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التوجه الرقمي في المملكة العربية السعودية بعد جائحة كوفيد-19 في قطاع الرعاية الصحية: دراسة
حالة للمستخدمين النهائيين في مدينة تبوك.

إعداد الطالب/

تهاني مؤنس الضوي العنزي

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Introduction:

For a long time, the COVID-19 pandemic has enhanced digital transformation in different fields worldwide. The sector that has been most affected is the health sector because adaptation to the circumstances entailed a reduction of contact and the continuity of services. The Healthcare sector of Saudi Arabia, aligned with the Vision 2030 goals, has adopted digitization to improve quality and availability. Mainly, this study selects Tabuk City as the subject of investigation, aiming to identify the effects of the stated digital shifts on end-user interaction in health (White et al., 2022).

The pandemic exposed weaknesses and missing links in society's conventional healthcare structures, forcing institutions to adopt innovative solutions quickly. In various sectors of society and people's daily lives, technology utilization emerged as a way to handle the problem—Saudi Arabia's policies backed by solid digital resources promoted this change. Tabuk City is used in this study and, therefore, acts as a case to understand how these changes have been implemented and their success in enhancing service delivery and user satisfaction (White et al., 2022).

COVID-19, as a new awareness in early 2020, made tremendous impacts on the world's health care, forcing a radical shift from conventional delivery modes to online platforms. Not only did the pandemic check the efficacy of prior established structures, but it also broke barriers to automation internationally. Thus, in the context of the healthcare sector, the necessity of delivering uninterrupted assistance while avoiding close contact accelerated the implementation of telemedicine. By 2020, patients and healthcare providers had to adopt telemedicine, home monitoring, and remote record-keeping. This shifting proved vital to sustain the continuity of health care provision and health care needs demand during the pandemic while maintaining the safety protocols on social distancing (Siswati et al., 2023).

Saudi Arabia, commonly known as KSA, unveiled its Vision 2030, a roadmap in which the country intends to bring down its reliance on oil, establish a new pattern of economy and state, and strengthen in areas of public services digitalization and the COVID-19 pandemic played a significant role in documenting the digital transformation plans in the country.

Vision 2030 has a clear focus that targets the promotion of a digital economy, the creation of facilities, the promotion of the development of new firms, and the improvement of the quality of life of its people. In the framework of this vision, significant investments were made in developing digital health technologies, which were helpful during the COVID-19 pandemic (Siswati et al., 2023).

In Tabuk City, such national initiatives were further narrowed down to enhance the adoption of digital solutions for the conveying of health as well as the provision of healthcare services. Telemedicine emerged unknown to the city's healthcare providers until they quickly adapted to it to minimize in-person consultations or examinations.

Interoperability frameworks were adopted by implementing electronic health records systems to improve patient data management and care. All these measures were valid for the moment to address the problems caused by COVID-19 and paved the way for better preparation in healthcare for the future (Siswati et al., 2023).

Similarly, the shift was embraced within the appropriate sector, and healthcare centers opened online in Tabuk City. Appointments were switched from physical to virtual consultations; operations became a telemedicine service. These modifications supported the sustainable delivery of care. Still, they concurrently pinpointed the technologies' reliance and the requirement for continuing medical study and computer literacy among formal and paraprofessional carers and patients. From the data collected for a specific case of Tabuk City in the Philippines, it is possible to identify the benefits and challenges of using the digital trend in delivering solutions for the improvement of the outcomes of healthcare processes, which potentially contribute to the enhancement of the quality and availability of the healthcare services to the population.

Consequently, the following research questions have been formulated to achieve this study's primary objective: This study seeks to compare the effects of digitalization on the end users in Tabuk City's healthcare delivery system. In pursuing this objective, the study aims to learn about the reception of the solutions that gave rise to service delivery, their efficiency, and the problems that users encountered. This paper's conclusion will inform the future implementation of digital health projects by identifying communities' actual needs and expectations (Melin, 2020).

The significance of this study transcends the situation in Tabuk City, although it focuses on it. Looking at the Saudi Arabian case, as the country tends to achieve Vision 2030 objectives, the study's findings would be helpful in better understanding national plans for digitalizing health. Therefore, the study's results may be beneficial as a practice for other territories and states currently experiencing similar changes and are interested in international digital health (Melin, 2020).

In the table blow is summarize for the most popular apps used during and after covid-19 in healthcare sector:

name	Brief summarize about the services	Available
Tawakkalna	“The “Tawakkalna” application aims to be the digital companion for individuals in the Kingdom and to increase the quality of life by providing a wide range of integrated and consistent services that enrich the experience of citizens, residents, and visitors.” (Tawakkalna Platform, n.d.)	Android , ISO and web based
Mwaidy(My appointment)	“Appointment’ is an electronic service provided by the Saudi Ministry of Health to enable the beneficiary to book his appointments in primary health care centers and manage these appointments by modifying or canceling them, as well as managing his other appointments in any hospital to which he is referred”.((Mwaidy,MOH, n.d.)	Android , ISO and web based
Sehhaty (My health)	“Sehhaty Services: • Review Sick Leave Electronically • Appointment Booking service • Instant Medical Consultation Service • Medical Team Selection Service (My Doctor) • Protection and Infection Control Service for Corona (Covid-19) • Health file - health record (know your numbers) • Add dependents Service • Vaccination Follow-up Service • Reviewing medical reports and sick leaves • Pregnancy follow-up service for women • Insurance approval follow-up service • Medicines and Prescriptions Review Service • Pre-marital Medical Examination • School Entry Health Exam Program «Fitness Testing» • Exploratory Examination of Students. (Sehhaty Platform, n.d.)	Android , ISO Android , ISO and web based
Awlawia card	“Awlawia card is issued by patient experience departments in health facilities for specific groups of society including (people with	Android , ISO

(Priority card)	disabilities - the elderly over 60 years old - home health care patients - cases approved by the medical committee) Awlawia offices or patient experience departments in health facilities provide this service”. (Awwlawia Card,MOH, n.d.)	
Labayh	“Labayh is a comprehensive online solution for therapeutic and wellbeing services, Providing 1:1 sessions, webinars, support groups by licensed therapists” (Labayeh,MOH, n.d.).	Android , ISO and web based
Smoking Cessation Help Service	“A service that provides awareness and therapeutic practices for those wishing to quit smoking, through trained and qualified cadres in accordance with Saudi Guideline for Tobacco; to reach a role model in efficiency locally, regionally, and globally”(Smoking Cessation Help Service, n.d.).	Android , ISO and web based

Problem Statement:

Before COVID-19, the healthcare system in Tabuk City needed to be stronger, particularly having only a few resources in terms of technology and digitalization to support their major developmental approaches to health and related concerns at that period, which were mostly done physically and face to face. The COVID-19 pandemic effectively unleashed the use of new critical solutions in distance learning and telemedicine, which raised the issues of developing reliable digital platforms and resources, as well as applying advanced digital instruments and services with limited digital competence in the process, thus offering both potential and threats for end-users.

Significance of the Study:

The importance of this study lies in identifying solutions to the problems and issues that the healthcare industries in Tabuk City managed to face in the pre-COVID-19 period. In the past, conventional approaches were often employed to serve the goal and purpose for which they were designed. However, they had their demerits regarding time constraints and availability to the targeted population, especially the ones in the rural areas and regions with limited health facilities. Thus, analyzing effective transition digital solutions, the study

reveals how such longstanding problems can be reduced by introducing new technological applications. Such transition is essential for anyone interested in formulating policies that fill the existing gaps in the delivery of services to enhance inclusivity and efficiency (Lavorgna et al., 2020).

The population shift towards digital solutions during the COVID-19 year was historic and caused a net of shifts in the delivery of healthcare services. To a certain extent, this study aims to describe the above solutions from the perspective of end-users and assess the extent of their efficacy. Thus, analyzing user satisfaction, penetration, and such problems as the study reveals the advantages and drawbacks of such digital tools. This evaluation is required to discover what digitalization means in practice and to make proper decisions on further investments in digitalization (Jonassaint et al., 2015).

The conclusions of this study are helpful for policymakers and program developers. Consequently, as KSA irrevocably progresses towards its Vision 2030 goals, which mark a significant development in digital networks and services, this work introduces empirical findings to policy and programming. Through identifying the needs and uses of end-users in Tabuk City, proper policy measures towards promoting digital literacies, increased opportunities for acquiring technologies, and sustainability of the government's objectives, particularly in health, will be provided. Thus, the study's recommendations will point to policies enhancing the fair distribution of quality healthcare services within the region (Lavorgna et al., 2020).

One strength of this study is that it targets the end users' perceptions and level of satisfaction with the delivered digital health. Therefore, the study looks into the opportunities and difficulties of implementing e-learning technologies from the educators', healthcare providers', students', and patients' viewpoints. Such an understanding is compulsory for developing suitable and effective digital solutions for the community. This present research provides valuable knowledge about improving user experience and satisfaction since usability is critical to ensure digital strategies' positive acceptance and longevity. (Lavorgna et al., 2020).

Thus, though the study has been developed based on Tabuk City, and its results can be explained based on the general tendencies in developing Saudi regions interested in digital technologies, it will be potentially helpful for other areas of the country and other countries facing similar processes. Thus, the findings and discussion of the exact experiences and effects of using digital health in Tabuk City add knowledge to the international database. Other regions and countries can then follow the positive lessons and failures met in Tabuk City. This dissemination of information is crucial in today's society, specifically in the realm of technology and increased interconnectivity, as it benefits the advancement and development of society (Jonassaint et al., 2015).

Cognisant of the growing centrality of technology in the global economy, Saudi Arabia's Vision 2030 sets targets for digital improvement in healthcare. This study supports these goals as it evaluates the status of utilizing the digital health and promotion tool in Tabuk City. Increased awareness from this study will shape the local strategies to meet the transformation's national goals and objectives to support the diversified economy based on knowledge. Thus, by presenting successes and the range of problems, the study provides a guideline for the enhanced and user-oriented approach to achieving the Vision 2030 goals (Jonassaint et al., 2015).

Objectives of the Study:

Primary Objectives

1. In this study, the following question guide will be used to assess the outcome of this research on the effects of digitalization in healthcare in Tabuk City after the COVID-19 pandemic:
2. In this paper, the author analyzes the impact of digital health technologies in Tabuk City, especially on health care provision and patients satisfaction levels.

Secondary Objectives

1. To define the opportunities and threats of using IT tools in healthcare and understand the possible outcomes after implementing such changes.

2. For the review, the author proposes to outline recommendations based on the end user's perspective of digital health and healthcare services.

Research Questions:

1. How has COVID-19 affected the view of healthcare in Tabuk City's digital landscape post-COVID-19?

a). Was this affect has positive or negative impact on healthcare services?

b). Do the healthcare providers still benefit from the digitalization post-Covid-19?

2. How does the use of Information Communication Technology influence the management of healthcare services and consumers' satisfaction in Tabuk City?

a).What are the most used of digital healthcare services in Tabuk city?

b).How does the How does the use of Information Communication Technology impact the effectiveness and productivity in Tabuk city?

c).How does the use of Information Communication Technology contribute in cost reduction ?

d). How does the use of Information Communication Technology assist the management of health care regarding the cost and time in Tabuk city?

e). What impact does ongoing training and education have on enhancing the utilization of Information Communication Technology in the healthcare industry in Tabuk City?

f).What roles do the government and healthcare institutions play in promoting and enhancing the use of Information Communication Technology in Tabuk City?

g).What methods can be used to assess the influence of Information Communication Technology on healthcare services in Tabuk City?

h).What are the latest advancements in ICT that could enhance the administration of healthcare services and customer happiness in Tabuk City?

3. What do end-users experience using digital health technologies and related platforms?

a.)How do end-users evaluate their experiences regarding using digital health technologies and related platforms?

b).Do end-users recommend these digital health technologies and related platforms to other users?

c). what changes would benefit the user in the context of digital healthcare services?

d).How frequently do the end-users are using of digital healthcare service in context of their daily life?

e).Do the end-users received enough education regarding digital healthcare services?

f).Are these digital health technologies and related platforms available at all time?

Hypotheses:

Primary Hypotheses :

1. Consequently, digitalization has enhanced health delivery in Tabuk City.

2. Healthcare provider and patient satisfaction with digital health services are significantly high.

Secondary Hypotheses :

1. The following challenges hinder the efficacy of e-health interventions such as digital literacy and infrastructure.

2. It is understood that policy interventions and training can further improve the benefits derived from using the tools on the users' experience.

Previous Studies

Past research has established considerable attention and actual implementation of technology in healthcare industries, especially concerning the adaptability to COVID-19.

- **International Studies:**

Various global authors of literature stress mobility and the potential of digital technologies to revolutionize the healthcare sector. Studies in countries such as the United States of America and the United Kingdom have indicated that digital technologies contribute a lot to patient satisfaction, the operation of the healthcare system, and understanding of health issues. Some of these studies' conclusions focus on the UI guideline and the importance of follow-up and training to optimize the impacts of digital health interventions (Tobias et al., 2023).

In another study conducted by Zhao et al. What factors influence the mobile health service adoption? A meta-analysis and the moderating role of age, Volume 43, 2018, the following factors, which determined the initiation of mobile health services, were considered. Those variables deemed essential in the current meta-analysis include perceived usefulness, perceived ease of use, and the possible effect of age on the supporters of these services. This work underscores the need to consider users' specific requirements and likes to enhance the usage of m-health applications.

In addition, Pramana et al., for their systematic review on the impact of the SmartCAT m-health self-treatment platform on child anxiety, confirmed the evidence for using e-therapy. The findings pointed to the fact that the platform offered substantial recovery in the manifestation of child anxiety symptoms through the ecological momentary intervention strategy, underlining the role of m-health applications regarding the application of real-time personalized health care. The value of these studies is in the synergy generated from the sources, namely, understanding the antecedents stimulating the usage and perceived satisfaction of digital health solutions. They all emphasize the values of a human-oriented approach, except for the peculiarities of digital literacy and data and information protection.

Identifying such factors will help formulate practical, user-friendly, and more adapted digital health interventions in the practice of caregivers and policymakers

- **Regional Studies:**

According to other papers conducted in the Middle East and North Africa (MENA) region, it has been established that there is increasing use of digital health technologies. For instance, empirical studies conducted in the United Arab Emirates UAE and Qatar have shown ways through which health systems are adopting social media to enhance the health status of the populace and ensure increased access to health services. These studies also focus on regional issues like digital literacy and infrastructural constraints of the regions, which tend to affect the response to e-health initiatives (Tobias et al., 2023).

- **National Studies:**

A wide range of research has been conducted on technological development in Saudi Arabia in general, the government's massive digitalization plan, and its focus on the Healthcare and education sectors in particular.

Alanzi'.T.M's study examined post-COVID-19 user satisfaction with m-health applications in the Saudi context in 2022. Data analysis highlighted that though users are delighted with the convenience of such hubs' applications, they are very concerned about their privacy and security. This suggests that it is necessary to incorporate measures such as cybersecurity to increase the users' trust (Hassounah et al., 2020).

In other study conducted by Moubarak.F Mekni MM and Adlwish A (2022) ,Digital learning ,life satisfaction, and perceived stress due to COVID-19 Emergency. In this study it was primly addressed the high education system and measuring the stress level amount F-students during covid-19. This study focused mostly on digital learning during covid-19.The finding shows that the digital method that used during the pandemic had affected the flexibility and allowed the students to achieved e-learning recourses at much lower cost.

Scheffer Yt noted that such programs like Saudi Vision 2030 help to increase the usage of such technologies in the sphere of digital health, which in turn enhances service delivery and patients' results.

However, concurrently, some of the problems that have been identified include privacy issues, issues to do with the digital divide, and issues to do with the need for enhanced regulatory frameworks to sustain the implementation of digital health solutions (Tobias et al., 2023).

These findings are especially timely for Tabuk City, as digital technologies in healthcare are increasing. It is crucial to identify users' experiences and difficulties in using such technologies to benefit from them.

Theoretical Framework

Technology integration across different fields is a dynamic process that entails several aspects, and scholars have sought to explain it through various theories. Two of the most well-known theories in this regard are the Technology Acceptance Model (TAM) and the Diffusion of Innovation (DOI) theory (Griffin et al., 2019).

One of the best-known models is the Technology Acceptance Model (TAM), which describes how and why users in an organization adopt a specific technology. TAM

concepts reveal that perceived usefulness and ease of use are two precursors used to explain a person's behavioral intention, which will define actual usage behavior.

Perceived usefulness, according to the theory, is the extent to which a person considers using a particular system to improve their working performance, while perceived ease of use is the extent to which a person believes that using the system does not require much effort. Regarding health care, TAM can support determining how the related stakeholders, such as educators, students, health care providers, and patients, recognize and utilize technologies. For example, if twenty healthcare providers regard telemedicine platforms as easy to use and helpful in treating patients, they will incorporate them into practice.

Likewise, if students perceive e-learning platforms as easy to use and beneficial for their learning needs, they will accept further and use those platforms (Griffin et al., 2019).

Another significant perspective in adopting technology is Everett Rogers' simplified Diffusion of Innovations (DOI) theory. DOI enlightens people on how, why, and at what rate these new concepts and technologies diffuse to cultures. It outlines the factors familiar with the adoption process: relative advantage, compatibility, complexity, trialability, and observability. Relative advantage measures how much it is better than the concept it replaces. Relative advantage is defined as the extent to which an innovation is better than the precursor techniques in achieving the adoption goals of potential users. Complexity, however, is the extent to which an innovation is perceived to be challenging to understand and utilize. Trialability is the extent to which an innovation can be tested in a trial fashion. Communicability, therefore, relates to the extent to which the outcomes of an innovation are central or visible to other people. Carrying out the DOI in this study helps the search for variables influencing the use of technology in health in Tabuk City. For instance, if machines and other digital assistants are perceived as more effective than traditional forms of treatment, they are consistent with the user's approach in a specific field or course of study. They are easy to operate and try out. The above-stated applications will likely be utilized (Griffin et al., 2019).

Besides these adoption models, there are digital health frameworks that provide comprehensive specifications of how and for what to use and assess digital health solutions. WHO's Digital Health Strategy and IMSS's Digital Health Framework can be classified as this type of concept. Each of these structures targets several vital principles, including user-centeredness, compatibility, security, and re-evaluation (Alshaikh et al., 2021).

The WHO released a document known as the WHO Digital Health Strategy, which offers a conceptual framework for enhancing health through deploying digital technologies. It reiterates the need to develop digital health solutions that fit the end user's needs and expectations. The strategy also aims at integration so that various digital health systems can easily connect and help improve the healthcare sector's operations. Data security is another one that involves safeguarding the patient's sensitive health information from unauthorized access and breaches. Another is monitoring, which enables regularly examining digital

health processes and programs to identify their impact and efficiency so that changes can be made if required (Alshaikh et al., 2021).

I am organizing the Elements of Care through the HIMSS Digital Health Framework with supporting data and information on the elements of digital health care. It is divided into several steps: planning and designing the intervention, establishing the program, formative evaluation, and summative evaluation. Stakeholder engagement is a critical component of the framework to reach its goals. Therefore, all the relevant parties' viewpoints and requirements will be addressed. However, it also underlines the necessity of having an adequate architecture based on reliable connections to the Internet, suitable HW and SW, and user training.

These frameworks of digital health are applied in this study to evaluate Tabuk City's digital health initiatives. This way, through implementing the user-centered design approach, cross-system compatibility, data confidentiality, and constant assessment, the study offers a detailed analysis of the efficiency and effectiveness of the noted measures on the end-users. Thus, using the presented approach, the study can evaluate the compatibility of digital health tools and propose recommendations based on the preferences of the providers and patients to increase satisfaction and use rates. Likewise, by stating the degree of compatibility between various digital health systems, the study will be able to outline the existing obstacles to communication and recommendations on how to eliminate them (Alshaikh et al., 2021).

Methodology and Research Methods:

For the data collection method in this research, A quantitative research design has been employed, as questionnaires and interviews are ideal for accumulating the quantities of data to determine the impact of digitalization on healthcare in Tabuk City's end- users. The quantities approach is relevant since the researchers can compare the collected data; thus, the information gathered will be more valid and reliable. A quantitative data is related to specific figures and statistics that provide a detailed estimate of user satisfaction level, the

number of acceptors and users of digital tools, and perceived benefits and risks of using the technology.

Research Design :

Since the study is oriented to analyze the influence of digitalization in the development of healthcare in Tabuk City, a quantitative research approach will be adopted to conduct the study. The study will mainly concentrate on m-Health applications like Sahetty, Mawid,

Wasfaty, and online clinics. A quantitative approach is appropriate in this research endeavor because it is geared toward measuring the degree of the adoption and use of digital health tools by developing nations and searching for relationships between variables. As the study employs more quantitative data, it offers opportunities to generalize the results to the increased numbers of Tabuk's healthcare providers and patients.

Quantitative research is more rigorous and can be scaled, which is necessary when studying phenomena that have affected many people through digital health tools. This design entails collecting data using formal equipment like questionnaires whose answers can be measured and analyzed statistically. This has raised the importance of using digital health tools more significantly since the onset and range of the COVID-19 virus spread. Adopting the quantitative research approach, it is hoped that the study will delve into how the tools above are used, their efficiency, and the difficulties the users observe.

Study Population and Sample :

The study population shall embrace all healthcare providers and patients in Tabuk City and consideration of the research questions; diverse samples will be selected across the province to capture the general population's response. Tabuk comprises a population of 551124, and 1089 doctors and 3362 nurses serve in six Tabuk's hospitals and 37 primary health care units. A vast and diverse population offers a sound framework for the sampling process. Using a sample of 300 participants, both in and out of healthcare practice, the information will be collected from doctors, nurses, and patients. This sample size is considered adequate for achieving a high level of reliability in the results and, at the same time, possessing practical feasibility regarding data gathering and analysis.

For this reason, the selection of the samples will be made based on the stratified random sampling method to ensure that these subgroups of the population will be covered in the study. This shall be done according to the population of users into different strata regarding professions such as doctors or nurses and the status of the users as patients. Election samples will then be carried out within the stratum to guarantee that all key organizations are adequately covered. This method increases the credibility and dependability of the findings since it minimizes the sampling prejudice and guarantees the representation of the population in the sample. Regarding the adoption and usage of digital health tools, the stratified sampling technique will assist in establishing the disparities across different classes of the population.

Data Collection Methods:

The primary data gathering technique will be structured questionnaires to gather detailed information concerning the usage, level of satisfaction, and perceived benefits and barriers related to digital health tools. The close-ended questions make it easier to get quantitative data, and thus, the questionnaire will consist of them only. These questions will focus on demographic information, the frequency of use of the applications, perceived usefulness and ease of use, and perceived barriers. Structured questionnaires are easy to compare and analyze because they minimize the variation of the answers from the respondents.

Minor a pre-testing survey, the instruments will be administered among a small sample of the targeted population before the eventual large-scale administration. Accountability for this is taken to the pre-testing, which determines the validity and reliability of the questionnaire. During the creation of the questions, there is an opportunity to detect all the vague or problematic aspects that may arise during the investigation, which will help to make corrections before the primary data collection stage. The last one will be administered both online and offline, and the questions developed will be such that there will be easy answers for all the participants. The strong points of this approach are efficiency, cheapness, standardized gathering of data, and the possibility of obtaining a large amount of information from a considerable number of respondents, which will create the basis for further analysis.

Data Analysis :

The arithmetic data gathered in the surveys will be analyzed quantitatively utilizing statistical tools, including SPSS or R, to ensure they are quantifiably accurate and credible. Survey data will be analyzed using descriptive statistics to establish the level of satisfaction, the extent of using digital health tools, and perceived benefits and challenges. The preceding means that these statistics will comprise mean, median, mode, standard deviation, and frequency distributions. Another approach is a descriptive analysis, which will present the cross-sectional survey results by categories, percentages, and proportions, giving a clear picture of the extent to which the sample population uses the identified digital health tools.

Inferential statistics will also be used to identify the correlation and pattern of various variables. Differences in satisfaction and usage of the product by different demographic variables, including age, gender, and profession, will be determined using t-tests and chi-square tests, respectively. The factual usage of the tools and the perceived ease of use and usefulness of the digital health tools shall be analyzed using regression analysis. With the help of statistical software, data analysis will be done professionally to arrive at valid results. Therefore, synthesizing the following five research questions will enable this study to generate comprehensive findings that will increase understanding of the factors that foster the uptake and use of digital health tools in Tabuk City (Alkhaldi et al., 2021).

Integration of Findings:

The results of this study shall be synthesized to present an overall picture of the effects of health information technologies in the context of Tabuk City's health care system. Descriptive analysis will feature summary statistics, variances, and coefficients to determine patterns and relationships concerning applications such as Sahetty, Mawid, Wasfaty, and Virtual Clinics among healthcare providers and patients. Thus, the theoretical and practical implications of using these digital tools in teaching and learning will be illustrated based on descriptive statistics and the examination of the factors affecting the

use of these tools through inferential statistics. The findings will benefit decision-makers and implementers in the region's healthcare system as they seek to increase the efficiency of the innovations and the broader delivery of care (Alkhaldi et al., 2021).

Ethical Considerations:

Ethics issues remain vital in this investigation so that the participant's rights are respected and the research process is credible. Participants' rights will be protected by self-volunteering and being aware of the study aims, methods, possible dangers, and advantages during the consent stage. Informing the participants that participation here is voluntary and that they can opt-out at any time will be encouraged. To ensure the privacy of the data collected, all data will be coded and kept secret from unauthorized persons. This research will follow the principles of ethics set down by the relevant institutional review board (IRB), entailing the approval of the research proposal. These actions will protect the participants' identity and guarantee the ethicalness of the research (Alkhaldi et al., 2021).

Study Tools:

Survey Instruments:

The research instruments employed in this study are self-developed questionnaires based on various well-constructed scales documented in earlier studies. These instruments will include demographic data, frequency of use, attitude, perceived usefulness, perceived ease of use, and perceived barriers. This segment will involve the demographic data part with questions on the participant's age, gender, employment, and income level. I will ask

questions regarding the frequency of use to determine how often the sampled participants use digital tools and platforms for healthcare and accessing health care services. Attitude-related items would assess the respondents' overall sentiment and inclinations to engage or participate in the different aspects of digital technology in these scenarios. Each of these constructs indicates the perceived usefulness, concerning the extent to which respondents find the selected digital tools helpful and perceived ease of use, which shows to what extent the respondents regard the technologies in question as easy to use. In addition, the survey will reveal challenges that people have regarding technology's applicability in delivering

health and health-related information. The survey instruments will first be pre-tested on a cached small sample of the target population before the large-scale administration. Therefore, this pilot test seeks to establish the reliability of the items contained in the survey. The information gathered from the pilot test will help perfect the study to obtain the desired information.

Secondary Data Analysis:

Secondary data analysis is another research technique that will enhance the survey findings because this work will analyze survey material with other available data to strengthen the context and credibility of the study. This will include an analysis of data from the General Authority for Statistics and other health data sources to understand better the state of digitization in Tabuk's health sector. This tool shall include statistical information on the number of doctors, nurses, primary care centers, and the city's population to understand better survey variables based on the dynamics of healthcare facilities in the town. The remaining sub-variables will be gathered through secondary data, which will again help find the gaps and affirm the patterns discovered in the primary data to make the study more robust and prosperous.

Study Boundaries:**Geographical Boundaries :**

The research focuses on Tabuk City, which was selected based on the country's relevance and ongoing digital transformation processes. In the northwestern part of the country lies

Tabuk City, which, over the years, has become a sample of trends taking place in the country. Thus, while the study is sensitive to the unique characteristics of Tabuk, its goal is to offer recommendations that could be effective for other Saudi urban cities that are in the process of digital transformation (Alanazi, 2022).

Temporal Boundaries :

The temporal aspect of the research is from the beginning of the COVID-19 outbreak to the present. This, however, was before the COVID-19 pandemic, which massively changed the speed and dynamics of digitization. It required modifications of various industries, such as the medical field, which affected Tabuk City dwellers' digital activities and usage. Thus, the analysis of this timeframe aims to capture the 24/7 responses and changes in communication and digital activity patterns.

Scope and Limitations:**Scope :**

The study particularly emphasizes the teaching-learning area of healthcare sectors besides the healthcare domain in Tabuk City. Those sectors were selected to show the importance of organized critical care in large populations, especially in the current COVID-19 pandemic. The research focuses on these domains to explore how several digital tools and platforms disseminate health information about service delivery and interaction with the locals (Alanazi, 2022).

Limitations :

Despite its scope, the study acknowledges several potential limitations that may influence the generalizability and reliability of findings:

1. Potential Biases in Self-Reported Data: This is essential because surveys or interviews may use self-generated data, which may include some sources of error like self-selection bias, social desirability bias, or recall bias when the questionnaires inactivate digital behaviors and digital experiences (Ahmed, 2023).

2. Limited Generalizability: The findings may mainly pertain to urban contexts akin to Tabuk City to some extent, meaning that the study may need to be more readily generalizable to other geographical and socio-economic areas within Saudi Arabia.

3. Challenges in Accessing Certain User Groups: Some challenges identified include the following: It might be challenging to reach out to some target clients or respondents in Tabuk City because of the following;

To address these limitations, significant effort will be made in selecting samples using strict criteria, using multiple data collection and analysis sources, and assessing the contextual factors that may affect the use of digital devices across the different population groups in Tabuk City.

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