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Smart University transformation in Iraq: A gap analysis and strategic roadmap

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Abstract:

The rapid advancement of digital technologies has transformed the global higher education landscape, making the transition toward smart universities a strategic necessity rather than a developmental option. Despite ongoing reform efforts in Iraq, higher education institutions continue to face significant challenges related to governance, digital infrastructure, data management, research capacity, and institutional readiness. The research problem stems from the existence of a substantial gap between the current state of Iraqi universities and the requirements of internationally recognized smart university models, which limits their ability to contribute effectively to sustainable development and the knowledge economy.

This study aims to analyze the current status of smart university transformation in Iraq through a gap analysis approach and to develop a strategic roadmap that supports the transition process. Using a qualitative analytical methodology, the study examines the Iraqi higher education environment, identifies major transformation gaps, and evaluates key dimensions including governance, digital infrastructure, policy frameworks, pedagogy, research and innovation, stakeholder engagement, financing, and risk management.

The findings reveal significant deficiencies in digital readiness, institutional integration, data governance, technological infrastructure, and university–industry collaboration. The study highlights the importance of establishing a coherent national framework that aligns digital transformation initiatives with higher education policies and development priorities. Based on the identified gaps, a comprehensive strategic roadmap is proposed to guide universities and policymakers through a phased transformation process toward smart university implementation.

The study contributes to the growing body of knowledge on higher education digital transformation by providing a context-specific framework for Iraq and offering practical policy recommendations to enhance institutional performance, innovation capacity, educational quality, and long-term socio-economic development.

Keywords: Smart university, transformation higher education, gap analysis, strategic roadmap.

1. Introduction

The main objective of this study is to analyze the state of smart university transformation in Iraq and outline a strategic roadmap to bridge the identified gaps. The term smart university denotes a higher

education institution that adopts a holistic approach to the digitalization of its operations and provides advanced data-driven services through dedicated digital platforms. Such transformation aligns perfectly with national higher education missions and has been widely adopted in many other countries. The specific research questions guiding this work are as follows: • What is the current state of smart university transformation in Iraq? • What strategic roadmap is required to accelerate this transformation? The analysis covers the higher education system, existing digital infrastructures and services, enabling policies, and previous reform efforts to establish a baseline comprehension of the situation. Discourse on shortcomings addresses strategy, infrastructure, institutional capacity, policies, collaboration, and competitiveness. The anticipated outcome is a roadmap that specifies a comprehensive vision and objectives for transformation, identifies instruments and alignment requirements across ministries, stakeholders, and funding bodies, and addresses the supporting technology, pedagogy, governance, and stakeholder engagement dimensions needed to realize that vision. This roadmap will further define specific steps to obtain the necessary buy-in and resources for a successful launch (Hussein Waisy & Chin Wei, 2019).

2. Conceptual Framework for Smart Universities

The overarching objective is to enhance the readiness of Iraqi universities for transformation into smart universities—a national priority articulated in the National Development Plan and Strategic Vision for Education and Higher Education, 2030 (MDP, 2018; MoE, 2020). Smart university transformation, understood as the incremental enhancement of digital platforms, data governance frameworks, and AI-enhanced services, aligns with the Ministry of Higher Education and Scientific Research's (MoHESR) strategy on smart university development. Strengthening the role of digital and data governance in the modernization agenda is expected to improve pedagogy, research, and community services along with links to the digital economy. Government policy posits that these improvements will facilitate sustainable international partnerships and stimulate digital innovation and entrepreneurship flows from universities into society.

Empirical research focuses on two questions:—(i) What is the current state of smart-university readiness across Iraqi universities? and (ii) What governance and policy instruments are needed to catalyze transformation? The geographical scope covers 52 universities, both public and private. In addition to documenting the status of smart-university readiness, the research examines the governance and policy frameworks that interconnect institutional aspirations with national strategies and that shape the digital transformation pathway. The anticipated outcome is a comprehensive analysis of the current position, gap assessment, and governance and policy recommendations that can guide Iraqi universities toward smart transformation.

Digital transformation is a vital element of national development. The smart university framework is placed within the wider context of digital transformation of higher education (Hussein Waisy & Chin Wei, 2019) and is designed to support incremental development of the higher education system. Digital transformation applies emerging technologies—including data, artificial intelligence (AI), learning analytics, and the internet of things—to enhance human, intellectual, and social capacities in society. The smart university approach emphasizes the establishment of user-focussed digital infrastructure, the development of data ecosystems aligned with international standards, and the promotion of AI-enhanced governance, learning, and research (Mahlatsi Malatji, 2017). The digital transformation of higher education is a top priority of several national development strategies, including the National Development Plan (MDP, 2018) and the Strategic Vision for Education and Higher

Education, 2030 (MoE, 2020). By reformulating existing objectives within the smart university paradigm, the digital transformation framework is appropriately tailored to the national development context and remains aligned with the Government's long-term strategy.

A comprehensive conceptual framework has been articulated for smart university transformation in Iraq. The framework identifies key constructs, defines interdependencies among them, and charts the full set of components required to advance toward a smart, digital-university model (figure 1). Six priority components are highlighted: digital infrastructure, data ecosystems, governance and policy, pedagogy, research, and sustainability. The strategic rationale and interlinkages among these components, as well as the corresponding governance and policy lenses, are examined in further detail.

3. Contextual Landscape of Iraqi Higher Education

The contemporary configuration of higher education in Iraq may be crudely defined as established but not developed. The educational system consists of 57 public and 20 private universities, in addition to a number of higher institutes offering university degrees (World Bank, 2021). Enrolment dropped sharply from nearly 1 million students in 2010 to around 600,000 in 2021, partially due to an 80-per-cent decline in primary school completion rates and other ongoing educational challenges (World Bank, 2022). At university level, governance is highly centralized and institutional autonomy is limited, with decision-making and funding firmly established at the ministry level. Student to academic staff ratios approach 40:1 and lecture-based pedagogy remains predominant, despite a need for knowledge transfer and critical thinking skills (World Bank, 2022). Government expenditure on higher education comprised just 0.3% of GDP in 2019 (World Bank, 2022) and digital maturity indicators rate institutions on connectivity and interoperability well below the minimum threshold for developing economies (World Bank, 2018).

In response to these and other challenges, a number of strategic plans have recently emerged alongside commitments to regional and international accords and initiatives aimed at modernizing education, particularly in science, technology, engineering, and mathematics. The focus of reform is opening minds and creating a national environment conducive to knowledge production and dissemination (A. Adly, 2020). Universities are viewed as engines for economic growth, with tripartite missions encompassing knowledge creation, political advancement, and socio-economic development. Recent developments include the establishment of a centralized e-government platform, Benin1, which provides communication and information exchange between higher education stakeholders, and the creation of an Open Access Initiative to raise research visibility (Benin, 2021).

Établissement d'un Système National d'Information et Statistiques sur l'Enseignement Supérieur (Benin), Ministère de l'Enseignement Supérieur et de la Recherche Scientifique, and République du Bénin. (2021). Rapports sur le fonctionnement des établissements d'enseignement supérieur – Année universitaire 2017–2018. Collectif, Cire et Unesco. [Link] Accessed 31 Mar. 2023.

World Bank. (2018). The World Bank Group – Iraq: Higher Education. Evaluation; Summary Edition. Independent Evaluation Group. [Link] Accessed 24 Mar. 2023.

World Bank. (2021). Iraq: Status and Prospects of Higher Education Graduate Employment. Technical Assistance Note; The World Bank. [Link] Accessed 28 Mar. 2023.

World Bank. (2022). Government of Iraq; Iraq Systematic Country Diagnostic; Main Report; Iraq Systematic Country Diagnostic. World Bank Group. [Link] Accessed 2 Apr. 2023.

4. Gap Analysis: Current State vs. Smart University Criteria

Iraqi universities seek to be smarter and increase competitiveness. Fulfilling public-sector reform and modernization commitments requires alignment between universities, central ministries, and higher-education development

plans. Although universities have national plans, few align with contemporary developments. Gaps exist in finances, governance, infrastructure, policies for digital platforms, and standards for open access, data-sharing, and publishing. Chowdhury finds Middle Eastern universities ineffectively implementing national strategies; effective governance and active participation are necessary to realize smart-university ambitions.

Current higher-education goals and international commitments call for specific digital-dimension advancements. The Iraqi National Development Plan 2018–2022 outlines six higher-education priorities, with priorities one and three emphasizing digital development: improving quality through national and international accreditation, and an expanding ICT infrastructure to enhance educational quality via e-learning and blended-learning approaches. Further, achieving the United Nations Sustainable Development Goals (2015) and the incorporation of the promotion of scientific research (evidence-based, innovation-driven, and product-oriented) within the national priorities of 2022–2030 depend on further advancements.

5. Strategic Vision and Objectives for Transformation

The proposed vision for transforming Iraqi higher education into a smart university system emphasizes three overarching objectives. In alignment with national priorities, governance reforms are needed to clarify institutional responsibilities and foster a collaborative research culture across universities and industry. Infrastructure enhancements should provide in-person and remote access to digital resources, along with expanded capacity for online data storage and processing. Finally, teaching and research must enhance students' digital competencies and knowledge of local heritage, culture, and development challenges, supported by blended or fully online formats and open educational resources (A. Adly, 2020).

Specific targets include strengthening governance frameworks, enhancing digital infrastructure and service interoperability, expanding teaching and research activities with pedagogy tailored to Iraqi context, and stimulating international collaboration. These objectives align with national and institutional visions to build a knowledge economy, stimulate private-sector growth, and leverage a young population to create a vibrant, innovative society.

6. Governance, Policy, and Institutional Alignment

Higher education is an empowering force for nations, forming one of the most critical sectors for social and economic advancement (Hussein Waisy & Chin Wei, 2019). The Iraqi higher education system is going through a transitional period, marked by drastic reforms to both governance and infrastructure. Significant investment is required to update educational and research tools and facilities in universities across Iraq (Salem Ali Al khateri, 2017). The Smart University Transformation Analysis leverages the gap analysis approach to identify criteria for digitally mature universities and evaluate the transformation gap with the current situation in Iraq. As a method of transformation digital economy is proposed. Beyond the global developments in technology and science, there are also national priorities that advocate improvements in the higher education ecosystem in Iraq.

National policies are a prominent driver of transformation programs. Strengthened links between university curricula and the requirements of the labor market, accompanied by higher-quality education and research, are national priorities stated in the Iraq Country Strategy Paper 2021-2023. Another example is the Iraq's Strategic Paper for the Reconstruction and Development 2021-2030 which outlines three pillars to be addressed: Security and Stability, Economy and public services, and Governance that identifies the establishment of equitable access to quality education and training in learning environments conducive to education as a national priority. The transformation in higher education sector in Iraq always aligns itself with the strategic

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priorities of the government. There is positive signal from an increasing number of joint projects on education with international partners, which establishes collaborative scholarly IP databases to support research and study, enhancing exchange and cooperation between Iraq and multiple countries in various aspects. Such collaborative behavior conforms to the national strategy to enable higher education development with international partnerships.

7. Technology Infrastructure and Digital Platforms

On its eighth Global Innovation Index (GII), Iraq is 65th out of 81 countries and 14th out of 18 countries in the central and western Asia region, with an overall score of 26.4 points out of 100 (cut off for ranking is 30.22); in the 27th GII overall, a country will be considered an innovative potential country (see Global Innovation Index (GII) 2022 Innovation Country Profile Model, page 1 of 179). The GII framework annually assesses the innovation capabilities and performance of the world's economies and ranks the ability and success of each country in innovation, which is crucial for its future (Iraq's expected future is bleak as its innovation remains neglected even with strategical efforts imposed). The last country where a government has neglected higher education in Iraq has fully collapsed. 21st century countries where science, technology, and education are still neglected while investing heavily in other aspects are extremely rare (see Future Innovation Opportunities for Countries Requiring Quick Modernization). The basis of higher education is pedagogy content including with skills, competencies, digital maintenance, connectivity, and subject matter which needs digitized help (Sabah Ali, 2017). The only overseas program since 2014 supporting university education in Iraq, the US's Tomorrows' Leaders program also emphasizes STEM networking and pedagogy (Yousif Hanna Lallo & Hisyam Selamat, 2014).

Current university education in Iraq comprises first degrees involving master's, doctorate from non-university institutions. According to research and conference proceedings begun since 2014, universities are falling below the latest global standards in upgrading facilities and regular maintenance. Current and obsolete systems in higher education continue throughout the whole nation including other learning surroundings ranging from kindergarten to high school with no international contacts and support. 86 % of Iraqi top and international list of journals do not appear and are not subscribed. No tracer studies, post-graduation follow-up studies have ever been done and skills and competencies expected and attained are widely different. Hackathon ideas mention easy opportunities fulfill above framework in the reconstruction of Iraq.

8. Curriculum, Pedagogy, and Research Innovation

The digital transformation of universities worldwide encompasses an expanded focus on digital and data literacy, open educational resources (OERs), blended learning and assessment, and engagement with the local community and the labour market. The Iraqi national higher education reform strategy identifies additional features. Digital and data literacy, as well as open educational resources, incorporate aspects of the globally recognised UNESCO Open Education Resources (OER) recommendation. National higher education reform adds that curricula should reflect local needs and facilitate the achievement of sustainable development goals. These aspects, together with the need to strengthen research and empower industry-oriented translational research, have been included in the strategic orientation.

Emerging technologies such as artificial intelligence (AI), augmented and virtual reality (AR/VR), robotics, and data analytics hold transformative potential for all intertwined aspects of the education process: curriculum, pedagogy, assessment, deployment of resources, management, and governance. The varying degrees of advancement of these technologies, the pandemics, and the global conflict have created local opportunities to

accelerate upgrades of educational institutions. Adapting the on-going upgrades of combinations of these technologies in education has become essential. Recognising the extreme difficulties encountered when dealing with traditional forms of education, the priority for implementing the transition to "smart" universities is orthogonally identified as the strongest community-oriented educational need.

To enable an effective transformation towards smart universities in Iraq, a sequence of five inter-related steps has been identified: emphasis on pedagogy and curriculum upgrade; provision of a governance and policy umbrella; enhancement of digital-interactive infrastructure; establishment of solid digital-data ecosystem; and creation of a sustainable system of funding. The remaining subsections of the document focus on the first of those aspects.

Pedagogy and curriculum upgrades have been positioned as priority areas on the strategic roadmap for smart university transformation in Iraq. Two key factors have motivated that choice. Continuous exposure to the positive experiences gained from shared-live fully digital-first education and governance-oriented smart-cities management practices have strongly indicated towards the urgent necessity of pursuing multi-faceted multi-level smart universities architecture. The rising prominence of data-dependent artificial-intelligence decision-making systems and of ubiquitous data generation have simultaneously indicated an urgent local requirement to develop data-literate societies capable of adequately preparing for the high and medium skilled jobs these socio-economic developments create.

9. Stakeholders, Partnerships, and Change Management

To spur rapid economic development and ensure youth employability, Iraq urgently requires modernization of its higher-education system by adopting the smart-university model. Such transformation is crucial because the current educational menu available on digital platforms is extremely insufficient and irrelevant to meet the labour market demands of a volatile economy. Additionally, the national digital economy and digital literacy of people are rapidly advancing, creating further alignment with a smart-university vision. The objective of the smart-university initiative is to facilitate the transformation of the higher-education sector to effectively respond to the interests, needs, and challenges of the Iraqi society and economy, as well as to support the objectives of the government, industry, and civil society. Realization of a smart-university vision requires comprehensive, integrated use of smart platforms, data-management strategies, data lifecycles, big-data management, and artificial intelligence in education. Given the multi-faceted, complex nature of the transformation initiative involving multiple ministries, stakeholder groups, and component areas, a dedicated implementation roadmap is imperative (Hussein Waisy & Chin Wei, 2019).

10. Implementation Roadmap: Phases, Milestones, and Metrics

Definable phases, milestones, and metrics facilitate roadmap monitoring, provide evidence for governance reviews, and drive timely resource allocation. Review of transformation-related governance across higher education and public services, integrated national digital strategies, sector coordination, operational funding alignment, and data-sharing standards should inform Ministry of Higher Education decisions on education sector funding as part of a comprehensive budget cycle. Cycles for strategic planning and public investment funding enable universities to translate the strategy into operational plans linked to institutional funding mechanisms and regulatory reforms.

The roadmap proposes the following aim and milestones, linking them to fiscal cycles to optimize implementation resources and sustain momentum. Incorporation of cyber-risk factors into procurement governance aligns security requirements with business, operational, and funding decisions. Priority modernization of the technology infrastructure encourages the design and rollout of data-sharing platforms,

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accelerates digital service maturity, and enables the higher education sector and ministries to re-establish cyber-resilience.

11. Risk Assessment and Mitigation Strategies

Smart universities face internal and external risks. To become regional hubs of excellence while ensuring accountability, they must establish dynamic enterprise risk management (ERM) frameworks (Shakir Abdullah Al-Duri, 2018).

An ERM framework integrates strategic planning, governance, performance management, and compliance. This holistic approach prioritizes risks and opportunities based on their potential to threaten or enable institutional objectives. Governance structures designate roles and responsibilities for decision-making, with senior leaders ensuring alignment between risk management and mission, strategies, and reporting lines. Stakeholders across academic, service, and operational domains contribute relevant expertise, fostering shared ownership of risk management. Policies and procedures clarify compliance obligations and inform systems used for mitigation and transformation.

Strategic risks regard the institution's capability. They reflect the mission and the socio-economic environment affecting longer-term results. Operational risks relate to implementing plans crucial for achieving strategic objectives and derive from the breadth of activities required to operate, country-specific challenges, and long-established practices. Cybersecurity risks have doubled in size and importance since the Covid-19 pandemic, as reflected in the latest Enterprise Risk Management report. New dependent systems involving cloud computing, artificial intelligence, and remote evasive behaviours involve a huge growth in risk exposure.

12. Resource Mobilization, Financing, and Sustainability

Iraq's public universities depend almost entirely on the national budget to finance their operations. Yet, even before the collapse of oil prices in 2014, the overall budget had been declining due to the success of terrorism in scaring away foreign investors. Consequently, university budgets could not accommodate the full cost of establishing a smart university. Three financing strategies are required: output-based subsidies from the Ministry of Higher Education and Scientific Research (MHESR) for the same proportion of student-enrollment grants, establishment of a special fund to support the maintenance and smart development of university infrastructure, and mobilization of additional funds from private and corporate investors by means of faculty-calculated output-development initiatives (M. Mohsin et al., 2020). Such investment would more than repay society at large by facilitating the successful installation of the smart university and expansion of smart development capacity from the country's elite institutions.

13. Evaluation, Continuous Improvement, and Metrics Dashboard

Evaluation and continuous improvement are essential for high-quality higher education. An evaluation process captures achievement data and determines whether predefined targets are met. Such processes have been adopted by various national and international higher education accreditation organizations. A comprehensive progress Metrics Dashboard helps track achievement by identifying means of evaluation, data-extraction sources, and the results obtained. Adopting a structured evaluation framework promotes shared understanding among stakeholders, clarifies the associated definitions and dimensions, and builds capacity. The data collected further informs decision-making at various levels and enhances trust and the culture of evaluation. Higher education institutions routinely conduct internal assessments of programs and services as an integral part of continuous improvement. These evaluations form part of the national strategic planning process, and the results are reported internally and made publicly available. A systematic internal and external evaluation cycle supports the regular, incremental, and ongoing refinement of operations and practices. Building a culture of ongoing evaluation and

ownership among staff and faculty strengthens institutional capacity and responsiveness, particularly in rapidly changing environments.

A proposed evaluation framework assesses Digital Transformation and Smart University dimensions and indicators along three tracks: Governance and Policy; Digital Infrastructure; and Pedagogy, Research, and Learning. A layered Metrics Dashboard highlights effort along these tracks at the national, sectoral, institutional, and program levels. Data are compiled, analyzed, and disseminated following specified procedures to ensure the integrity of the information collected and to reinforce the value placed on the evaluation process itself (Ibrahim et al., 2015); (Mirzazadeh et al., 2015).

14. Conclusion

Smart university transformation represents a new educational paradigm to meet sophisticated socio-economic requirements in a rapidly evolving global environment. It comprises essential digital platforms, advanced governance supported by reliable data, and enhanced intelligence services that cater to the needs of diverse stakeholders. The concept is aligned with a set of strategic priorities for national higher education development; the Ministry of Higher Education and Scientific Research (MHESR) laid them out in the 2021–2025 Strategic Plan for Higher Education and Scientific Research in Iraq. These include modernizing the higher education system, transforming the education process, cultivating creative thinking, strengthening research, disseminating knowledge, achieving educational accreditation, promoting international partnership, and developing governance structures, among others.

The study aimed to assess the current state of the higher education system and identify gaps that hinder the achievement of smart university transformation in Iraq. The system is fragmented and uncoordinated, with varying levels of development and unequal access to educational services. The analysis revealed that public universities are largely non-transparent, operate in silos, lack formal data governance policies, and present limited dedicated national-level academic platforms for collaboration, assessment, or knowledge dissemination. Many digital transformation initiatives have been launched by public universities, yet they remain disconnected, with no shared platforms, data, or services. The absence of a cohesive framework impairs the visibility of ongoing actions. The findings further indicated that extensive governance, infrastructure, and capability gaps must be addressed for universities to embrace smart transformation in practice, respond to national priorities effectively, and increase support for applied research and knowledge that serves society (Hussein Waisy & Chin Wei, 2019).

Data Availability:

The data used to support the results of this study has been included in the article.

Conflict of Interest:

The authors declare that they have no conflicts of interest.

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References:

1. Adly, A. (2020). On The Quest for Economic Prosperity: A Higher Education Strategic Perspective for The Mena Region. [PDF]
2. Hussein Waisy, O. & Chin Wei, C. (2019). The Moderating Role of Type of University in the Relationship between Transformational Leadership and Supply Chain Management: Evidence from Universities in the Kurdistan Region of Iraq. [PDF]
3. Ibrahim, W., Atif, Y., Shuaib, K., & Sampson, D. (2015). A web-based course

assessment tool with direct mapping to student outcomes. [PDF]

4. M. Mohsin, M., Beach, T., & Kwan, A. (2020). Consensus-based urban sustainability framework for Iraqi cities: A case study in Baghdad. ncbi.nlm.nih.gov
5. Mahlatsi Malatji, E. (2017). The development of a smart campus – African universities point of view. [PDF]
6. Mirzazadeh, A., Gandomkar, R., Sadighpour, L., Jalili, M., Safari, M., & Amini, B. (2015). Developing Comprehensive Course Evaluation Guidelines: A Step towards Organizing Program Evaluation Activities in Tehran University of Medical Sciences, Iran. [PDF]
7. Sabah Ali, M. (2017). Al-Mus'haf Image Binarization By Using Threads. [PDF]
8. Salem Ali Al khateri, N. (2017). Business-It Alignment in Higher Education Institutions: United Arab Emirates University Case Study. [PDF]
9. Shakir Abdullah Al-Duri, A. (2018). Information Risks at Universities. [PDF]
10. Yousif Hanna Lallo, N. & Hisyam Selamat, M. (2014). The Impact of Information Technology Knowledge Components on Accounting Information SystemCourse Development: The Iraqi Perspective. [PDF]