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Strategic Framework Towards Advanced Digital Therapeutic Interventions in Saudi Arabia by 50% By 2030

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ABSTRACT

With the advent of digital therapeutic technology, it will be easy to deal with the existing healthcare challenges effectively. This strategic plan has explored a roadmap of advancing Digital Therapeutics (DTx) intervention in Saudi Arabia by 50% by 20230 to match the country's vision 2030 of transforming healthcare. The analysis has used diverse literature reviews and tools like PESTEL, SWOT Analysis, and Balanced Scorecard to identify the key factors that can facilitate achieving the projects. Some key issues identified were that the government supports DTx growth, available partnerships, and internet connectivity. However, aspects like regulatory framework, IT infrastructure, skills gaps, and accessibility of resources could affect the achievement of the plan for 2030. Through DTx, this blueprint intends to improve access to healthcare systems. The research will offer recommendations on how the plan can be achieved and the indicators that can be used to measure the project's success.

Keywords: Digital Therapeutics (DTx) , Healthcare Transformation, Saudi Arabia Vision 2030 , Regulatory Framework, Strategic framework

I. INTRODUCTION

The traditional approach to therapeutic intervention has not been substantial in intervening in the therapeutic services to the people of Saudi Arabia. Healthcare organizations have struggled to meet the therapeutic needs of the populations due to inadequate collaboration tools, high costs of operating traditional models of service delivery, and limited reach to populations with conditions that need therapeutic intervention. The quick advancement of digital therapeutic intervention in Saudi Arabia will help accelerate clinical and healthcare services to the people, increase collaboration, reduce costs, and reach more people. The Kingdom of Saudi Arabia is under a quick healthcare transformation, which is geared by the government's Vision 2030 initiative.

This strategic plan has emphasized adding digital health solutions as a key core of revamping and enhancing the country's healthcare and clinical systems. The key elements that are being prioritized by the plan are broadening e-health platforms, mHealth services, medical Apps, telemedicine services, effective health analytics, and mobile solutions. The interventions will offer tailored solutions using modern technologies like wearables, AI-driven platforms, and mHealth options, enhancing patients' engagement and overall outcomes while minimizing the cost and resources allocated. There are increasing reports and initiatives from concerned bodies like the Saudi Food and Drug Authority (FSDA)and the National Regulatory Authority, which show more interest in DTx for addressing non-communicable diseases and increasing stress, psychological, and lifestyle health problems. That can be confirmed by the fact that KSA has invested in digital healthcare to enhance efficiency and how patients get engaged, with the potential to unlock about $27 billion by 2030 [31].

The Vision 2030 plan acknowledges the advantage of collaboration with the public and private sectors to drive the transformation and meet the overall goal at the right time. However, to achieve the vision, some barriers need to be dealt with, including the digital infrastructures, literacy level of the population on digital interventions, cost of production, policy concerns, and ethical issues that emerge towards fulfilling the initiative on time.

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II. LITERATURE REVIEW

Digital therapeutics (DTx) represent an innovative approach to healthcare, utilizing evidence-based software to prevent, manage, or treat medical disorders. This review synthesizes global research on DTx, with a focus on their applications in chronic disease management, mental health, implementation strategies, and technological advancements. The literature is organized into four thematic sections based on shared focus and citation clusters, followed by tables summarizing key findings and research gaps. The review highlights DTx's transformative potential, particularly in Saudi Arabia's Vision 2030 context, while identifying barriers and opportunities for future development.

A. *DTx in Chronic Disease Management and Non-Communicable Diseases*

Digital therapeutics are increasingly recognized for their efficacy in managing chronic conditions and non-communicable diseases (NCDs). Alqahtani et al. [1] underscore DTx's alignment with Saudi Arabia's Vision 2030, which aims to advance health technologies and improve accessibility. They highlight DTx's role in addressing prevalent conditions in the Kingdom, such as diabetes and cardiovascular diseases, through mobile apps, wearables, and AI-driven platforms that enhance patient engagement and outcomes. However, barriers like low digital literacy, regulatory challenges, and limited local DTx development persist, with the authors suggesting that Saudi Arabia could adopt reimbursement models from the U.S. and Germany to enhance scalability.

In Japan, Tanaka et al. [3] examine DTx applications for nicotine dependence, insomnia, and hypertension, concluding that these interventions are cost-effective and improve accessibility. They advocate for integration into clinical practice and expansion to other chronic conditions, though data collection for tailored treatments remains a challenge. Smith et al. [4] provide a global perspective, reviewing clinical trials that demonstrate DTx efficacy in chronic disease management and neurological disorders. They note the COVID-19 pandemic's role in accelerating adoption but emphasize persistent issues in standardization and trial design.

Lee et al. [9] focus on neurological disease management, defining DTx as software-based interventions that complement traditional therapies. They highlight benefits such as reduced costs, improved compliance, and continuous monitoring, positioning DTx as a promising tool for long-term conditions. Similarly, Patel et al. [10] explore DTx in Parkinson's disease (PD), detailing AI-driven virtual coaches, gait-improvement platforms, and digital CBT for managing motor and non-motor symptoms. They identify barriers like limited access among older adults and the digital divide, calling for inclusive design research.

Kumar et al. [13] emphasize big data's role in preventive care, integrating EHRs, claims data, and wearables to inform predictive models for NCDs. In India, Gupta et al. [22] evaluate the Phable Care app for type 2 diabetes, reporting a 76.6% improvement in blood sugar control among participants, reinforcing DTx's complementary role in diabetes management. Collectively, these studies affirm DTx's potential in chronic disease management, though regional and technological barriers require attention.

B. *Mental Health & Behavioral Interventions*

DTx have emerged as vital tools for mental health and behavioral interventions, addressing conditions like alcohol use disorder (AUD), smoking cessation, and general mental wellness. Johnson et al. [5] demonstrate that digital interventions for AUD offer flexibility and patient-centered care, reducing addiction rates effectively. In Saudi Arabia, Alharbi et al. [6] use semi-structured interviews to reveal challenges in traditional mental health support, advocating for AI-driven apps to enhance accessibility and support Vision 2030's wellness goals. Chen et al. [7] extend this argument, highlighting AI chatbots as a scalable solution to the shortage of mental health professionals, enabling single practitioners to serve larger populations.

Regulatory challenges are a key focus in Brown et al. [11], who explore DTx for mental health and warn that strict frameworks may limit psychologists' adoption, reducing care access. They advocate for global regulatory harmonization and psychologists' involvement in decision-making. Zhang et al. [12] review Large Language Models (LLMs) in mental health, noting their application in diagnosis and therapy but flagging data reliability issues as a barrier to effective training.

Behavioral interventions are exemplified by Taylor et al. [21], who evaluate Quit Genius, a CBT-based app for

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smoking cessation, reporting a 45% abstinence rate compared to 29% with brief advice, with high user engagement (74% at week four). Similarly, Wilson et al. [25] assess the Drink Ration app for reducing alcohol consumption among British veterans, with results pending in 2024, signaling potential expansion to other conditions. These studies highlight DTx's efficacy in mental health and behavior change, tempered by regulatory and data challenges.

C. Implementation, Adoption, and Equity

The successful deployment of DTx depends on implementation strategies, physician adoption, and equity considerations. Davis et al. [2] explore digital health interventions (DHIs), noting their adaptability to diverse populations through mHealth, eHealth, and AI. Strategies like gamification and self-monitoring enhance engagement, with a post-2017 shift toward personalization to address disparities. Kim et al. [8] find that physicians' adoption of DTx hinges on ease of use and perceived usefulness, reinforced by scientific endorsements, underscoring professional trust's role.

Lopez et al. [14] highlight telemedicine's integration during the COVID-19 pandemic, which accelerated DTx adoption and improved intervention speed. Müller et al. [15] address reimbursement, arguing that developers' awareness of existing frameworks could prevent delays like those in Germany's DiGA system. Nguyen et al. [16] propose digital transformation networks to reduce health inequities, closing gaps in digital determinants of health.

In pediatric care, Singh et al. [23] emphasize customizable DTx for sustained use, based on interviews with Canadian physicians. Thompson et al. [28] focus on vulnerable groups, using autism as a case study to highlight the digital divide's impact and propose inclusive literacy solutions. Carter et al. [30] outline nine criteria for adopting DTx in large U.S. healthcare systems, stressing strategic planning and executive support for sustainability. This section reveals that while DTx adoption is advancing, equity and systemic integration remain critical hurdles

D. Technological Advancements and Future Directions

Technological innovation underpins DTx's future potential. Shiwlani et al. [18] demonstrate AI's role beyond diagnosis, reducing costs and improving outcomes. Evans et al. [19] apply this to pediatric oncology, advocating for AI-driven personalized care. Patel et al. [20] integrate robotic process automation (RPA) with AI and machine learning, enhancing diagnostic precision and scalability.

Adams et al. [24] review digital health's evolution, emphasizing AI, EHRs, and telemedicine for quality care, though privacy and interoperability challenges persist. Rossi et al. [26] analyze AI and big data in European public health, calling for integrated policies to address accessibility and regulatory issues. Garcia et al. [27] introduce One Digital Health (ODH), unifying human, animal, and environmental health through big data and smart technologies, with stakeholder collaboration key to crisis response.

White et al. [29] assess DTx app usability via the System Usability Scale (SUS), reporting scores of 76.64 ± 15.12 (68.05 ± 14.05 excluding physical activity apps), recommending SUS for evaluation. These studies position DTx at the forefront of healthcare innovation, contingent on resolving ethical and infrastructural challenges

Table 1 Key Findings

Theme	Key Findings	Sources
Chronic Disease Management	DTx effectively manage NCDs (e.g., diabetes, PD) with cost-effectiveness and improved outcomes.	[1], [3], [4], [9], [10], [13], [22]
Mental Health	DTx enhance accessibility and efficacy in AUD, smoking cessation, and mental wellness.	[5], [6], [7], [11], [12], [21], [25]
Implementation & Equity	Adoption requires physician trust, equity-focused design, and strategic planning.	[2], [8], [14], [15], [16], [23], [28], [30]

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Table 2 Research Gaps

Paper Number	Methodology	Strengths & Weaknesses	Findings / Results / Gap
[1],[6]	Review,interviews (KSA)	Contextual, limited local data	DTx aligns with Vision 2030, apps aid mental health
[2],[4]	Systematic review,trials	Broad scope, standardization gaps	DHIs boost engagement, DTx trials need validation
[3],[21]	Case study,RCT (Japan/UK)	Focused, short-term focus	DTx cost-effective for nicotine, Quit Genius excels
[5],[25]	Review,trial (alcohol)	Practical, results pending	DTx aids AUD, Drink Ration potential unproven
[7],[12]	Review (AI,LLM)	Innovative, data reliability issue	AI chatbots, LLMs ease mental health burden
[8],[23]	Survey,interviews	User-focused, small samples	DTx acceptance tied to ease, customization key
[9],[10]	Review (neuro][PD)	Thorough, access barriers noted	DTx enhances neurological care, inclusivity needed
[11]	Policy analysis	Insightful, regulatory focus	Strict rules limit DTx mental health access
[13],[20]	Data,tech review	Data-driven, integration complex	Big data, RPA-AI improve preventive care, diagnostics
[16],[28]	Framework,case study	Inclusive, empirical gaps	Digital platforms reduce equity gaps, aid vulnerable

Digital therapeutics (DTx) are transforming healthcare, aligning with Saudi Arabia's Vision 2030 to enhance health outcomes and accessibility. They excel in managing chronic diseases, mental health, and behavioral issues, leveraging AI and big data. However, challenges like regulatory hurdles, digital literacy, and equity need addressing for scalability. Future research should prioritize local DTx development, standardized validation, and inclusive design to build a robust ecosystem.

III. METHODOLOGY

The research begins with a Literature Review that informs the Survey Design (80 respondents). Findings feed into both SWOT and PESTEL analyses, which then inform Balanced Scorecard KPIs. This structured approach enables continuous Monitoring & Evaluation of digital therapeutics adoption in Saudi Arabia's healthcare system see Fig.1.

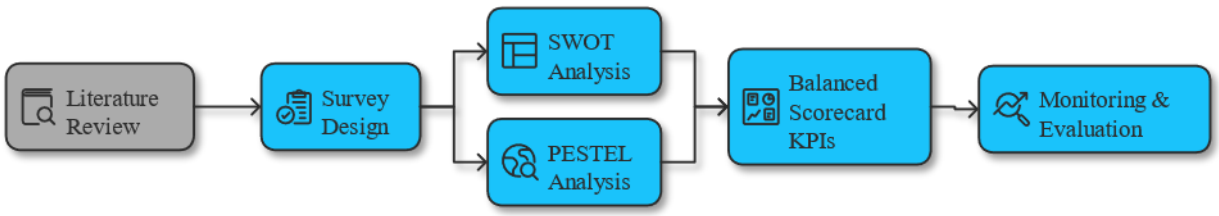

Fig.1 Paper Methodology Visual Flow

Data Gathering Technique

This questionnaire explores the awareness, perceptions, and behaviors related to digital therapeutics (DTx) among 80 respondents in Saudi Arabia. This study examines respondents' DTx knowledge, usage patterns, and perceived challenges to offer guidance on implementing and integrating digital health solutions in line with Saudi Arabia's Vision 2030 goals.

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The demographic profile reflects a balanced age distribution (31–45: 40.3%, 46–60: 37.7%, Over 60: 6.5%) and near-equal gender split (46.1% male, 53.9% female), ensuring diverse perspectives. Urban respondents dominate (70.1%), with the public (28%), healthcare providers (11.7%), and patients (2.3%) offering varied viewpoints, particularly from end-users.

Knowledge and Awareness: Fig.2 show Awareness of DTx is moderate, with 37.7% familiar with the concept, while 62.3% are not, indicating a knowledge gap. Conversely, 54.5% recognize Vision 2030's healthcare objectives, suggesting broader awareness of national goals than specific DTx applications. Mobile health apps (80.3%) and wearables (43.4%) are the most recognized tools, reflecting their integration into daily life. However, AI-driven mental health platforms (19.7%) and telemedicine (21.1%) lag, pointing to uneven familiarity with advanced technologies. This highlights the need for targeted education to bridge awareness disparities.

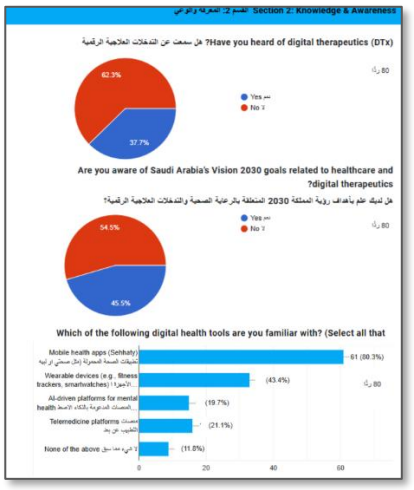

Fig.2. Knowledge & Awareness

Attitudes and Perceptions: Perceptions of DTx effectiveness are positive, with 59.8% viewing them as effective (28.6% very, 31.2% somewhat) for chronic disease management, though 35.1% remain neutral, indicating uncertainty. Adoption intent is moderate, with 54.6% likely to use DTx (23.4% very, 31.2% somewhat), but 42.9% are neutral, suggesting hesitation. Strong support for DTx investment (88.3%) aligns with Vision 2030, with only 1.3% opposition, presenting a favorable environment for policy initiatives. Engaging the neutral 10.4% through awareness campaigns could further solidify support.

Behavioral Data: Fig.3 shows High engagement with digital health tools is evident, with 74% using apps (69.7%) or wearables (51.5%), while telemedicine usage is lower (18.2%), possibly due to access or familiarity issues. Usage frequency varies: 26% are daily users, 15.6% weekly, 20.8% monthly, and 23.4% rare users, with 14.3% never engaging, aligning with the 26% non-users. This suggests a committed user base but a significant unengaged segment, necessitating strategies to enhance access and habit formation.

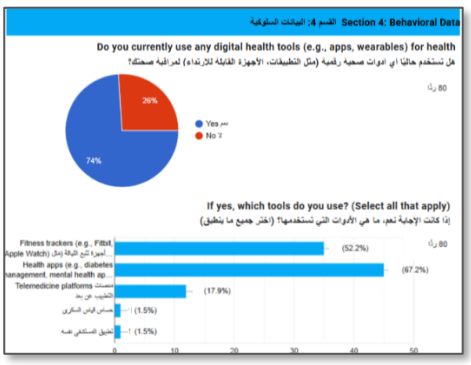

Fig.3. Behavioral Data

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Challenges and Suggestions: Open-ended responses identify patient conviction (44.1%) as the primary barrier, followed by infrastructure and knowledge gaps (11.8% each). Suggestions emphasize awareness and education (28.9%), training (21.1%), and infrastructure development (10.5%). Integration strategies include phased implementation (13.8%) and workforce expansion (6.9%). These findings underscore the need for multifaceted approaches to overcome skepticism and logistical hurdles.

Healthcare Providers and Researchers: Familiarity with DTx regulatory frameworks is moderate (55.4%), but 22.1% are unfamiliar, and 17.6% note regulatory ambiguity as a barrier. Limited patient access (48.5%) and insufficient training (22.1%) further impede adoption. Optimism prevails, with 38.5% envisioning a significant DTx role, improving patient experiences (11.5%) and reducing hospital congestion (7.7%).

The survey reveals strong DTx potential in Saudi Arabia, supported by public enthusiasm and Vision 2030 alignment. However, addressing awareness gaps, patient skepticism, infrastructure deficits, and regulatory clarity is critical. Targeted education, training, and phased implementation can enhance adoption, ensuring DTx contributes effectively to transforming healthcare delivery by 2030.

A. PESTEL Analysis

To determine the feasibility of the plan to advance digital therapeutic intervention by 50% by 2030, a comprehensive PESTEL analysis was thoroughly conducted to assess the macro-environment factors influencing the usage of DTx across the country.

The analysis has given a broader understanding of the external aspects that are likely to influence fulfilling the strategic vision and plan being put in place by the government. These PESTEL elements can either positively or negatively facilitate adoption; thus, since the implementation is a strategic plan, aspects that affect negatively should be mitigated effectively.

a) Political Factors

Government Support and Vision 2030: Vision 2030 is at the center of Saudi Arabia's national goals, with the country emphasizing digital transformation and more concerned with healthcare changes. That offers a favorable climate for adopting and accelerating DTx since it will mean more government efforts. Some government programs, like the National Transformation Programs, are important in advocating digital transformation solutions [32]. Under such a program, KSA invested USD 65 billion to advance the country's digital infrastructure for healthcare, which is a huge commitment to ensure the plan succeeds. However, it is important to note that some of these programs may face bureaucratic issues; thus, effective leadership will be needed to achieve the plan.

Regulation and Policies: Since the COVID-19 experience, the regulatory landscape in Saudi Arabia has been widely regulating health services, especially now that businesses are trying to go digital. The changing nature of digital healthcare necessitates the importance of comprehensive regulations, as some institutions may lack the capacity to meet the standards for transformation based on data privacy as defined by the Saudi Data AI Authority (SDALA) [33]. Such regulations may affect the adoption process and the evolution of digital solutions like AI, Blockchain Technology, and the Internet of Things (IoT), which keep bringing new changes.

Health Reforms: The government is giving wide opportunities for privatizing the health sector and increasing insurance coverage, impacting the industry's landscape. The reforms are helping healthcare facilities partner with possible stakeholders to increase opportunities for the DTx, where private companies can partner with insurance bodies to enhance growth.

Political Stability: Political stability in the country affects aspects like regional and international relationships.

The current political status of the country is stable. It can easily collaborate with other countries to get the materials that necessitate the digital transformation in the healthcare sector [34]. Due to such political stability, international companies like FPT have agreed with THIQAH, a provider of smart business innovations in Saudi Arabia, where the collaboration will enhance digital advancement solutions in different industries, helping the ambitious vision of 2030.

b) Economic Factors

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Economic Growth: According to Saudi Economic Watch 2024, the country is resilient in economic expansion, with the non-oil sector growing by 4.9%, led by hospitality, trade, and renewable industry [35]. Such growth also impacts health expenditure since populations have disposable income that they can use to consult on their health, lifestyle diseases, and therapeutic sessions with professionals. Such economic growth will positively impact DTx in healthcare when looking for the most effective solutions.

Economic Diversifications: The Kingdom of Saudi Arabia is diversifying its economy to stop depending on oil, which is a significant opportunity for coming up with DTx solutions. The DTx providers can receive funding from different sources in all sectors to facilitate the growth of digital infrastructures.

c) Social Factors

Change in Demographics: There are increasing demographic trends regarding age, urbanization, and professionals. The country's large population is young people, 65% and 45% in urban centers [37]. The growth of more educated young professionals will inspire the adoption of DTx in health sectors since they will need little training to capture the trends. Figure 1 below shows population development in KSA and how the regions distribute them.

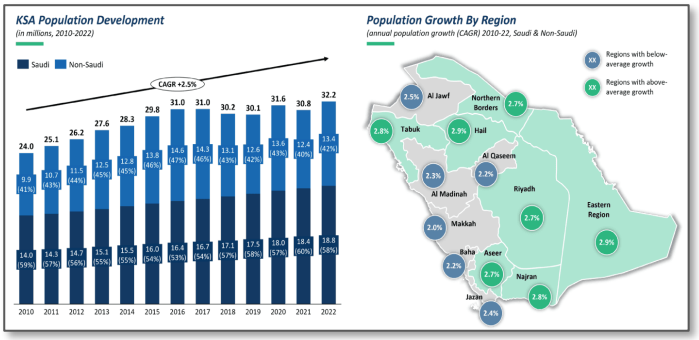

Fig.4. Population Development in KSA

Health Awareness: There is increasing awareness about preventive care and cautious health life in Saudi Arabia. The DTx interventions can enhance healthcare education and attention and promote innovations.

Cultural Attitude: The cultural attitude in Saudi Arabia is significantly impacting the way DTx is adopted because, in most cases, people are holding to traditional ways of seeking medication and treatment. Such attitudes will likely slow down the adoption of DTx in the healthcare sector.

d) Technological Factors

Digital Infrastructure: The government has invested highly in supporting companies to start developing digital infrastructure. There is also increasing the use of mobile phones and other gadgets where a large population is connected to the city. In the country, there are about 33.4 million users of the internet and technology, which is about 99% of the population, and such milestones will be key for achieving digital advancement in healthcare [38]. There is also high growth in AI, Data Analytics, the Internet of Things, and Blockchain technology, which will facilitate the growth and adoption of digital intervention in healthcare.

e) Environmental Factors

Sustainable Digital Infrastructure: Saudi Arabia's government is working hard to achieve sustainable goals, one of which is reducing its carbon footprint. Adopting technology will thus aid in reducing professional movements' dependence on huge information storage using papers and files on shelves made from cut trees. This aspect could encourage the speedy adoption of DTX.

E-waste: There is increasing concern about e-waste, such as computers, cables that transmit the internet, and other hardware. These wastes are believed to greatly impact the environment and sustainability. As such, DTx might be slowed down because some healthcare facilities cannot find better ways to dispose of e-waste to reduce carbon footprint.

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f) Legal Factors:

Data Privacy Laws and Regulatory Framework: The DTx has a complex data regulatory framework that includes internal and international regulations. Saudi Arabia has created a wide range of privacy laws, such as Personal Data Protection Laws (PDPL), which guide the establishment of information technology [39]. However, the increasing dialogue among the stakeholders and key industries will likely slow the country's adoption process of DTx.

B. SWOT Analysis

The survey design exploring digital therapeutics (DTx) awareness, perceptions, and behaviors in Saudi Arabia directly informs the SWOT analysis by supplying empirical data that identifies strengths, weaknesses, opportunities, and threats.

This iterative process ensures the SWOT analysis is evidence-based, delivering actionable insights for integrating DTx into Saudi Arabia's healthcare ecosystem. Consequently, it shapes a SWOT framework that effectively balances public readiness with adoption challenges.

Strengths • Government Investment and Support • High Internet Connectivity Level • Young and tech-savvy Generation	**Weaknesses** • High Regulatory Gaps • Limited Skills and Knowledge • Integration of New systems with Legacy systems • Digital Literacy Gaps
Opportunities • Increasing DTx Market • Strategic Partnership • Research and Development • Telemedicine Integratio	**Threats** • Increased Cybersecurity • Threats of Regulatory Changes • Ethical Concerns on Data Privacy Cost of Implementation

Fig.5. SWOT Analysis

Strengths: The key strength for Saudi Arabia to achieve the plan is that the government supports the digital transformation programs. It has welcomed partners to develop IT infrastructures and funds key projects. There are also well-educated populations with a high level of internet connectivity, up to 99%, which will increase the overall implementation of the plan [40].

Weaknesses: The analysis indicates high regulatory gaps in how to dispose of e-waste, privacy laws, and data protection. There are also gaps in knowledge and education among the users and limited skills among the healthcare providers who will need high training to get to the standard [39]. There is also the challenge of integrating new technologies with legacy systems, which might affect the swiftness of the adoption of these technologies in healthcare.

Opportunities: An increasing market for global digital health consultancy is influencing organizations to take the DTx seriously. There is an opportunity for strategic collaborations partnerships, increasing the adoption rate of digital technology [32],[33]. There is also an opportunity for more research and development (R&D), which will inform the implementation process more effectively.

Threats: The main threat associated with adopting the DTx in digital therapeutics is the increasing number of cybersecurity issues. There is also the threat of regulatory change due to changing technology, which will bring new issues that will significantly affect the adoption process, where the regulatory issues will slow the adoption [41]. Other emerging issues are ethical concerns about technology, data privacy, and security. Data will be needed to train some App users, but they will likely shy away due to their privacy issues.

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C. *Balanced Score Card*

A Balanced Scorecard (BSC) is an effective management tool that assists organizations to change their vision and goals into measurable objectives. Applying the tool to the plan of DTx in Saudi Arabia can offer structured aspects in tracking the development and progress to ensure alignment across different levels of the organization.

Table 3 Strategy Map

Perspective	Theme	Objectives
Financial	Sustainable Funding	Secure funding for digital therapeutics development and implementation.
Customer	Patient-Centric Care	Improve patient access to and satisfaction with digital therapeutic solutions.
Internal Processes	Efficient Implementation	Streamline the integration of digital therapeutics into healthcare systems.
Learning & Growth	Workforce & Innovation	Build digital health capabilities and foster innovation in digital therapeutics.

Table 4 Balanced Scorecard Table

PERSPECTIVE	Objective	Measurement	Target	Action Plan (Initiative)
Financial	Secure funding for digital therapeutics development and implementation.	% of budget allocated to digital therapeutics.	20% of healthcare budget by 2025.	Establish public-private partnerships (PPPs) for funding digital therapeutics.
	Ensure cost-effectiveness of digital therapeutics.	Cost savings from reduced hospital visits and improved outcomes.	30% reduction in healthcare costs by 2030.	Conduct cost-benefit analyses for digital therapeutics and scale cost-effective solutions.
Customer	Improve patient access to digital therapeutics.	% of population using digital therapeutic tools.	50% adoption rate by 2030.	Launch nationwide awareness campaigns and subsidize digital therapeutic tools for patients.
	Increase patient satisfaction with digital therapeutics.	Patient satisfaction score (out of 10).	Achieve a score of 8.5/10 by 2030.	Develop user-friendly digital therapeutic platforms with patient feedback loops.
Internal Processes	Streamline integration of digital therapeutics into healthcare systems.	% of healthcare facilities using digital therapeutics.	80% of facilities integrated by 2030.	Develop interoperability standards and integrate DTx with EHRs and HIS systems.
	Ensure regulatory compliance and approval of digital therapeutics.	Number of approved digital therapeutic products.	50 approved products by 2030.	Establish a dedicated regulatory framework for digital therapeutics.
Learning & Growth	Build digital health capabilities among healthcare providers.	% of healthcare providers trained in digital therapeutics.	90% of providers trained by 2030.	Launch training programs and certifications for healthcare providers.
	Foster innovation in digital therapeutics.	Number of new digital therapeutic solutions developed annually.	10 new solutions per year by 2030.	Create innovation hubs and provide grants for startups and researchers.

Note: The values presented in this table 4 are based on assumptions due to limited available data.

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Table 4 outlines a strategic plan for integrating digital therapeutics (DTx) into healthcare systems using a Balanced Scorecard framework, which balances financial, patient-focused, operational, and developmental goals.

From a financial perspective, the plan aims to secure funding (targeting 20% of healthcare budgets by 2025) and improve cost-effectiveness (30% savings by 2030) through partnerships and data-driven scaling. For patients, it focuses on increasing access (50% adoption by 2030) and satisfaction (8.5/10 rating) using subsidies, awareness campaigns, and user-friendly designs. Internal processes emphasize seamless integration (80% of facilities by 2030) and regulatory compliance (50 approved products), achieved through interoperability standards and dedicated frameworks.

Lastly, learning and growth priorities include training 90% of providers and fostering innovation (10 new solutions yearly) through education programs and startup grants. Each objective has measurable targets, actionable initiatives (e.g., public-private partnerships, EHR integration), ensuring a structured approach to advancing digital therapeutics in healthcare.

IV. RESULTS AND RECOMMENDATIONS

The analysis of the trajectory for implementing advanced digital Therapeutic Interventions in Saudi Arabia by 50% by 2030 indicates more success possibilities. The country's political trajectory has allowed the government to support the initiative because it is one of the key agendas for Saudi Arabia's vision. Digital technology offers key benefits to healthcare systems, which include collaboration in care, patient engagement, and increased convenience for patients and physicians.

The economic aspects are one of the key factors accelerating the adoption of digital healthcare since the companies will be able to achieve overall growth. Healthcare organizations seek to reduce the cost of operations while achieving the optimum healthcare for the patients. Research published in 2020 by McKinsey Global Institutions estimated that connected devices and improved networks in healthcare could produce about $420 billion in the world GDP by 2030 [42]. In Saudi Arabia, digital healthcare is likely to play a key role in enhancing healthcare and achieving outcomes, bringing about $27 billion to the economy by 2030; thus, such projection is essential for adopting digital therapeutic intervention.

V. CHALLENGES

Complexity is the main challenge of achieving the advanced digital therapeutic intervention by 50% by 2030. One of the main challenges is that the healthcare facilities are categorized into three key sectors managed by different regional zones and directorates in the country. These facilities operate in fragments, each with a unique business model and financial projections. Another challenge is the gaps in the skills and professionals needed to implement digital transformation. Again, integrating new digital systems, legacy systems, and limited IT infrastructure poses high challenges. There is also the challenge of regulatory frameworks ranging from government policies and evolving digital regulations that will likely affect the overall exercise of achieving the project's plan.

A. Recommendations

- **Streamline Regulatory Frameworks:** The governing body needs to develop an effective regulatory framework that will be reliable for a long time. That should be done by collaborating with bodies like the SFDA and other bodies involved in the regulations.

- **Embrace Innovative Ecosystems for DTx:** The government and the key bodies need to develop DTx innovative hubs with the right funding mentorship and ensure the involved bodies have the right resources to increase local innovation and catalyze cultural appropriateness.

- **Training and Awareness:** The stakeholders need to increase public and professional awareness through training on the benefits they will receive from implementing the DTx in their healthcare practices.

- **Equitable Access to Digital Resources:** The government must ensure that the public receives the right resources in equal measure to achieve the digital edge milestone. For example, mobile clinics and telemedicine can be deployed in remote areas.

- **Consistent monitoring of Performance:** Continuous data collection and analysis are needed to

effectively track the KPIs from the BSC to ensure that every milestone is met for the project's new 2030.

VI. MONITORING AND EVALUATION

The strategic plan to advance Digital Therapeutics (DTx) in Saudi Arabia by 50% by 2030 employs a robust Monitoring and Evaluation (M&E) framework, using the Balanced Scorecard (BSC) and Key Performance Indicators (KPIs) to track progress toward Vision 2030 goals.

Criteria Definition: Criteria align with strategic objectives, ensuring alignment, accuracy, reliability, timeliness, relevance, and simplicity. KPIs focus on adoption (50% by 2030), satisfaction (8.5/10), and cost savings (30% by 2030).

Data Collection: Quantitative data from app usage (69.7%) and budgets, plus qualitative feedback from surveys (80 respondents) and interviews, provide comprehensive insights. Dashboards and audits track integration and regulatory progress.

Data Analysis: Techniques like trend analysis, gap analysis, and SWOT assess adoption trends (74% use digital tools) and barriers (44.1% patient conviction). Benchmarking against global standards identifies gaps (62.3% DTx unawareness).

Reporting Findings: Clear reports with charts highlight achievements (88.3% investment support) and challenges (17.6% regulatory ambiguity), shared via stakeholder workshops.

Action Implementation: Prioritized actions include training (90% providers) and awareness campaigns, with Budget allocated. Responsibilities and timelines ensure accountability.

Process Review: Annual reviews adjust KPIs for evolving needs, ensuring alignment with Vision 2030. This continuous cycle drives DTx adoption, positioning Saudi Arabia as a healthcare innovator.

VII. CONCLUSION

The strategic plan has outlined a well-established mechanism to achieve the advanced digital therapeutic in Saudi Arabia by 50% by 2030. The analysis has analyzed the key driving factors using the PESTEL analysis and SWOT analysis, then used BSC to state the KPIs that can measure the company's success.

This strategic plan outlines a comprehensive approach to advance Digital Therapeutics (DTx) in Saudi Arabia by 50% by 2030. The KSA can harness DTx to enhance population health results by resolving regulatory issues, developing new technologies, and educating the public.

The plan's focus is to achieve sustainability through the plan, which prioritizes equal healthcare opportunities, protects data security, and demands thorough evaluation for long-term success.

Strong government backing and stakeholder alliance will enable the implementation of these recommendations, making Saudi Arabia a leading force in DTx throughout the region. Long-term surveillance and modifications will guide Saudi Arabia through digital healthcare transformations to achieve Vision 2030 goals. This initiative will advance Saudi Arabia towards becoming a healthier, digitally empowered nation.

Data Availability Statement

The data that supports the findings of this study are found in the references.

Appendix

Survey questionnaire results of 80 respondents are shown.

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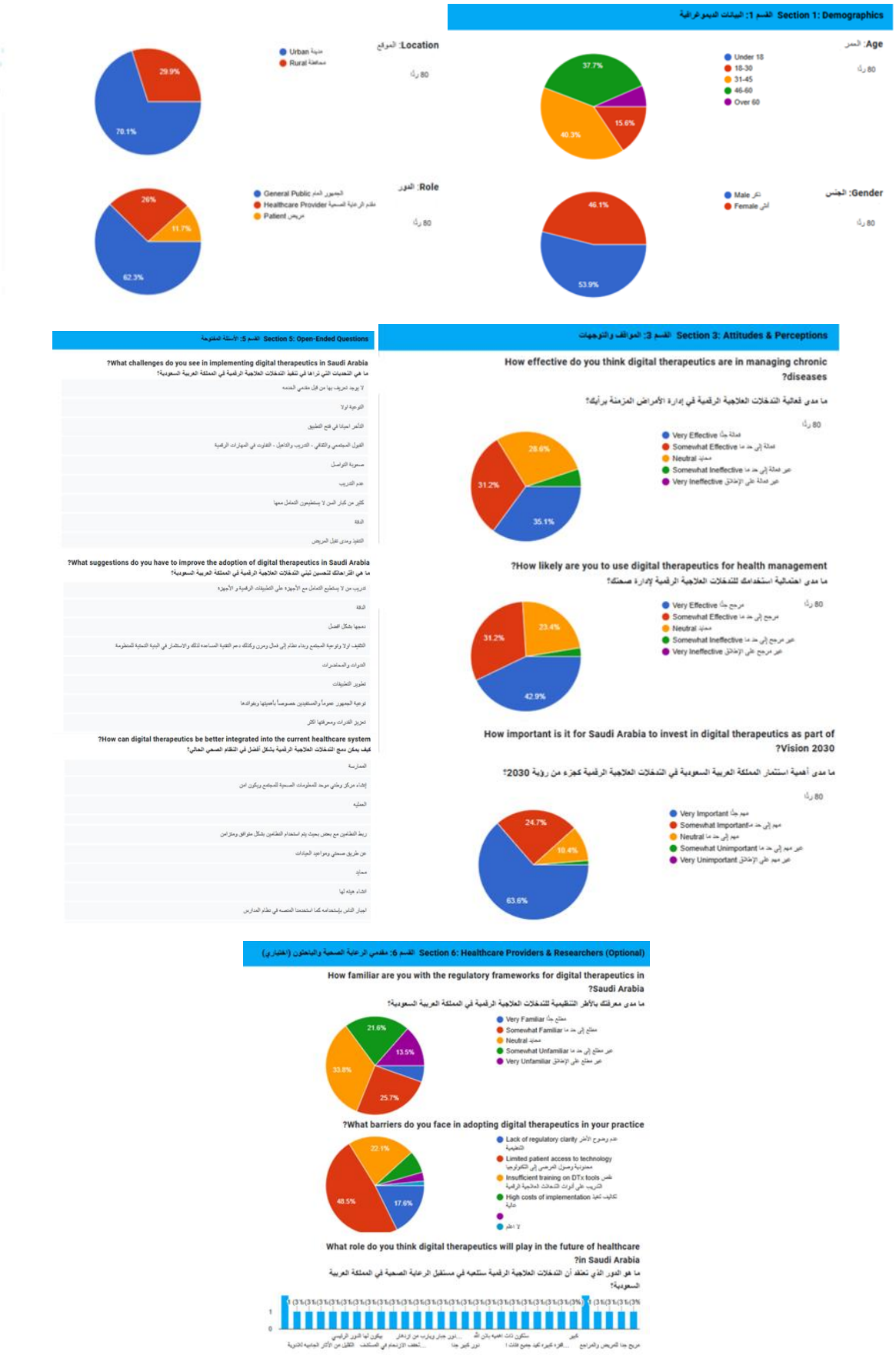

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