, which examined privacy and security in telehealth applications during the COVID-19 pandemic. This research underscores the necessity for transparent, responsible, and privacy-preserving practices in digital health technologies—principles that are directly applicable to the deployment of EMR systems.

Additionally, Bahaddad, Almarhabi, and Alghamdi (2022) investigated the acceptance of Bring Your Own Device (BYOD) initiatives, providing insights into the delicate balance between user convenience and information security. By employing the unified theory of acceptance and use of technology (UTAUT) model, their study reveals the complex challenges associated with secure technology adoption in healthcare settings, thereby reinforcing the need for robust security protocols within EMR systems.

When analyzing the cultural and organizational challenges to EMR adoption in Saudi Arabia, it is essential to acknowledge the distinctive societal norms and values that shape the healthcare sector. For instance, a 2022 study on gender integration in historically male-dominated workplaces illuminates broader cultural dynamics, demonstrating how societal beliefs and managerial attitudes toward gender roles impact organizational transformation and technology adoption. These findings stress the importance of EMR implementation strategies that are mindful of gender considerations and the wider cultural context.

Further research by Baradwan and Al-Hanawi (2023) into telemedicine services identifies resistance from both patients and healthcare professionals, reflecting deeper cultural hesitations regarding digital healthcare solutions. This resistance parallels the obstacles encountered in EMR adoption, indicating that effective implementation requires a nuanced understanding of cultural attitudes toward healthcare technologies.

Studies on the adoption of e-government services further clarify the significant influence of cultural factors in shaping employee perspectives on technological progress. These insights are

directly relevant to EMR adoption, suggesting that fostering a cultural transformation within healthcare organizations is essential for the successful integration of digital records.

Finally, Alateeg and Alhammadi's (2023) research on e-commerce adoption among traditional retailers offers useful analogies, especially in understanding how cultural and organizational contexts affect perceptions of usefulness, ease of use, and cost-related concerns. These elements are equally important in EMR adoption, highlighting the critical need for culturally sensitive change management strategies.

Policy and regulatory challenges

Alshareef and Tunio (2022) conducted a study investigating the influence of leadership on the adoption of blockchain technology within small and medium enterprises (SMEs) in Saudi Arabia. Although the primary focus was on blockchain, the research provides valuable insights into policy and regulatory trends that may affect the uptake of innovative technologies more broadly, including EMR. The study identifies both the potential advantages and challenges that SMEs encounter, which are pertinent to healthcare organizations considering EMR implementation. It also highlights the importance of understanding the comprehensive operational mechanisms of SMEs in fostering social and economic progress, a perspective that can be extended to the healthcare sector (Alshareef & Tunio, 2022).

Research addressing the enhancement of corporate stability through regulatory and financial reporting in Saudi Arabia's banking industry offers perspectives on the complexities and advancements within the financial sector. While centered on banking, this work sheds light on the effects of financial policy initiatives and regulatory reforms, which are equally applicable to the healthcare field, especially regarding the adoption of EMR systems.

Al-Qahtani and Albakjaji (2023) evaluated the legal infrastructure governing foreign investment in Saudi Arabia, with reference to the National Investment Strategy. Their analysis of the legal framework and its effectiveness in fulfilling policy objectives draws parallels to the regulatory challenges faced in EMR adoption. The study stresses the necessity for a legal structure that is consistent with national policies and objectives, thereby ensuring an effective and trustworthy environment for investors—an imperative that also holds true for stakeholders involved in EMR systems.

Altobashi's (2019) exploration of corporate governance practices among companies listed in Saudi Arabia examined the evolution, implementation, and adoption of contemporary regulations. The research delved into the various institutional pressures that motivate organizations to adopt governance practices and the obstacles encountered in this process. These findings offer valuable perspectives on the policy challenges associated with the adoption of new regulations and practices, which are directly relevant to the healthcare sector's efforts to implement EMR systems.

Case studies and success stories

Salih et al. (2022) carried out a study focusing on the critical success factors (CSFs) for implementing enterprise resource planning (ERP) systems within the Saudi Arabian food sector. The research underscores the significance of user acceptance, effective project management, and robust top management support as key determinants of successful ERP system deployment. These elements are equally vital for the adoption of EMR systems, highlighting the necessity for sound management practices and comprehensive user training (Salih et al., 2022).

In a separate investigation, Salih et al. (2022) explored the impact of top management and vendor support as critical success factors during the post-implementation phase of ERP systems in SMEs across Saudi Arabia. The results indicate that sustained vendor support and efficient interdepartmental communication are pivotal to the ongoing success of ERP systems. This study offers important insights into the role of continuous support and communication in ensuring the effective adoption of EMR systems.

Andejany et al. examined the critical success factors associated with the Tawakkalna application in Saudi Arabia during the COVID-19 pandemic. Their research centered on the application's efficacy in managing health status verifications and proposed enhancements to optimize the process. The findings from this case study deliver valuable guidance for EMR implementation, particularly regarding user acceptance and operational efficiency within healthcare settings.

Alharbe's research was dedicated to developing a framework for EMR implementation in public hospitals in Saudi Arabia. The study investigated both the barriers to and enablers of EMR adoption within healthcare organizations, taking into account cultural, resource-based, and technological considerations. This work presents a comprehensive framework that can inform and support the successful deployment of EMR systems in Saudi public hospitals.

Together, these studies offer a comprehensive view of strategies for the effective implementation of EMR systems in Saudi Arabia, emphasizing the critical roles of user acceptance, management backing, vendor cooperation, and context-specific implementation frameworks.

The process of EMR adoption in Saudi Arabia is characterized by a range of challenges and achievements. Effectively addressing technical, financial, human, cultural, and policy-related barriers—while drawing on insights from successful implementations—is crucial for progressing the healthcare system in alignment with the objectives of Saudi Arabia's Vision 2030.

Emerging trends and future directions in EMR adoption

As the literature on EMR adoption in Saudi Arabia continues to expand, it is apparent that, despite notable advancements, there remain considerable gaps and emerging themes that warrant further scholarly attention. These areas not only provide promising avenues for future research but also have the potential to make substantial contributions to the ongoing discourse on healthcare digitalization, especially within the rapidly evolving Saudi healthcare context.

One critical direction for future inquiry involves examining the complex relationship between cultural values and organizational frameworks in Saudi Arabia and their influence on EMR adoption. Gaining a deeper understanding of these dynamics is vital for developing EMR implementation strategies that are attuned to the unique cultural and organizational landscape of the Saudi healthcare sector. Additionally, the incorporation of artificial intelligence (AI) and big data analytics into healthcare systems represents a significant research frontier. Exploring how AI can augment EMR systems—particularly through predictive analytics for patient care and operational efficiency—is a crucial area that could provide transformative insights for EMR adoption in Saudi Arabia.

Privacy and security issues have emerged as central concerns in the literature, highlighting the necessity for future research to evaluate and advance privacy-preserving techniques within EMR systems. This may include investigating the use of blockchain technology, sophisticated

encryption protocols, and privacy-by-design methodologies to ensure robust protection of patient information.

Another important area for exploration is the influence of evolving healthcare policies and regulations, especially in response to technological progress and global health crises—on the adoption and integration of EMR systems. Future research should seek to assess the impact of recent regulatory developments on EMR implementation and identify opportunities for policy refinement to facilitate more effective adoption processes.

The role of patients in the EMR adoption process remains relatively understudied. Future investigations could yield valuable findings by focusing on patient perspectives regarding EMR, including their privacy and data security concerns, as well as the potential of EMR systems to enhance patient engagement and promote self-management of health.

Moreover, the rapid expansion of telemedicine services, particularly in the wake of the COVID-19 pandemic, underscores the importance of exploring the integration of telemedicine with EMR systems. Research in this area could clarify strategies for improving healthcare delivery, patient outcomes, and system efficiency in Saudi Arabia through the seamless convergence of EMR and telemedicine platforms.

Delving into these emerging topics and unexplored areas within the current body of research can significantly deepen our understanding of the challenges and opportunities associated with EMR adoption in the Saudi Arabian healthcare sector. This endeavor extends beyond academic interest; it contributes to a more nuanced narrative on healthcare digitalization and encourages a richer dialogue among researchers and practitioners regarding the transformative potential of technology in patient care, aligning with the overarching goals of Saudi Arabia's Vision 2030 for a more innovative and efficient healthcare system.

Barriers of medical coding

The implementation of medical coding systems in Saudi Arabia faces several systemic barriers that hinder their effective integration into healthcare operations. One significant challenge is the shortage of adequately trained clinical coders, exacerbated by the transition to complex classification systems such as ICD-10-AM. While the Saudi Commission for Health Specialties (SCHS) has initiated post-graduate training programs to address this gap, the demand for certified coders continues to outpace supply, particularly given the need to reconcile paper-based records with electronic systems. The transition to ICD-10-AM has further compounded these challenges, requiring coders to master over 15,000 diagnosis codes and 12,000 procedure codes, a process that demands extensive retraining and adaptation to updated Australian Classification of Health Interventions (ACHI) standards.

Technological limitations represent another critical barrier, as many healthcare facilities still rely on hybrid or paper-based medical records. This reliance complicates the accurate extraction of diagnostic and procedural data, increasing the risk of coding errors and inconsistencies. The lack of integrated electronic health record (EHR) systems in 46.7% of hospitals forces coders to manually transcribe information, a process prone to omissions and inaccuracies that directly impact claim reimbursements. For instance, a 2024 study found that 26% of primary diagnoses and 9.9% of secondary diagnoses were incorrectly coded in Najran hospitals, leading to significant revenue leakage and compliance risks (Albagmi, 2024).

Regulatory and policy gaps further undermine coding practices, as 28% of clinical coders report dissatisfaction due to the absence of standardized coding policies and insufficient institutional support. The Saudi Health Council's mandate for ICD-10-AM adoption has not been uniformly enforced, resulting in disparities in implementation across public and private sectors. Additionally, the lack of alignment between national health policies and coding requirements creates ambiguities, particularly in reconciling insurance claims with the Council of Health Insurance (CHI) standards (Al-Harith, 2025a).

Cultural and organizational resistance to digitization also poses a barrier, with 54% of healthcare professionals demonstrating limited English proficiency and computer literacy, which are critical for navigating ICD-10-AM's English-dominated terminology. This resistance is compounded by hierarchical organizational structures in male-dominated workplaces, where managerial attitudes toward technological change often prioritize traditional practices over innovation. Furthermore, 65% of coders express skepticism about internet-based training programs, preferring face-to-face instruction despite evidence that digital upskilling could alleviate workforce shortages (Al-Harith, 2025b).

Conclusion

The adoption of Electronic Medical Records (EMR) systems in Saudi Arabia represents a pivotal component of the nation's Vision 2030 healthcare transformation agenda. While significant progress has been made in digitizing healthcare delivery, this review underscores that the journey is fraught with multifaceted challenges. Technical limitations, financial constraints, resistance to change, cultural and organizational barriers, and privacy and security concerns continue to impede widespread EMR implementation. Furthermore, the systemic challenges surrounding medical coding highlight gaps in workforce readiness, technological infrastructure, and regulatory coherence that must be addressed to ensure accurate data capture and health service reimbursement.

Despite these obstacles, various success stories and case studies offer a roadmap for effective EMR deployment, emphasizing the importance of strong leadership, user engagement, vendor support, and culturally attuned implementation strategies. Emerging trends, such as the integration of artificial intelligence, telemedicine, and blockchain technologies, offer promising avenues to enhance EMR functionality and trust.

To realize the full potential of EMR systems, a holistic and coordinated approach is required—one that aligns technological innovation with human factors, policy reform, and cultural sensitivity. By building on current research and addressing the identified barriers, Saudi Arabia can achieve a digitally empowered healthcare system that delivers efficient, equitable, and patient-centered care in line with its national vision.

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