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The Impact Of Digital Transformation On Organizational Development And Provision Of Healthcare Services In Saudi Arabia: A Systemic Review

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Abstract
Background*: The impact of digital transformation is particularly significant in the healthcare sector. Digital transformation has enabled healthcare providers to deliver more effective and efficient healthcare services. Digital technologies like telemedicine have expanded healthcare access, especially in remote areas.*
Methodology*: Data collection involved conducting a literature review utilizing multiple computerized databases. A targeted search conducted in January 2024 identified 15 articles that matched our criteria. A thorough search of PubMed, Scopus, and Web of Science was carried out to include studies published between 2014 and February 2024. The following search approach was applied: "digital" OR "technology" AND "healthcare" AND "Saudi Arabia." To find any potentially relevant studies, we manually reviewed the references of the included studies and earlier systematic reviews.*
Results*: Two studies aimed to evaluate the current status of digital transformation in Saudi Arabia by measuring the readiness for digital transformation, the patterns of digital transformation in providing healthcare services, and its seeking among individuals. One study aimed to assess the effectiveness of telemedicine and digital technologies in the healthcare system using an electronic application (Seha) to improve healthcare delivery and patient satisfaction. Another study aimed to investigate the effectiveness of digital healthcare transformation from the patients' perspective. We also included five studies that measured the interactions between healthcare practitioners and digital transformation in healthcare.*
Conclusion: *The present study's findings demonstrated the significance of bringing digital transformation to Saudi Arabia's healthcare sector. Currently, improvements are being made to digitization using various tactics, such as telemedicine and electronic applications. Additionally, readability and willingness for a more digitalized future in healthcare are demonstrated by the opinions of both patients and healthcare professionals.*
Keywords: *Digital transformation, healthcare, Saudi Arabia*

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I. Introduction

Digital transformation is not merely adopting new technologies within organizations; it represents a strategic shift in how businesses and governments leverage digital tools to innovate and enhance operations. This process, initiated toward the end of the 20th century but accelerated significantly in the early 21st century, underscores the urgent need to digitize various sectors [1].

A formal definition of digital transformation, as put forth by [2], is "a process that aims to improve an entity by triggering significant changes to its properties, such as its business model, value proposition, customer experience, and operational processes, through the use of digital technologies." [3]

The significance of digital transformation is underscored by its capacity to position organizations for survival and prosperity in an era where technology drives economic growth. This transformation empowers organizations to engage customers better, explore new markets, foster innovation, and enhance operational efficiency. Digital transformation is not a passing trend but a vital strategy for maintaining competitiveness in the digitized age [4].

Successful digital transformations have been observed in various sectors. Digital transformation typically falls into several categories, including transforming customer experiences, exploring new market opportunities, fostering innovation, and enhancing operational effectiveness [5]. For a successful digital transformation, organizations must formulate a clear strategy, establish digital business objectives, evaluate strategies, and consider the financial aspects and risk management. A comprehensive framework, like the Digital Transformation Framework (DTF), can aid this process [6].

Studies indicate that 40% of Vision 2030's objectives can be attributed to the successful implementation of the Digital Transformation initiative. The government has introduced nationwide efforts to

support this digital revolution, including the National Digital Transformation Strategy, to ensure that digital transformation is a cornerstone of the realization of Vision 2030 [7].

The Ministry of Communications and Information Technology (MCIT) spearheads digital transformation in Saudi Arabia. MCIT is responsible for modernizing government services and enhancing the efficiency of the public sector through various initiatives, including the National Information Center, the National Digital Identity Management Program, and the National Cybersecurity Authority [8].

Health Information Technology (HIT) has emerged as a driving force in reshaping healthcare delivery and improving patient care by leveraging innovative technologies. Adopting digital health tools, information systems, and electronic communication services has enhanced healthcare services globally [9].

The impact of digital transformation is particularly significant in the healthcare sector. Digital transformation has enabled healthcare providers to deliver more effective and efficient healthcare services. Digital technologies like telemedicine have expanded healthcare access, especially in remote areas [10].

The healthcare sector is undergoing a profound transformation due to the pervasive influence of digital technologies. This digital revolution, spurred by initiatives like Vision 2030 and the National Transformation Program, signifies a fundamental shift in how healthcare services are organized, delivered, and experienced. In pursuing a modern state, the Saudi government has prioritized digital transformation as a linchpin for achieving its objectives. However, as the healthcare in Riyadh embraces this digital metamorphosis, it faces a myriad of challenges and uncertainties that warrant comprehensive investigation [11].

The current study aimed to examine the current state of digital transformation in Saudi Arabian healthcare, assess the effectiveness of digital technologies in healthcare service provision, evaluate the impact of digital transformation on organizational development, identify barriers and challenges in the implementation of digital transformation, and explore stakeholder perspectives on digital transformation.

II. Materials And Methods

This study was carried out in compliance with the Cochrane Handbook of Systematic Reviews of Interventions at each step [12]. A reporting standard called Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) was created to address inadequate systematic review reporting. The PRISMA statement consists of a checklist with 27 elements that are advised to be reported in systematic reviews and an "explanation and elaboration" paper that includes examples of reporting and further reporting guidelines for each item. As demonstrated by the guidelines' co-publication in several journals, endorsement from nearly 200 journals and systematic review organizations, and acceptance across disciplines, they have received widespread support and adoption [13]. Following the PRISMA statement's guidelines, we conducted this systematic review and meta-analysis [14].

Study design

A systematic review of the literature usually entails an extensive and thorough plan and search strategy developed a priori, aiming to minimize bias through identifying, evaluating, and synthesizing pertinent research on a particular subject [15]. This research adopts a systematic review methodology to comprehensively assess the impact of digital transformation on organizational development and healthcare service provision within Saudi Arabia. This approach aims to identify and critically analyze relevant academic literature that sheds light on this critical topic.

Data Sources and Search Strategy

Data collection involved conducting a literature review utilizing multiple computerized databases. A targeted search conducted in January 2024 identified 15 articles that matched our criteria. A thorough search of PubMed, Scopus, and Web of Science was carried out to include studies published between 2014 and February 2024. The following search approach was applied: “digital” OR “technology” AND “healthcare” AND “Saudi Arabia.” To find any potentially relevant studies, we manually reviewed the references of the included studies and earlier systematic reviews.

Study inclusion and exclusion criteria.

Inclusion Criteria:

- All observational studies, mainly cross-sectional investigations of our aim.
- Studies related to Digital Transformation in Saudi Arabia.
- Studies published in respectable publications and on official websites after undergoing peer review.
- This study targeted high-standard literature of scientific rigor and dependability by including only official, trustworthy sources.
- Published in English

Exclusion Criteria:

- Studies that did not investigate the digital transformation and technology in Saudi healthcare.
- Reviews, case reports, and editorials.
- Studies that are not published in English
- Studies are not published in international peer-reviewed journals

Study selection process

We carried out the screening process, which involved using Rayyan software. [16]**;** (a) title and abstract screening to find studies that met the pre-established inclusion criteria (b) full-text screening to ascertain eligibility for quantitative analysis and. Disputes were resolved by consensus deliberation. A robust cloud-based software program designed specifically for researchers performing systematic literature reviews (SLRs) and meta-analyses is called Rayyan. This platform, which has a user-friendly layout and many capabilities, acts as a single hub for the review process.

- **Database search:** Performed a search in electronic databases, which led to the discovery of 184 records.
- **Duplicate removal:** Rayan software was utilized to detect and eliminate duplicate records, removing 79 records in total.
- **Initial screening:** 105 records were evaluated using predetermined criteria in Excel software to ascertain their inclusion or exclusion.
- **Initial exclusion:** After the first screening process, 87 records were eliminated because they were not relevant or suitable. This left us with just 18 records that were deemed appropriate for further investigation.
- **Full-text screening:** A comprehensive analysis of the full text of the 18 remaining records was conducted to evaluate their suitability for inclusion.
- **Final inclusion:** After thoroughly examining the Full-texts, 15 recordings were considered suitable and included in the study.

Critical appraisal

The assessment used the PRISMA and Newcastle Ottawa scale (NOS) evaluation criteria, it is included cross-sectional studies and a quality assessment (NOS) [17]. The NOS critical evaluation checklist enabled us to assess the presence of bias in the nonrandomized research study's design, conduct, and analysis and its approach to addressing bias following the literature search. It evaluates studies based on three broad categories: selection of study groups, comparability of groups, and ascertainment of either the exposure or outcome of interest. Scores of 0–3 represented low quality, 4-6 represented intermediate quality, and 7-9 represented high quality. After gathering relevant research, we evaluated its quality using established PRISMA guidelines. Then, we employed a PRISMA flowchart to rigorously assess each study's applicability and relevance to our research question.

Data extraction and synthesis

Using Microsoft Excel sheets, we extracted the study's primary data, including study ID, design, aim, and main findings. A narrative synthesis was used as the data analysis technique for this systematic review. This required determining the significant themes, trends, and patterns in the studies to provide a thorough narrative interpretation of our results. In this intricate and multifaceted field, the narrative synthesis method made describing and synthesizing the relevant information in depth easier.

III. Results

As previously noted, PRISMA was used to screen and identify the fifteen most relevant publications for this systematic review, and the results are displayed in various tables below. Figure (1) provides an overview of the screening procedure.

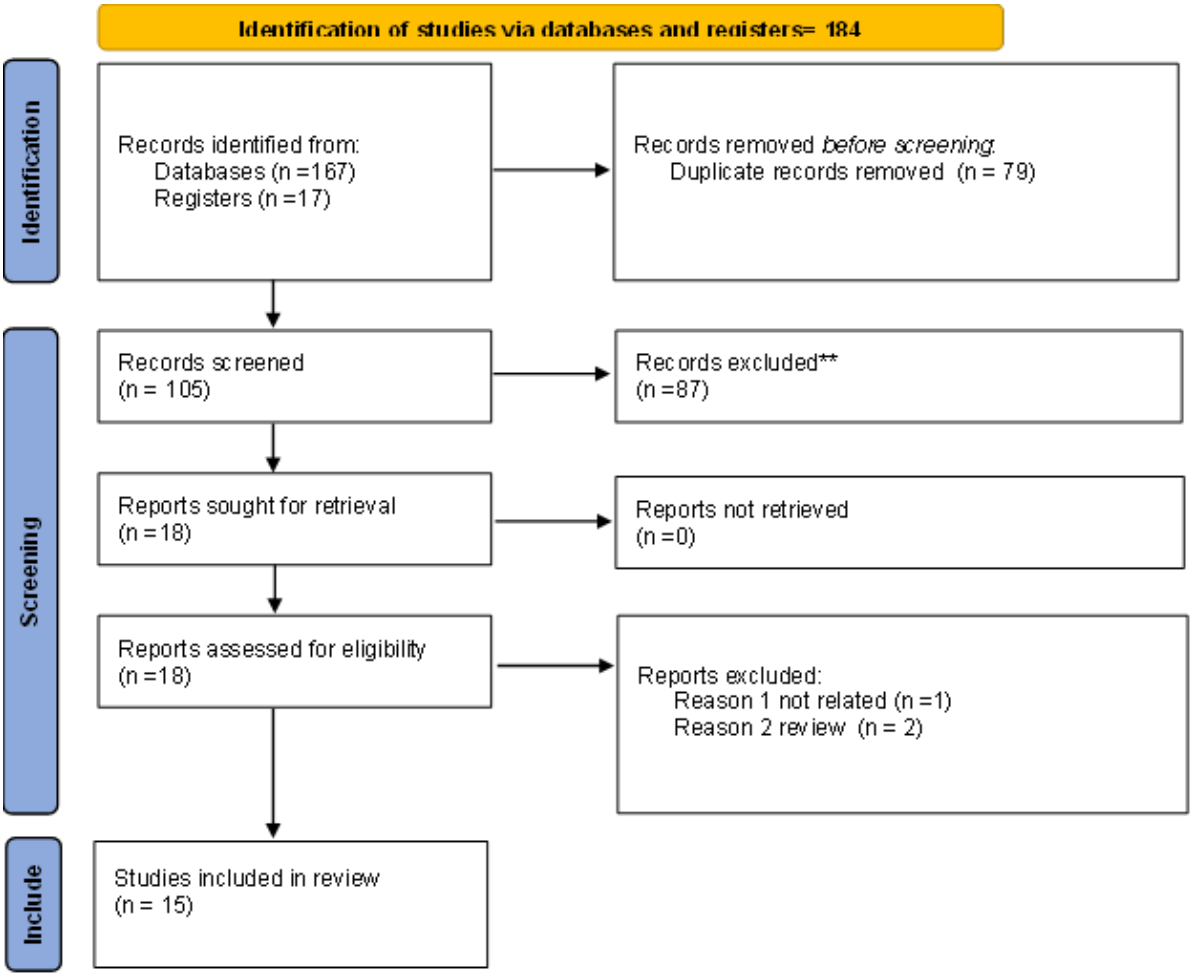

Figure 1: PRISMA flow diagram for the screening process

A total of 15 articles [11, 18-31] were included in the current systematic review. All of them were cross-sectional studies conducted at different centers in Saudi Arabia.

Two studies [20, 21] aimed to evaluate the current status of digital transformation in Saudi Arabia by measuring the readiness for digital transformation and the patterns of digital transformation in providing healthcare services and seeking them among individuals. One study aimed to assess the effectiveness of telemedicine and digital technologies in the healthcare system using the electronic application (Seha) to improve healthcare delivery and patient satisfaction [19]. Also, a study aimed to investigate the use of electronic health records [28]. Another study aimed to investigate the effectiveness of digital healthcare transformation from the patient's perspective [22]. We also included five studies that measured the interactions between healthcare practitioners and digital transformation in healthcare [11, 18, 23-25]. Two studies investigated the satisfaction of healthcare practitioners with healthcare digitalization [23, 25], while two studies investigated the attitudes and perceptions of the healthcare team toward digitalization [18, 24]. Another study investigated the electronic and digital healthcare applications among healthcare practitioners [11]. Two studies were conducted to investigate the use of digital healthcare in dentistry [26, 30]. Another two studies aimed at identifying the use of telemedicine in patients with special conditions such as chronic diseases and cancer [27, 31].

Regarding the studies investigating the current status of digital transformation in Saudi Arabia, the findings showed insights into the present conditions of healthcare digital transformation in Saudi Arabia. These studies showed which actions policymakers should take to improve the current status and the importance of providing educational programs among individuals to increase their knowledge about digitalization in healthcare.

Regarding telemedicine use by the Seha application, the individuals who were included showed improved outcomes and increased satisfaction after using the application. They reported ease of access and high effectiveness of the application system.

Although digital health services have shown improved satisfaction and ease of delivery of services, difficulties such as lack of time or a packed schedule have prevented patients in Saudi Arabia from using telemedicine.

Regarding the levels of satisfaction among healthcare practitioners, the Jazan region's developed e-health systems have a strong overall satisfaction rate, according to the data. Older physicians and physicians working in primary healthcare settings showed lower satisfaction levels, suggesting that more research is necessary to determine the difficulties senior physicians, in particular, have when utilizing e-health systems in these contexts. However, healthcare providers have also reported some barriers to the use of telemedicine. (Table 1)

Table 1: Summary and characteristics of the included studies

Study ID	Country	Design	Sample size	Data collection	Aim	Main findings
Al-Kahtani 2022	**Saudi Arabia**	**Cross-sectional**	10	Questionnaire	In accordance with the four dimensions—person-enabled health, predictive analytics, governance and workforce, and interoperability—adopted by the Healthcare Information and Management Systems Society, this study attempts to assess the preparedness for digital health transformation at various hospitals in the Eastern Province of Saudi Arabia concerning Saudi Vision 2030.	It was discovered that there are reasonable implementation rates and that, compared to government hospitals, commercial healthcare institutions had a higher digital transformation score overall. 'Governance & Workforce' was the most implemented dimension, according to the survey, while 'Predictive analytics' was the least implemented.
Alhur 2023	**Saudi Arabia**	**Cross-sectional**	2184	Questionnaire	To look at Saudi people's digital health literacy levels and how they typically search for health information online.	Our study's findings demonstrate the urgent need for Saudi Arabia to implement targeted educational programs that will increase the country's digital health literacy. This is especially crucial for closing the gaps between genders and age groups. Enhancing these essential skills would significantly enable people to make informed health decisions. These developments are essential to fostering a better-educated culture and adept at handling health-related data in a digital setting.
Alharbi 2021	**Saudi Arabia**	**Cross-sectional**	528	Questionnaire	This study aims to assess how well the e-health application Seha performs in terms of enhancing patient satisfaction with provided care, expanding access to care, and increasing system efficiency.	This study demonstrated how the Seha app enhanced Saudi Arabia's healthcare system. In terms of their perceived ease of access to healthcare services, their contentment with those services, and the system's effectiveness as indicated by the number of necessary doctor visits, users of the app reported having a superior overall health experience. Age, gender, the typical caregiver, and technological issues were among the characteristics that seemed to affect the app's use.
Mohamed 2023	**Saudi Arabia**	**Cross-sectional**	323	Questionnaire	This study attempted to assess the efficacy of digital health services from the patient's point of view and investigate the attitudes, experiences, and satisfaction of patients in the Jazan	In Saudi Arabia, digital healthcare has the potential to enhance both the efficacy and results of medical care significantly. Thus, monitoring and dispensing care via a digital health service would be beneficial. However, Saudi

					region.	Arabian patients have not been able to use telemedicine due to issues including time constraints or busy schedules.
Gosadi 2022	**Saudi Arabia**	**Cross-sectional**	445	Questionnaire	To gauge doctors' experiences and satisfaction with e-health systems and pinpoint the variables related to their degree of satisfaction.	According to the data, the Jazan region's developed e-health systems have a strong overall satisfaction rate. Older physicians and physicians working in primary healthcare settings showed lower satisfaction levels, suggesting that more research is necessary to determine the difficulties senior physicians, in particular, have when utilizing e-health systems in these contexts.
Alharbi 2023	**Saudi Arabia**	**Cross-sectional**	607	Questionnaire	To evaluate Saudi Arabian healthcare providers' knowledge, telehealth practices, attitudes, and impediments.	Healthcare professionals were well-informed about telehealth and believed it to be a legitimate and trustworthy practice. While telehealth services are available in most hospitals, the facilities are not up to par. More than half of the participating healthcare providers think some obstacles are preventing the use of telehealth in Saudi Arabia, even though telehealth awareness and practices are steadily expanding throughout Saudi medical institutions and providers.
Alhazri and Bugis 2022	**Saudi Arabia**	**Cross-sectional**	169	Questionnaire	To research the conflicts that users of electronic health services and applications in Riyadh face.	Training programs must be planned and implemented to raise healthcare practitioners' awareness of e-health applications and initiatives. It is essential to have overarching programs that integrate the features of many programs. Additionally, health organizations should offer internet access, technical assistance, and maintenance for their equipment. Penalties and accountability ought to be implemented for carelessness and incorrect data entry. Ultimately, hospital policies and guidelines should be created regarding which applications to use and which not to use, given that two-thirds of the participants felt overwhelmed by the number of applications accessible.
Wali 2023	**Saudi Arabia**	**Cross-sectional**	53	Questionnaire	To identify and address any obstacles or difficulties to determine what influences physicians' opinions of and contentment with telemedicine in National Guard primary care facilities.	About 68% of the providers who felt that the virtual visits' lack of integration was not a problem expressed satisfaction with them. Physician satisfaction was unaffected by other obstacles, such as worries about patient privacy, the inability to explain the expenses and connectivity problems. In general, no significant correlation was found between physician satisfaction and either technology comfort level or demographics. Furthermore, the various support options provided to doctors did not affect how they felt about virtual visits. If ongoing research and development are done, telehealth can potentially change

						how doctors and patients get healthcare.
Albarrak 2021	**Saudi Arabia**	**Cross-sectional**	391	Questionnaire	To evaluate doctors' understanding and perspective of telemedicine and its uses. Secondly, to assess their inclination towards implementing telemedicine in clinical settings.	Even though most professionals use social media or email to communicate with patients, most own two or more smart devices. However, most medical professionals still do not know much about telemedicine technology. Furthermore, most participants expressed favorable opinions on telemedicine and a willingness to use it in clinical settings. The main obstacles to the widespread use of telemedicine were concerns about privacy, a lack of training, financial constraints, and problems with information and communication technology.
Radwan 2023	**Saudi Arabia**	**Cross-sectional**	613	Questionnaire	This study aimed to evaluate the traits and credentials of dentists in practice that sway users to utilize digital dentistry technologies in Saudi Arabia. Additionally, this study sought to determine the perceived obstacles and difficulties dentists face and potential future advancements in using digital dental technologies in Saudi Arabian clinics.	Compared to non-digital users, a statistically significant proportion of Gen Xers (10.1%) used digital technologies in dental practices. 92% of respondents felt that digital technologies ought to be taught at dentistry schools for undergraduates, and 40% said they had gotten adequate postgraduate training in the field. Nevertheless, 79% of participants in workshops and official courses genuinely acquired new skills or knowledge in digital technology. The main obstacles were identified as "lack of clinical evidence," "lack of education and pioneers," and "lack of practitioners' awareness." Those who use digital technology less frequently think that using it to treat patients makes the course of care more predictable.
Aljerian 2023	**Saudi Arabia**	**Cross-sectional**	388	Questionnaire	To determine whether telepathology is widely accepted and understood, whether it will be used in the future, and whether patients and healthcare professionals in Saudi Arabia believe the practice has benefits and drawbacks.	Regarding telepathology, the participants' average knowledge rate was 80.3% (n= 312). Significantly, 88.16% (n=342) favored its acceptance, and 89.97% (n=349) thought it would be helpful in the future. Seventy percent of the respondents (n = 272) identified "expedited results" as the main benefit of telepathology. However, "the necessity for costly infrastructure" was identified by 60% (n=233) as its main drawback.
Alzghaibi 2023	**Saudi Arabia**	**Cross-sectional**	17	Face-to-face interview	To investigate the widespread adoption of electronic health records in Saudi Arabia's primary care facilities.	According to the study's findings, the major reasons the large-scale initiative failed were poor technical support, a lack of connectivity, and personnel changes, mainly involving high-ranking employees of the Saudi Ministry of Health. The project's size can directly impact the success rate of implementing electronic health records. Large-scale projects are more complex than minor initiatives and may encounter various difficulties. During the pre-implementation phase, the project team's

						concerns included essential elements like organizational process and redesign, legal concerns, training, and support. The implementation plan for electronic health records also addressed additional end-user and technology-related factors.
Wazqar 2024	**Saudi Arabia**	**Cross-sectional**	21	Face-to-face semistructured individual interviews	To investigate family caregivers and cancer patients' difficulties with digital healthcare technology platforms during the COVID-19 epidemic.	Similar factors hindered the participants' capacity to reap the benefits of digital healthcare technologies. Four themes emerged from the difficulties the two groups faced: individual user preferences, attitudes toward these platforms, access to platforms, and use of platforms for cancer health-related goals. This study found many areas that might be improved to promote future benefits and equitable use of digital healthcare technology platforms.
Alfallaj 2022	**Saudi Arabia**	**Cross-sectional**	26	Questionnaire	To find out how digital dental technology is used in Saudi Arabian undergraduate dentistry education and how financing sources affect dental schools' use of digital technology.	This national study demonstrated the continued need to incorporate digital elements into patient care and dental school courses in Saudi Arabia. Furthermore, no correlation was found between the funding sources and the incorporation of digital dentistry technologies into the existing curricula. To graduate qualified dentists who can provide digital dental treatment and be in line with Saudi Vision 2030 for the digitalization of healthcare, Saudi dental schools must, therefore, place a strong emphasis on applying and utilizing digital dental technology.
Almalki 2023	**Saudi Arabia**	**Cross-sectional**	342	Questionnaire	To look into the differences in telemedicine use and accessibility among Saudi Arabian patients with long-term illnesses in Riyadh.	According to the survey, 25.73% of the patients used telemedicine. Adults over 30 were more likely to use telemedicine than older adults. A higher likelihood of using telemedicine was linked to living in metropolitan regions, being female, and having more education. Employed participants showed an increased likelihood of using telemedicine among socioeconomic characteristics. Furthermore, the lowest socioeconomic level group was less likely to use telemedicine than the highest socioeconomic status group regarding the socioeconomic status index.

Quality assessment

Regarding the quality of the included studies using NOS, 10 of the included studies were of high quality, while 5 of them were of moderate quality (Table 2).

Table 2: Quality assessment of included studies using the New Castle Ottawa Scale for cross-sectional studies

Study name	Representativeness of the samples (★)	Sample size (★)	Non-Response rate (★)	Ascertainment of screening/surveillance tool (max★★)	The potential confounders were investigated by subgroup analysis or	Assessment of the outcome (max★★)	Statistical test (★)	Overall quality level

					multivariable analysis. (★)			
Al-Kahtani 2022	★		-	★	★	★★	★	Mode(7)
Alhur 2023	★	★	★	★★	★	★★	★	High (9)
Alharbi 2021	★	★	-	-	★	★★	★	Moder ate (6)
Mohamed 2023	★	-	★	★★	★	★★	★	High (8)
Gosadi 2022	★	★	★	★★	★	★★	★	High (9)
Alharbi 2023	★	★	★	★★	★	★★	★	High (9)
Alhazri and Bugis 2022	★	-	-	★	★	★	★	Moder ate (5)
Wali 2023	★	★	★	★★	★	★★	★	High (9)
Albarrak 2021	★	-	★	★	★	★	★	Moder ate (6)
Radwan 2023	★	★	★	★★	★	★★	★	High (9)
Aljerian 2023	★	★	★	★★	★	★★	★	High (9)
Alzghaibi 2023	★	-	★	★★	★	★★	★	High (8)
Wazqar 2024	★	-	★	★★	★	★★	★	High (8)
Alfallaj 2022	★	-	★	★	★	★	★	Moder ate (6)
Almalki 2023	★	★	-	★	★	★★	★	High (7)

III. Discussion

Findings from the current study showed the importance of implementing digital transformation for the healthcare system in Saudi Arabia. The current status is that steps toward digitalization are already being made and are being improved through different strategies like electronic applications and telemedicine. Also, the attitudes of patients and healthcare practitioners show readability and willingness for a more digitalized future in healthcare.

Regarding the current state of digital transformation of healthcare and its effect on healthcare quality, the current study showed that steps to digitalization are already being done and are being improved through different strategies like electronic applications and telemedicine. An intricate healthcare conservation and protection system is formulated by the vital role that all healthcare organizations play [32]. The Ministry of Information and Technology also provides engineering services related to public health and security management [8]. The Saudi Arabian government changed the health industry in many ways [33]. Furthermore, it is well-recognized that Vision 2030 is a powerful and precise framework for preserving health in the future [34]. Identifying diverse biological issues that may surface in the future is highly valued by the Ministry of Health and the Ministry of Health Resources [35]. Technology is, therefore, a helpful tactic for growing businesses and services in the healthcare industry [36]. However, a few issues must be resolved before moving on to the higher functionality level. This entails administering the relevant health promotion services and monitoring the database of healthcare providers and services [37].

Regarding the effect of digitalization on healthcare services, digital health services transport medical education and healthcare services beyond geographic boundaries using e-health and communication networks. The Saudi Telemedicine Network, which serves all healthcare facilities, was the first nationwide telemedicine project started by the Saudi MOH in 2011 [38]. Despite the overwhelming proof of the value and advantages of digital health services, there were numerous obstacles to their adoption, with 75% of projects failing and up to 90% of cases occurring in underdeveloped nations [39]. The COVID-19 pandemic and its associated control efforts have altered the global health landscape in addition to the Kingdom of Saudi Arabia. The current circumstance poses a challenge to medical practice. It is advised against having follow-ups, elective procedures, or routine check-ups.

Additionally, healthcare facilities are now possible places for COVID-19 infection [40]. Healthcare professionals had to deal with waves of COVID-19 cases, serious personal protective equipment (PPE)

shortages, a lack of institutional and social support, working longer hours, role conflict, uncertainty brought on by shifting management practices and inadequate training, and exposure to violence at work [41]. Saudi Vision (2030) has developed a plan for digital healthcare investments for the next ten years. Telemedicine has applications in follow-up, consultation, direct care, and triage [42]. To combat the pandemic, the MOH in Saudi Arabia has added new capabilities to the present **TH** services, which have been successfully integrated into the delivery of healthcare through mobile applications (such as Seha, Mawid, Tawakklna, Tabaud, and Tetamman) [43]. These health applications are shown in (Fig. 2) [35].

Evidence supporting the improvement in healthcare service delivery in Saudi Arabia through using the Seha app was presented by **Alharbi, Alzuwaed (19)**. The findings demonstrated that the users of the mobile app had a better experience with health services than the users of the traditional providers in terms of accessibility, satisfaction, and efficiency (measured in the number of doctor visits required). The three main goals for improving healthcare service delivery in Saudi Arabia are customer satisfaction, speed and ease of access, and value for the money invested. Digital health adoption is one of the main strategies for enhancing healthcare delivery in Saudi Arabia. Technology and mobile apps could be a strategy to overcome the shortfall in healthcare delivery that traditional methods continue to have regarding access and quality of service [19]. According to the study's findings, e-health technology adoption could help with many enduring issues facing the healthcare system, including a lack of resources, lengthy wait times, and general patient discontent [33, 44]. It has been discovered that online consultations can significantly lower patients' costs for the medical services they receive [45]. The Seha app's users needed fewer doctor visits than those using traditional services, according to Alharbi et al.'s results, which supported this conclusion [19]. This suggests that more people may download the app, which could increase the effectiveness of the healthcare system and lessen the burden on traditional providers. These results also align with earlier studies that found that patient satisfaction and access to health services were enhanced by e-health apps [46-48].

Regarding barriers and challenges facing the implementation of digital healthcare, **Wali et al. (2023)** revealed that 86% of the providers who did not consider the lack of virtual visit integration a problem expressed satisfaction with the virtual visits. Physician satisfaction was unaffected by other obstacles, such as worries about patient privacy, the inability to explain the expenses and connectivity problems. In general, no significant correlation was found between physician satisfaction and either technology comfort level or demographics. Furthermore, the various support options provided to doctors did not affect how they felt about virtual visits. If ongoing research and development efforts are made, telehealth has the potential to change the way that both patients and doctors receive healthcare [25].

Moreover, **Wazqar et al. (2024)** sought to investigate family caregivers and cancer patients' difficulties when utilizing digital healthcare technology platforms during the COVID-19 epidemic. This study showed that four themes related to the challenges the two groups experienced emerged: access to platforms, use of platforms for cancer health-related purposes, attitudes toward these platforms, and individual user preferences. This study identified numerous areas for improvement regarding digital healthcare technology platform implementation, which could increase future benefits and equal use [31].

Regarding the attitude and perspective toward digitalization, several studies were carried out to evaluate healthcare providers' attitudes and satisfaction levels regarding the digital revolution.

According to **Albarrak, Mohammed (18)**, 46.1 percent of medical experts from different disciplines are ignorant about telemedicine technology. Similar research revealed that surgeons and doctors knew little about telemedicine [49, 50]. According to a prior study, the hospital's health professional teaching faculty members' awareness, knowledge, attitude, and skills are insufficient [51]. According to Albarrak et al., 46.9% of professionals can use telemedicine tools with knowledge [18]. Comparing this percentage of tool access to comparable research, which revealed a smaller percentage of doctors, nurses, general practitioners, and specialists familiar with telemedicine applications, shows that more people are using these tools [52]. The fact that a smaller percentage of conferences, seminars, training sessions, and meetings focused on the benefits of telemedicine and its applications was also disclosed by Albarrak et al., which may help to explain why the study's participants had a mediocre understanding of the field [18]. According to about 77% of the professionals, ongoing training is required to use telemedicine to pursue updated information. Similar data suggest that ongoing training is the most effective means of enhancing health professionals' knowledge [52, 53]. As a result, users' knowledge—especially that of medical professionals—is crucial to the deployment of telemedicine services.

According to **Mohammed (18), the majority of professionals from all disciplines (90%) believe that telemedicine is a practical way to provide patients with** medical care. According to similar findings, telemedicine can effectively provide patients with medical treatment at a distance [54]. Nonetheless, a prior study found that physicians had a moderately positive impression of the benefits of telemedicine technology [53]. However, according to Albarrak et al., over 90% of participants thought telemedicine may save money, time, and effort [18]. Furthermore, the findings of Albarrak et al. also showed that the doctors who participated in the

study thought that information and communication technology **(ICT)** may play a part in improving the effectiveness and efficiency of the healthcare system. Similar but inconsistent findings suggest that telemedicine will save time and money by providing doctors with professional medical consultations while they are still in hospitals [18]. As a result, this can save healthcare system costs, patient lives, and time [53, 54]. Most professionals concurred that four institutions currently use ICT for healthcare applications, yet clinicians must receive the necessary training to support future telemedicine use. According to **Akbulut (54)**, 95% of participants think that their coworkers would be open to implementing telemedicine at their places of employment [18]. These results are consistent with a different survey that found that 99% of doctors support telemedicine services and that their peers would also like to employ this technology. However, a prior study found that this needs to be investigated because there are more variables to consider when measuring telemedicine adoption in rural areas [55]. According to Albarrak et al., many medical professionals who operate in their hospitals and use telemedicine technology to consult with worldwide experts in their fields, such as cardiology, orthopedics, dermatology, and pediatrics, have confirmed that they can consult major centers. The medical practice will benefit from these results, especially regarding time management and referral patterns [56].

Gosadi, AlTalhi (23) conducted a cross-sectional study to determine how satisfied doctors were with the e-health systems in place at their hospitals. The study was directed at doctors who work in healthcare settings in the Jazan region of Saudi Arabia. Most doctors were young male Saudi nationals with bachelor's degrees who worked in hospitals. Their typical experience was two years, and they oversaw ten patients daily. While the participating physicians were generally pleased with how e-health systems improved their clinical workflow and helped them cut work hours, they expressed dissatisfaction with the e-health system training they received and thought that variations in e-health system use amongst physicians could affect the quality of data entered into these systems. The years of experience, employment rank, and kind of healthcare facility were factors related to the satisfaction level (marginal significance level).

Comparable local and worldwide research can be used to assess the conclusions of **Gosadi, AlTalhi (23)** Investigation. According to a review by **AlSadrah (57)**, which examined seven studies carried out in Saudi Arabia to gauge healthcare workers' attitudes toward electronic medical records, some healthcare workers' unfavorable attitudes toward these systems posed the biggest barrier to the appropriate use. **AlSadrah (57)** also mentioned a few further obstacles, like a lack of training and limited computer literacy. In addition, Alharthi et al. found that only 40% of doctors were satisfied with an electronic medical records system a year after it was implemented in a government hospital in the Eastern Province of Saudi Arabia [58]. The primary factors affecting doctors' satisfaction were speed, workflow integration, and patient data [57]. Computer literacy and training were considered less satisfying experiences among the recruited physicians, although Gosadi et al. discovered a generally positive satisfaction level with selected domains, showing a good attitude towards established electronic healthcare systems [23]. However, studies cited in the **AlSadrah** review and the **Alharthi et al.** study found lower satisfaction levels were carried out almost ten years ago. Therefore, it is possible that Saudi Arabia's perception of e-health systems has changed after ten years of deployment [57, 58].

IV. Conclusion

Health information technology has played a major role in significant changes in the healthcare industry by changing how health services are delivered and introducing new patient care modalities. The recently developed field of digital health focuses on using information technology and electronic communication services, tools, and procedures to provide healthcare services and encourage better health. The technological revolution has profoundly impacted the global healthcare system. In addition, the worldwide healthcare sector now strives to offer top-notch services due to breakthroughs in information and communication technology in all fields. The present study's conclusions demonstrated the significance of digital transformation in Saudi Arabia's healthcare sector. Currently, improvements are being made to digitization using various tactics, such as telemedicine and electronic applications. Additionally, readability and willingness for a more digitalized future in healthcare are demonstrated by the opinions of both patients and healthcare professionals.

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