

Assignment 2 Report

Course Title: Research Methodology in Computer Science

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Research Title: How saturated is the Saudi market in digital solutions?

Enhanced Research Title:

Developing a Digital Market Gap Analysis Framework for the Saudi Entrepreneur: Measuring Saturation and Identifying Company Opportunities Aligned with Vision 2030

Problem Statement

In the midst of the Kingdom's rapid digital transformation a transformation officially launched under the leadership of Crown Prince Mohammed bin Salman with the Vision 2030 initiative back in 2016. The Vision aimed to shift away from an oil-dependent economy, making oil a secondary driver rather than the core of economic growth.

However, as highlighted in several previous studies—such as those by *Al-Ghamdi (2021)*, *Al-Barashdiya (2021)*, and *Al-Aani (2010)*—the COVID-19 pandemic became the primary catalyst that accelerated this transformation at an unprecedented pace. While Vision 2030 had been in place since 2016, it was the pandemic that dramatically revealed which sectors urgently needed digital transformation, prompting government bodies and private institutions to accelerate digital adoption and expand technology-driven solutions.

In this wave of development, numerous initiatives emerged, and the concept of entrepreneurship was increasingly introduced and promoted. Previous research that we reviewed aimed at clarifying and raising awareness about what it means to be an entrepreneur. According to *Al-Barashdiyah (2021)*, an entrepreneur is defined as an individual who owns and personally manages a business project, and who possesses the ability to recognize and discover opportunities, bear their consequences, initiate project creation, secure the necessary resources, and provide new and distinctive solutions that meet customer needs. A digital entrepreneur, in this context, is one who manages their business through electronic platforms or networks and possesses the technical capabilities and skills required to conduct various commercial activities online. (*Al-Barashdiyah, 2021; citing Al-Aani, 2010*)

Furthermore, a dedicated authority was established to oversee the digital transformation process. Many studies have since tried to measure how far this transformation has come since the launch of the Vision, what key factors have driven it, and what obstacles still remain. Yet the key question persists: how do we measure the saturation of the Saudi market? How can a visionary entrepreneur study the market without tools to analyze market saturation and pinpoint a real problem that needs solving? What indicates that the main driver of this transformation's success is the Saudi individual and the role of digital governance in supporting these ideas and helping government entities adopt startup projects? The challenge in this direction

lies in the absence of knowledge about how to precisely determine market needs and establish a unified measurement of saturation.

Primary Objective

To review and analyze previous studies in order to determine the possibility of developing a unified metric for measuring digital saturation in Saudi Arabia. If such a metric cannot be established, the research will outline the steps and best practices that help entrepreneurs analyze the markets they intend to enter.

Supporting Objectives

- To **identify** and classify the main indicators that were used in the past literature to measure digital transformation, digital adoption, and market readiness.
- To **assess** if these indicators possess the necessary qualities of consistency and robustness that would allow them to be merged in a single digital saturation metric.
- To **scrutinize** the shortcomings of current tools, indices, and frameworks that judge digital readiness, thus giving the reason why a single saturation measure is not available.
- To **uncover** sector-specific digital needs by comparing results from different studies and spotting which sectors are already saturated and which are still with clear digital gaps.
- To **suggest** a tentative layout for a unified digital saturation metric if the research results imply it is workable.
- In case a unified metric is not possible, to create a user-friendly approach which entrepreneurs could apply to assess digital potentials and gaps in the market.
- To **present** practical recommendations to the entrepreneurs in order to ensure that their projects are in line with the digital priorities set by Vision 2030 and the national transformation goals.

Summary research paper's

Paper Subject: Digital entrepreneurship in the shadow of the COVID-19 pandemic: opportunities and challenges

This paper aims to showcase how COVID-19 had a huge impact by accelerating the shift towards digital solutions. It kind of forced everyone's hand and made a quick tech revolution in the market, which meant people lost jobs—especially those that used to rely on physical presence. In Oman, the paper shows how the pandemic pushed people to get into digital entrepreneurship and raised awareness about what that even means. It's basically saying that the market needed more flexible, scalable digital solutions and that the older ways just weren't cutting it anymore. The study used a qualitative analytical method with SWOT and PEST tools to dig into all this. The paper also represented how Oman government really stepped up to support digital transformation and encourage people to jump into entrepreneurship, they have initiated Entrepreneurship Center and have made Alrafd fund the Authorized entity for funding the startups. This research reflects the market's need for digital transformation and shows that the country's saturation with digital solutions has not yet reached the required level, as many opportunities for innovation remain.

Paper Subject: Updating the digital system of government agencies in the Kingdom of Saudi Arabia in light of Vision 2030

This paper the author relied on reviewing previous studies to draw insights into the kingdom's efforts toward digital transformation and to highlight the success it has achieved. Several international and global studies were reviewed, indicating that Saudi Arabia made remarkable progress in digital transformation. One of the reviewed studies showed that according to the United Nations' e-government index, the kingdom's ranking improved from 58th place in 2010 to 31st place in 2022. The study employed a descriptive cross-sectional case study design to assess the current state of digital transformation at King Khalid University within the framework of Saudi Vision 2030. It does

utilize questionnaires to measure the success of digital transformation at King Khalid University, referencing the sample population, gender ratios, and other demographic factors, but this survey was implemented and filled mostly by the university's employees. Overall, the study indicated a high level of satisfaction with the university's digital transformation efforts, reflecting positive outcomes in alignment with Saudi Vision 2030.

Paper Subject: The role of digital government and its support for government entities in adopting emerging technologies to activate digital transformation: A case study of the Saudi Digital Government Authority

The researcher in this study used an analytical approach combined with a case-study method, analyzing a wide range of previous studies to clarify the concept of digital transformation and several related terms. The study focused on highlighting the role of digital government in enabling government entities to adopt emerging technologies. It also presented numerous national projects that utilize these technologies, such as the *Meras* program, the *Etimad* platform, the *Absher* services, the *Hajj Hackathon*, and many other initiatives. In addition, the Digital Government Authority (DGA) developed a dedicated readiness index to measure how prepared government entities are to adopt emerging technologies. This index aims to clarify the projects being implemented, their levels of readiness, and the progress of each entity. It also helps entrepreneurs understand the state's direction in this field and identify opportunities aligned with national digital priorities.

Paper Subject:Measuring Digital Transformation in the Kingdom of Saudi Arabia: An Analytical Study of the Digital Transformation Measurement Tool

This study examines the reality of digital transformation in the Kingdom of Saudi Arabia by analyzing the official Digital Transformation Measurement Tool used by the Digital Government Authority. The study discusses how digital transformation has become essential in modern societies, driven by rapid technological progress and the need for efficient, high-quality public services. It reviews the standards, strategies, and requirements of digital transformation, as well as the advantages, challenges, and expected outcomes of implementing it in alignment with Saudi Vision 2030. Using a descriptive analytical and survey-based approach, the study evaluates the Kingdom's progress in applying digital transformation across government sectors and highlights the importance of measuring compliance with digital standards. The findings indicate that despite significant advancements, electronic and cybersecurity risks remain the biggest obstacles, requiring urgent legal and regulatory action—such as establishing a comprehensive Commercial and Electronic Transactions Law and enforcing personal data protection regulations. The study concludes that accelerating digital transformation across all government entities, increasing societal awareness, and adopting unified standards and enabling laws are essential for strengthening digital governance and improving service quality in Saudi Arabia.

Paper Subject:The role of using smart applications in developing the future of digital tourism in the smart city of NEOM from the perspective of a Saudi citizen

This study examines the role of smart applications in developing the future of digital tourism in NEOM, the Kingdom's flagship smart city project, from the perspective of Saudi citizens. In the context of Saudi Arabia's Vision 2030, which aims to diversify the national economy and reduce dependence on oil revenues, digital tourism has emerged as a key driver of economic transformation. NEOM represents a major pillar of this transformation, relying heavily on advanced smart applications, extended reality technologies, and integrated digital platforms to attract tourists and enhance the virtual image of the city. The study explores the importance of smart applications in

tourism, assesses citizens' awareness and usage of these applications, and gathers their recommendations for improving digital tourism services. Findings reveal that Saudi citizens possess strong digital literacy, prefer smart applications over traditional tourism methods, and believe these applications significantly enhance service quality, expand market reach, and strengthen NEOM's competitiveness. Despite this, some areas—such as customer loyalty and continuous engagement through applications—require further development to maximize the impact of smart tourism technologies.

Paper Subject: The role of digital transformation in achieving sustainable development within the framework of the Kingdom's Vision 2030

The Role of Digital Transformation in Achieving Sustainable Development within the Framework of The Kingdom's Vision 2030" by Ayed Ali Al-Qahtani examines the critical role of digital transformation in advancing sustainable development in Saudi Arabia, aligned with the goals of Vision 2030. Utilizing a descriptive analytical approach, the study highlights how digital technologies enhance institutional performance, improve operational efficiency, and create new economic opportunities, thereby contributing to greater innovation and workforce diversification. The findings underscore the necessity of integrating digital strategies into institutional frameworks to maximize their impact on sustainable development, while also calling for further empirical research to validate these insights and explore effective implementation practices across various sectors. Overall, the research affirms that digital transformation is essential for successfully achieving the objectives of Vision 2030 and fostering sustainable growth in the Kingdom.

Critical Analysis

The reviewed research papers state that digital transformation has become one of the main factors supporting economic resilience, the modernization of institutions, and mainly the national competitiveness—specifically, in the light of the Vision 2030 project and the recovery of the pandemic. Nevertheless, there is a different angle (entrepreneurship, government readiness, digital tools, higher education, sustainable development, and tourism) in each paper which reveals their differences in terms of depth, methodology, and quality of evidence.

Some papers (Al-Doubi, Al-Azzam, Al-Harbi & Al-Rabghi) rely on descriptive analytical or survey-based designs. While these provide strong conceptual insights, they also have a major limitation in the form of little empirical evidence on actual digital performance or world outcomes. The researchers depend heavily on self-reported opinions (for example, KKU survey, NEOM tourism survey) which results in bias and does not allow to measuring the actual system's effectiveness or the change in people's behavior.

The author's qualitative SWOT-PEST analysis of the paper on COVID-19 entrepreneurship (Al-Barashdiya) is a major contrast. Even though it is analytically rich, it depends on secondary literature rather than direct field data which leads to a limitation of the reliability of its conclusions regarding Oman's technological maturity.

The case-study of the Digital Government Authority (Al-Harbi & Al-Rabghi) presents the one with the best methodological depth. It consists of document analysis + structured interviews thus enabling the researchers to gather both policy-level insights and real operational challenges. This mixed evidence

brings about a more obvious and clearer picture of the state of technology readiness, the governance gaps, and the adoption constraints in government entities.

All the studies corroborate each other regarding the digital transformation benefits (efficiency, innovation, and market expansion) from their own perspectives. Nonetheless, they also point at persistent barriers: poor digital literacy

All of these studies do not provide a tool or a measurable indicator for assessing market saturation with digital solutions. They also show that determining a unified saturation percentage is nearly impossible, as it depends on various indicators—most of which still lack a clearly defined identity.

Connections

1. Digital Transformation as a National Priority

All studies agree that digital transformation is essential for economic growth and government modernization.

- Vision 2030 (Saudi Arabia) appears repeatedly as a catalyst.
- Oman's digital entrepreneurship surge during COVID-19 mirrors Saudi Arabia's push towards e-Government and digital services.

2. Importance of Government Support

Several studies highlight the decisive role of government in shaping digital maturity:

- Oman: Entrepreneurship Center + Al-Rafd Fund
- Saudi Arabia: Digital Government Authority readiness tools, Entrepreneurship accelerators, Hackathons, Government support.
- King Khalid University case: strong institutional performance due to government-led transformation

Government involvement consistently emerges as a *key enabler* of successful digital transformation.

3. Digital Technologies Improve Service Quality and Efficiency

Whether in tourism (NEOM apps), university services (KKU), or public sector operations (measurement tool), all studies conclude:

- Digital tools enhance accessibility
- Reduce service time
- Improve user satisfaction
- Support economic diversification

4. COVID-19 Accelerated Transformation

The pandemic is widely recognized as:

- A catalyst for rapid digitalization
- A revealing factor highlighting existing weaknesses

This aligns across the Oman entrepreneurship paper and the broader Saudi digital government analyses.

5. Challenges Are Shared Across Contexts

Common challenges include:

- Insufficient digital skills
- Weak awareness culture among citizens or employees
- Cybersecurity risks
- Lack of integrated systems
- Regulatory gaps (laws, data protection, governance frameworks)

Each study identifies these barriers from different angles, but the patterns are uniform.

Conflicts between findings

Despite the strong alignment, some findings diverge:

1. Maturity Levels: High vs. Low

- **Saudi Arabia:**
Multiple studies show *high digital maturity*, improved UN e-government ranking, and strong institutional achievements (KKU scoring 87.42%).
- **Oman (COVID-19 study):**
Emphasizes *low readiness*, weak infrastructure, and limited digital literacy.
This presents a clear contrast between the two national contexts.

2. Confidence in Digital Systems

- NEOM tourism study: Citizens show *high confidence* in smart apps.
- Oman entrepreneurship study: Citizens have *low trust* in digital startups and online services.
- Digital transformation measurement tool: warns of *major cybersecurity risks* undermining trust.

This indicates varying societal trust levels depending on country, sector, and digital maturity.

3. Scope of Digital Transformation

- Sustainable development paper emphasizes *long-term economic and environmental impact*.
- DGA case study focuses on *emerging technologies* (AI, IoT, blockchain).
- NEOM study focuses on *consumer-facing applications*.

These highlight different priorities, which can lead to multiple definitions of “successful digital transformation” means.

4. Innovation Readiness

- Some studies (NEOM, KKU, DGA) show high institutional capacity and technological readiness.
- Others (Oman entrepreneurship, digital measurement tool) highlight gaps in skills, culture, and governance.

This suggests digital transformation is progressing unevenly—not all sectors or countries have reached the same maturity.

Synthesis Matrix Literature Review

Study	Authors	Year	Study Design	Key findings/ Results	Methodology	Limitation
1-Digital entrepreneurship in the shadow of the COVID-19 pandemic: opportunities and challenges	Hafiza Suleiman Al-Barashdiya	2021	The paper uses qualitative and analytical research design. It relies on content analysis of previous literature and uses both SWOT analysis (to assess strengths, weaknesses, opportunities, Threats) and PEST analysis (to evaluate political, economic, social, and technological factors influencing digital entrepreneurship globally). The	1- Covid19 accelerated the adoption of the digital transformation 2-Covid19 affected Oman and encouraged the government to support the entrepreneurs and support them by funds and knowledge. 3-The coronavirus pandemic has exposed the weakness of the country's digital transformation, opening up many opportunities that would not have been as successful at another time. 4- The study showed the challenges weakness and	the author used SWOT analysis, which examined the strengths, weaknesses, opportunities, and threats, and PEST analysis, these two methods	1-Limited digital literacy and entrepreneurial skills among youth. 2-Insufficient digital infrastructure in some sectors. 3-A shortage of experts in the technical field related to digital entrepreneurship. 4-A lack of public trust in and support for young entrepreneurs, as well as a lack of confidence in the products and services of digital companies. 5-Weak legal frameworks and data protection policies. 6-Lack of funding and fear of financial risk among entrepreneurs.

			author reviewed and analyzed 70 studies published between ,2019–2020	the opportunity towards the digital transformation and the government support for entrepreneurs to take a step up.		
2-Updating the digital system of government agencies in the Kingdom of Saudi Arabia in light of Vision 2030	Saad bin Nasser Al Azzam	2024	The study employed a descriptive cross-sectional case study design to assess the current state of digital transformation at King Khalid University within the framework of Saudi Vision 2030.	1-Saudi Arabia has made remarkable progress in digital transformation, achieving a significant leap in the UN e-Government Development Index, rising from rank 58 in 2010 to rank 31 in 2022. 2-King Khalid University (KKU) ranked third nationally among 36 Saudi education and training institutions in the Digital Government Authority's Transformation Index, scoring 87.42% in 2022.	The study followed a descriptive–analytical methodology, using a quantitative approach based on a structured questionnaire distributed to 308 participants from King Khalid University, with data analyzed through SPSS to evaluate the availability and effectiveness of digital transformation requirements in line with Saudi Vision 2030.	1-Scope Limitation (Geographical and Institutional), The research was limited to one institution – King Khalid University – which means the findings may not fully represent the status of digital transformation across all Saudi government agencies or universities, and shows the bias to the employees in the university. 2-The results are based on self-reported questionnaire responses from 308 participants, which may include response bias or differences in individual

						perceptions.
3-The role of digital government and its support for government entities in adopting emerging technologies to activate digital transformation: A case study of the Saudi Digital Government Authority	Tahani Dabian Al-Harbi and Reem Ali Al-Rabghi	2025	A descriptive, single-case (case-study) cross-sectional design—grounded in literature review and supported by a structured field instrument—to assess government digital-transformation mechanisms.	1-DGA plays a central role in enabling emerging technology adoption The Digital Government Authority (DGA) actively supports government entities by providing frameworks, guidance, and evaluation tools that help them adopt emerging technologies in alignment with Vision 2030. 2-Successful adopters are highlighted to inspire wider adoption The DGA showcases successful government entities that have effectively adopted emerging technologies, using them as examples to encourage and guide others.	The methodology integrates document analysis with a quantitative survey to evaluate both the national and institutional progress of digital transformation under Saudi Vision 2030.	1-Relies on interview-based qualitative data The study depends on a structured interview with the Emerging Technologies Unit and document analysis, meaning it may not capture every perspective or operational challenge in government agencies. 2-Lack of quantitative measurements The study does not use numerical or statistical data to measure the actual success levels of emerging technology adoption. 3-Scope is restricted to emerging technologies Other important digital transformation areas—such as cybersecurity, data governance, citizen satisfaction, or legacy

				3-A formal readiness assessment tool is used The DGA has developed a structured “adoption readiness” assessment that evaluates each entity’s maturity level, identifies gaps, and provides customized development plans. 4-Practical use cases across sectors demonstrate real impact The study identifies several national programs and projects using emerging technologies (e.g., Meras, Etimad, Absher, Hajj Hackathon), showing how technology is already transforming public services. 5-Awareness-building is a major DGA function The DGA increases		system modernization—were not deeply examined. 4-Depends heavily on existing reports and literature Because much of the study draws from previous research and DGA documentation, it may not fully reflect real-time, on-the-ground challenges within individual government entities.
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				awareness through readiness guides, communication campaigns, and public initiatives to help organizations understand digital transformation requirements. 6-Benefits of emerging technology adoption are clear Entities that adopt emerging technologies experience: better service quality, higher efficiency and reduced costs. increased competitiveness, better citizen experience and value.		
4-Measuring Digital Transformation in the Kingdom of Saudi Arabia: An Analytical	Turki Al-Doubi	2023	descriptive analytical design, combining both analytical review and survey-based inquiry.	1-Digital transformation is now a national necessity 2-Digital transformation is essential for achieving	Descriptive Analytical Method, survey tool	1-Scope Limitation, The research focuses only on the digital transformation measurement tool and its application within Saudi government agencies,

Study of the Digital Transformation Measurement Tool				fast, efficient, and high-quality government services and keeping pace with global technological advancement. 3- The Digital Transformation Measurement Tool helps provides a structured framework for: assessing government agency compliance, tracking progress toward Vision 2030 goals, standardizing digital transformation initiatives across sectors 4-Cybersecurity and electronic risks are the biggest challenges,It includes: ,Data breaches ,weak digital security policies, lack of unified cybersecurity practices, risks associated with digital transactions		without assessing individual institutions in depth. 2- Time Limitation,the study analyzes the measurement tool as applied in 2022, which reflects that year's digital maturity; updates or reforms after that period are not included. And due to this lack of data i can say that most of the key findings and recommendations are achieved at this time, Regulation has been created maturity level has been increased and much more. 3-Data Source Limitation,the study relies on: Official reports, publicly available documents, and governmental guidelines
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				5- There is an urgent need for new digital laws,Such as: A comprehensive Commercial and Electronic Transactions Law,Strong executive regulations for personal data protection 5. Government entities need to accelerate digital adoption, agencies must: Implement digital transformation quickly, Improve system integration, Enhance service quality, Use technology to reduce paperwork and improve efficiency. 6. Awareness and cultural readiness remain weak, There is a need to: -Spread the culture of		
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				digital transformation -Train employees -Increase community awareness -Reduce the digital literacy gap		
5-The role of using smart applications in developing the future of digital tourism in the smart city of NEOM from the perspective of a Saudi citizen	Dr. Wasfi Al-Kasasbeh Dr. Ismail Abu Shalfa Dr. Khalaf Al-Hussain	2023	Quantitative cross-sectional survey	1-Respondents demonstrated strong familiarity and comfort with using smart tourism applications, especially via smartphones, and this shows the high awareness of the citizens. 2-The highest-rated item stated that using smartphones and their applications is among the fastest and most effective technologies supporting digital tourism in NEOM (Mean = 4.19), which refers to smartphones being the	The author used a descriptive analytical survey method.	1-The sample includes only 134 citizens out of a larger population; therefore, findings may not fully represent all Saudi society segments, and might show bias. 2-The study focuses specifically on NEOM, which limits the generalization of results to other cities. 3-The study addresses smart applications related to digital tourism, especially AR and VR technologies, without exploring other technological innovations. 4-Conducted during the

				most efficient digital tourism tool. 3-Smart applications help NEOM improve its services and reach new tourism markets (Mean = 4.17), reflecting strong perceived value. 4-Applications allow tourism entities to better understand user preferences and behaviors, improving marketing strategies. 5-The lowest-rated item (Mean = 3.27) showed that maintaining ongoing communication and building loyalty through applications is an area that needs to be taken care of to enhance the		2022–2023 academic year, and results reflect the technological and tourism context of that period. 5-Reliance on self-reported questionnaires may introduce response bias, and the absence of qualitative methods limits the depth of insight into user experiences.
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				insight and increase the loyalty		
6-The role of digital transformation in achieving sustainable development within the framework of the Kingdom's Vision 2030	Ayed Ali Al-Qahtani	2023	The study employs a descriptive analytical approach to comprehensively explore the role of digital transformation in achieving sustainable development according to Saudi Arabia's Vision 2030.	1-Digital transformation is vital for achieving sustainable development goals in Saudi Arabia, as it aligns with and supports the objectives of Vision 2030. 2-The integration of digital technologies significantly improves organizational performance, leading to better service delivery and greater operational effectiveness. 3-Digital transformation fosters innovation and creates new economic opportunities, contributing to the diversification of the economy and job creation.	A descriptive analytical approach was used, incorporating historical reviews, statistical data, and examinations of relevant local and international literature.	1-The reliance on secondary data and historical sources present challenges related to data accuracy and comprehensiveness, potentially affecting the robustness of the conclusions drawn. 2-The fast pace of digital innovations might affect the findings from becoming outdated quickly, as new technologies and methodologies emerge. 3-The research benefits from more empirical evidence, including case studies or pilot projects that illustrate successful digital transformation initiatives in various sectors. 4-The study does not fully capture the perspectives of

						all relevant stakeholders involved in the digital transformation process, such as private sector entities and local communities.
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