SIEMENS Healthineers

White paper- Innovation Think Tank Egypt

# The Future of Access to Healthcare Innovation in Egypt

Trends, disease pathways, technologies & innovations

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# The Future of Access to Healthcare Innovation in Egypt

**Sultan Haider[1], Dahlia Hassan[2], Tarek El-Ashraf[3], Michael Schmermer[3], Sebastian Ferrari[2], Syed Ali Mehdi[2], Apoorva Goenka[4], Jayati Vasavada[5]**

Innovation Think Tank, Siemens Healthineers, [1]Erlangen, [2]Dubai, [3]Egypt, [4]Bengaluru, [5]Gurgaon

## Abstract

Egypt has been increasingly investing in healthcare reforms to improve quality and accessibility of nationwide healthcare. Innovation in healthcare plays a crucial role towards this vision. In an attempt to fill this role, Innovation Think Tank (ITT), part of Siemens Healthineers, has been actively engaging healthcare institutions in the region and developing local innovation infrastructure. ITT has conducted its 156th program in Egypt to capture and validate healthcare and hospital trends relevant to the future of healthcare and access to care in the country. This program involved 40 diverse participants with the background of healthcare professionals, engineers, professors, students, researchers, etc. Multidisciplinary teams throughout this program were trained to develop solutions for local healthcare challenges using ITT methodology.

By using ITT Healthcare System Framework (ITT HSF), the data was captured and validated in the following categories: 1) Key current trends that will transform healthcare delivery and improve access to care in Egypt 2) Institutional challenges and goals for access to care in Egypt 3) the Egyptian Healthcare System 4) challenges and potential solutions for Egypt's future for access to care, all rated with their degree of impact and importance. An implementation roadmap for further development was proposed with key performance indicators (KPIs) and requirements. The consolidated data can provide inputs for future co-creation and solution development in Egypt.

**Keywords: Egypt, Healthcare System Framework, Access to Care, Future of Healthcare, Innovation Think Tank, Siemens Healthineers**

## Introduction

The Egyptian healthcare system includes a wide range of public and private healthcare providers as well as several finance agents. In recent decades, Egypt has made improvements to its citizens health. The average life expectancy in Egypt has increased from 64.5 to 70.5 years during the past 20 years due to improvements in population health. Also, Egypt has thousands of medical institutions and 95% of Egyptians live within 5 km of a medical facility. The healthcare system in Egypt is going through significant changes and stakeholders need to be well connected about both the current challenges and possible outcomes [1].

Egypt, one of the most populous countries in the Middle East and North Africa (MENA), and with a 2.5 percent annual population growth rate, is witnessing an increased demand for better education and healthcare services [2]. With its vision 2030, the government of Egypt is focusing on sustainable development strategy to enhance the quality of Egyptians lives. The main dimension of this vision looks after economic development, environmental and urban development, and social areas in education as well as health [3].

The Ministry of Health and Population, along with its five sectors of administration, governs the health system in Egypt. The constitution of Egypt firmly recognizes health as a fundamental human right and is dedicated to expanding coverage and ensuring access to high-quality care for all Egyptians. Yet, challenges such as lack of funds, poor quality care, shortage of medical equipment and skilled staff predominate in the public health system. Due to this, private facilities are being preferred by people who can afford it. On one hand, the Egyptian government is supporting privatization, and on the other hand, in order to address these challenges and make health services more affordable, the political leaders in Egypt are now united towards achieving Universal Healthcare Coverage by 2030 [4, 5].

The healthcare industry in Egypt is evolving, with a major focus on maternal and child health, lifestyle diseases, and geriatric care, to name a few. By embracing new technologies and innovations, and adopting a data-driven, patient-centric, and results-oriented approach, Egypt's healthcare sector is expected to boom in the coming years. Moreover, it is expected to become a medical and wellness

tourism hub and also provide other services related to healthcare, pharmaceuticals, medical devices, allied services, medical education and research, and contribute to Egypt's gross domestic product (GDP) [2].

Innovation Think Tank (ITT), as a part of Siemens Healthineers (SHS), has been actively engaging healthcare institutions in the region and developing local innovation infrastructure [6]. ITT has conducted its 156th program in Egypt to capture, contemplate, and validate healthcare and hospital trends relevant to the future of healthcare and access to care in the country. This program intends to act as a capacity building door to address and bring together key local healthcare institutions towards a common goal: Egypt's healthcare vision.

Egyptian healthcare workers have access to very little training on focused innovation management methodologies and research relevant to healthcare. There is a need to increase capacity at a local level and provide training to the Egyptian healthcare workforce to be competitive at a national and international level in order to address key local health challenges [7].

## Material and methods

Programs like the Innovation Think Tank certification serve as an inspiration for the upcoming generation of creative thinkers. Through August 21st to 28th, 2022, ITT, a part of the Chief Technology Office at SHS, held a certification program in Egypt with a focus on "Access to Care" and the "Future of Healthcare" **[Figure 1].** The enthusiasm for innovation from transdisciplinary participants was also a key driver of the program.

Throughout the program, Egyptian healthcare system's stakeholders—including technology users, researchers, students, and business professionals—met both in person and online to co-create by learning ITT methodology and applying it to actual challenges. The program gathered a total of 40 participants from 30 institutions.

Impulse speeches from key opinion leaders (KOLs) within Egyptian healthcare system and SHS initiated discussions on sustainable innovation infrastructure, followed by a survey on healthcare system framework for capturing and validating trends for future of healthcare and access to care in Egypt.

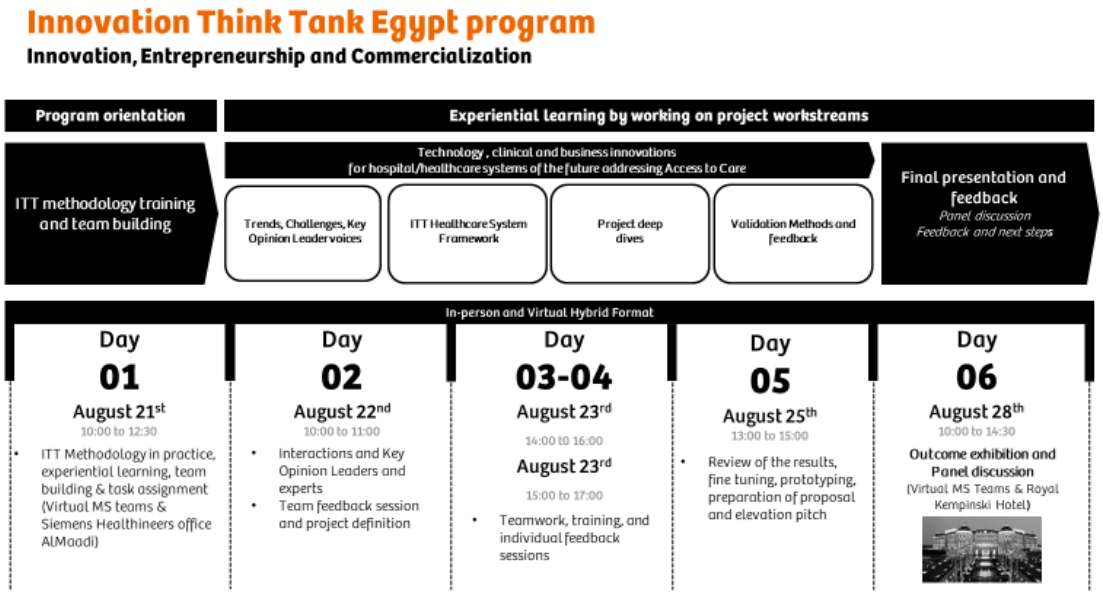


**Figure 1: Roadmap for ITTCP at Egypt**

For the purposes of capturing, analyzing, and validating data regarding trends and challenges relating to the Egyptian healthcare system and access to care, the Innovation Think Tank Healthcare System Framework (ITT HSF) was integrated **[Figure 2]**. ITT HSF uses three processes: 1) Need analysis by capturing stakeholder process, 2) Co-ideation by global transdisciplinary ITT teams, and 3) Co-implementation with stakeholders in the healthcare system by local ITT programs [8].


**Figure 2: Innovation Think Tank Healthcare System Framework for capturing and validating trends**

The template for ITT HSF was modified by taking inputs from previous surveys and customized to the specific requirements for capturing and validating Egyptian healthcare system trends and access to care challenges. The survey consisted of sections investigating healthcare system of Egypt, institutional challenges, healthcare trends, technological trends, clinical trends, and business model trends with regards to healthcare system and their degrees of impact & importance. Furthermore, the factors impacting access to care provision were also analyzed. The survey was filled by the participants which was then compiled with their responses.

On the final day, outcomes from the program were presented to the jury and experts, where the solution proposals were rated followed by a brief discussion with KOLs, researchers, and industry experts.

## Results

*Program outcomes*

The 7-day certification program at Egypt was successfully conducted between August 21$^{st}$ and 28$^{th}$ 2022. 7 teams comprising of 40 participants presented their final outcomes on August 28$^{th}$, 2022. A total of 400+ trends, 65+ KOL voices, 50+ stakeholders, 90+ pain points, 100+ solutions, and 20+ solution clusters were identified and proposed by the participants as a consequence of the program.

*Survey results*

The following categories were defined to consolidate and validate the collected information with respect to the overall healthcare system, access to care and future of healthcare in Egypt:

**Category 1:** *Key current trends that will transform healthcare delivery and improve access to care in Egypt and the degree of their impact on its healthcare system*

**Healthcare trends**

**Figure 3** illustrates the healthcare trends ranked by the participants based on their comprehended impact. Majority of the responders believed that digitalization and automation have a very high impact (72%), followed by healthcare for all: affordable healthcare coverages (66%), and hospitals providing at-home services (56%). Mobile medical units had a relatively moderate to low impact. Participants also identified other healthcare trends such as patient-centered care, smart hospitals, improved healthcare infrastructure, better access to drugs and healthcare services, data infusion, telemedicine, drone delivery, conducting trainings and medical database research, to name a few.

**Technology trends**

Participants rated the technology trends based on their perceived degrees of impact as shown in **Figure 4.** The top ranked technology trends with a high impact were increased use of digital healthcare apps (75%), AI-supported diagnosis (63%), and rise in telemedicine, telesurgery and telehealth for rural areas (59%). AR/VR for understanding procedures had a relatively high to moderate impact. According to 9% participants, drone delivery for healthcare supplies had a low impact. Additional technology trends mentioned by the participants included integrated network for healthcare services all over the country including integrated centralized databases for patients and healthcare providers, patient digital twin, rapid diagnosis technology, IoT and wearable devices, and data infusion.

**Clinical trends**

Clinical trends and their associated degrees of impact as voted by the responders are depicted in **Figure 5.** The clinical trend with the highest impact was shift from treatment of diseases to preventive care for early diagnosis (78%), followed by prediction of diseases based on patient health data (72%). Other

trends with a relatively high impact were improved cost structures for drug availability and free vaccine campaigns (63%), and improved care for the elderly in rural regions (59%). Rise in demand for at home services was perceived to have a moderate impact by 50% responders. Emphasizing on the different levels of healthcare systems, patient education and awareness on various diseases and their prevention, hand hygiene, minimizing self-medication use, early diagnosis and regular follow-up, better clinical handover, and telemedicine services were some more clinical trends recognized by the participants.

**Business model trends**

Business model trends with their degrees of importance are shown in **Figure 6**. 81% responders voted for partnerships with government for social care as having a high impact. Equipment sharing for health system with rural regions and freemium for healthcare software (72% each), public-private partnerships (69%), and cross-institutional collaborations for leveraging regional engagements (66%) were also recognized to have a high impact. Fee-per-service and value-based care had a relatively moderate to low impact. Additional business model trends identified were provision of free basic health care subsidized by the government to families in rural areas by primary health physician to tackle diseases at their start and support local manufacturers to cover lack of medical consumables and increase market share.

**Category 2:** *Institutional challenges and goals for access to care in Egypt and their degrees of importance*

**Figure 7** depicts the institutional challenges and goals for access to care in Egypt and their degrees of importance as perceived by the participants. Hospital bed availability, and quality of care and insurance coverage were recognized to have the maximum importance by the participants (72% each). These were followed by operational efficiency (69%) and availability of transportation facilities to reach nearest healthcare providers (59%). Shortage of skilled workforce was a major challenge according to 56% responders but had a low importance for 9% responders. Underutilization of devices due to lack of maintenance and servicing was voted as a challenge of relatively moderate to low importance. Other challenges identified by the participants were related to physician burnout and public awareness on first aid.

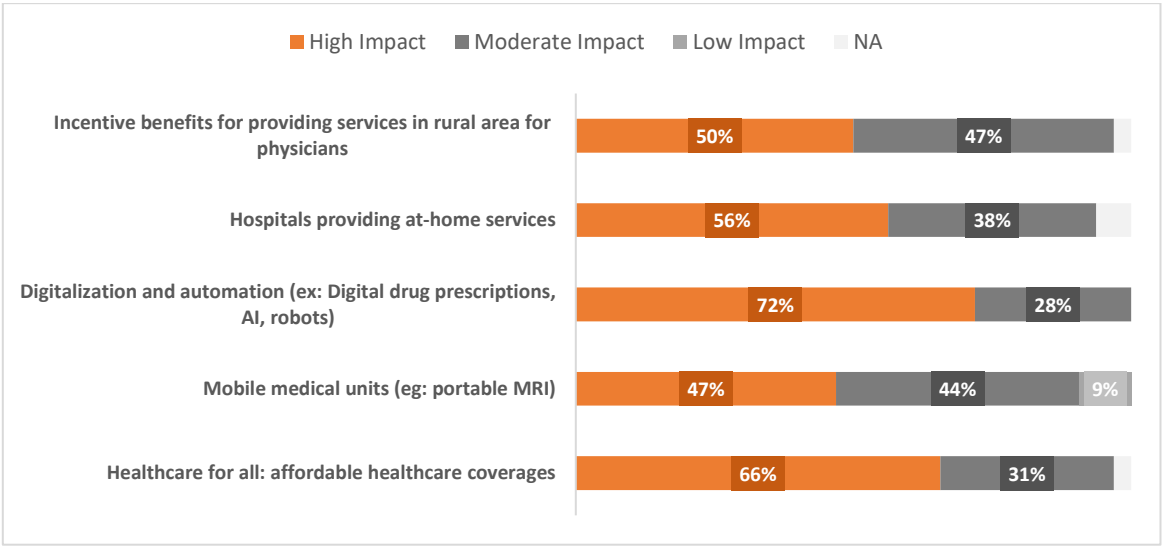


**Figure 3: Healthcare trends outcome analysis**

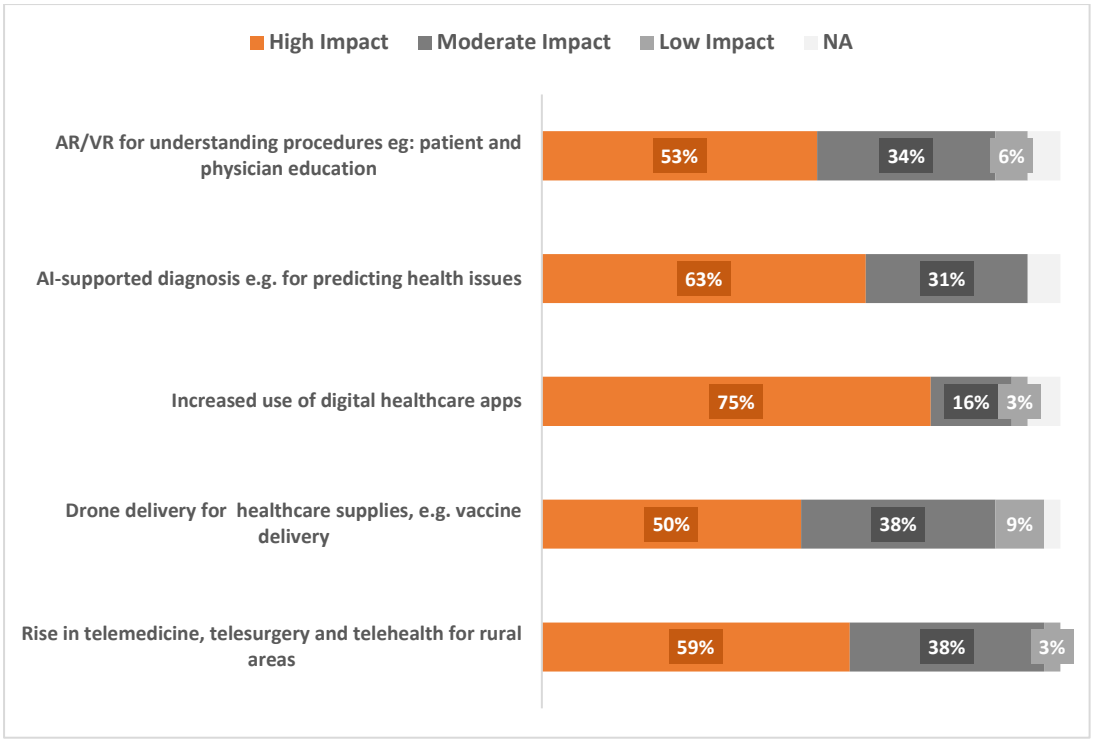


**Figure 4: Technology trends outcome analysis**

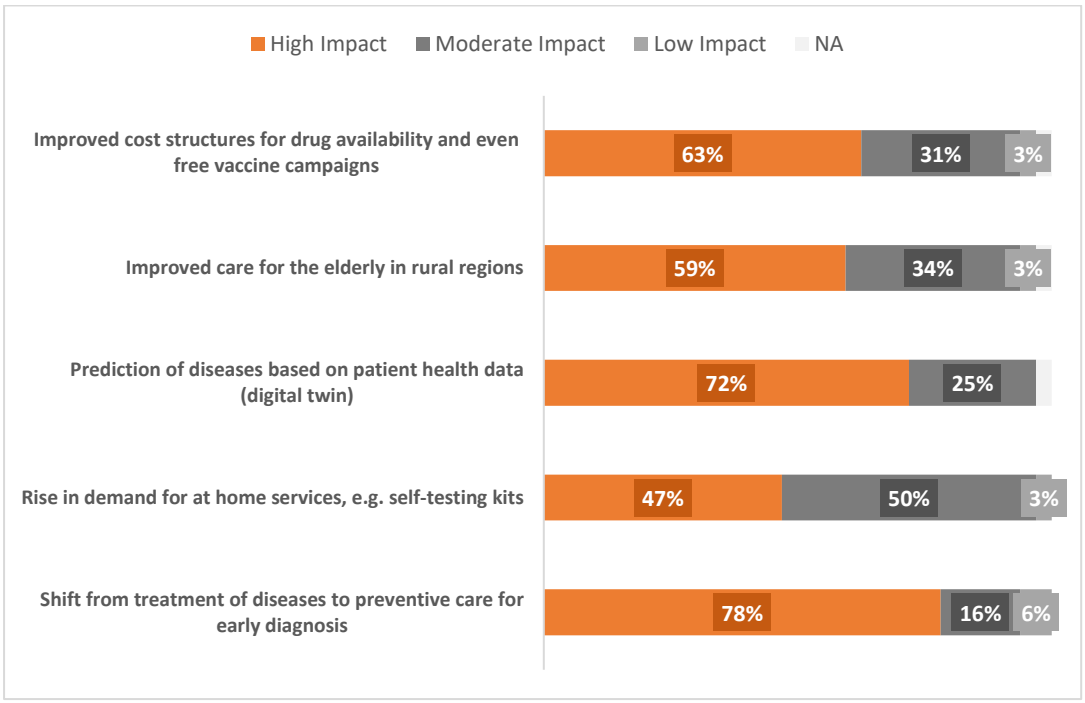


**Figure 5: Clinical trends outcome analysis**

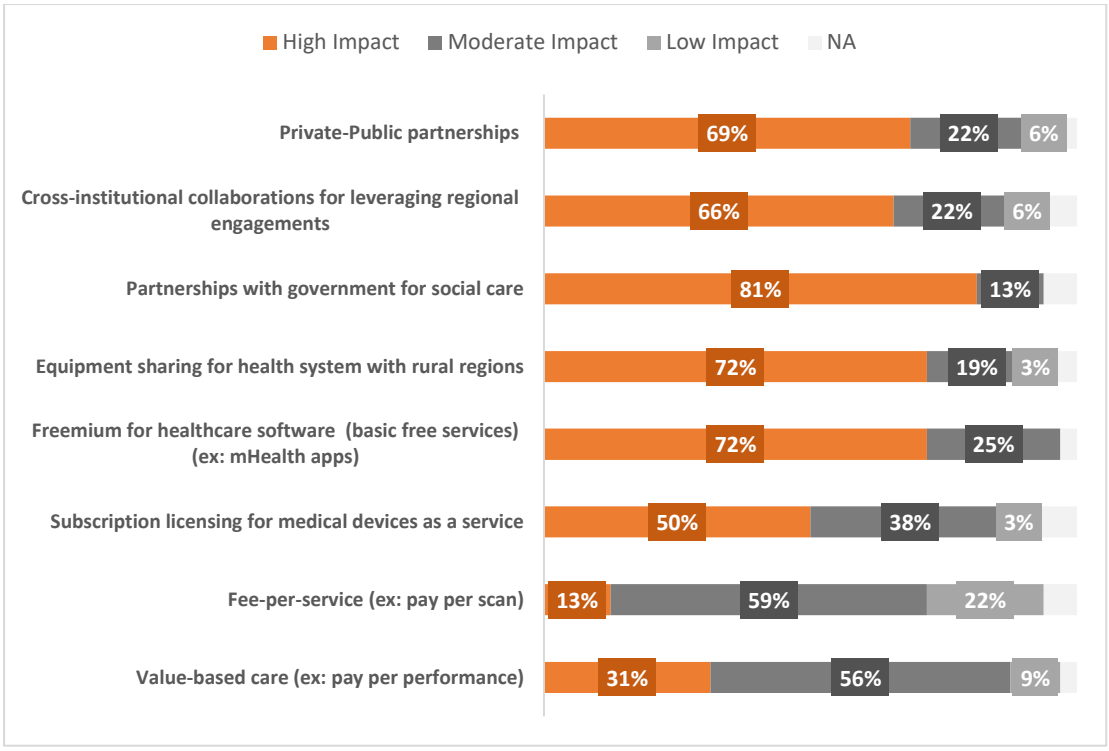


**Figure 6: Business trends outcome analysis**

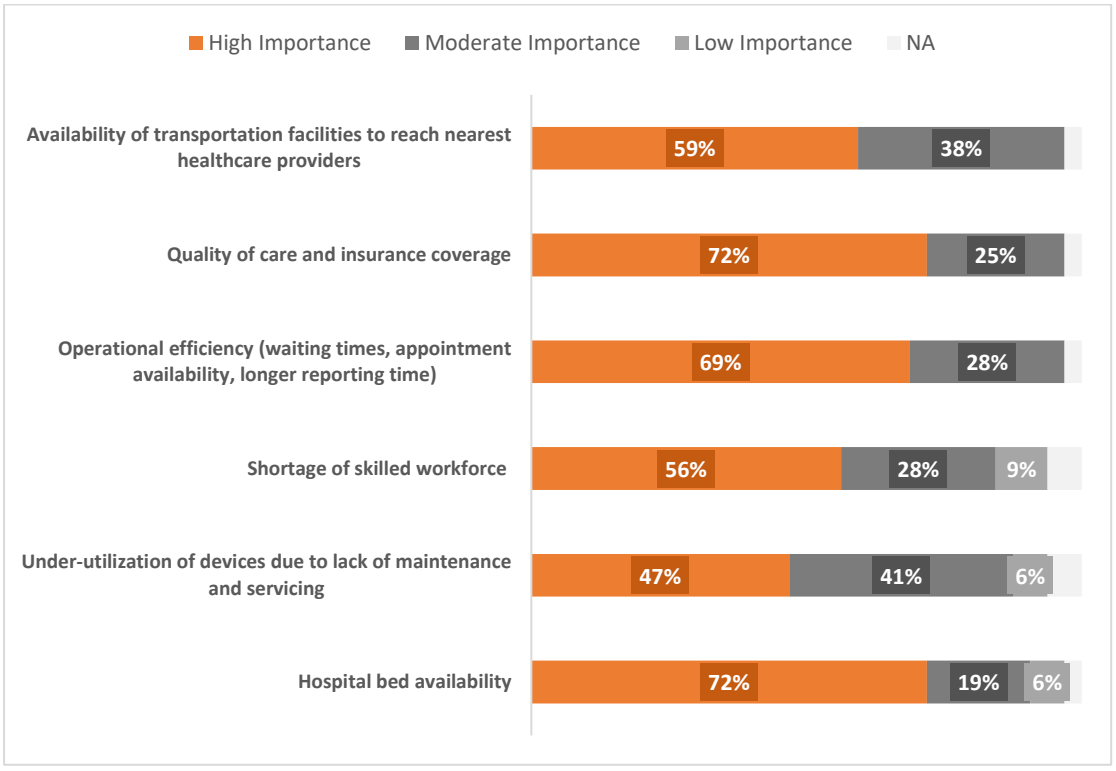


**Figure 7: Institutional challenges and goals for access to care in Egypt and their degrees of importance**

**Category 3:** *Egyptian Healthcare System*

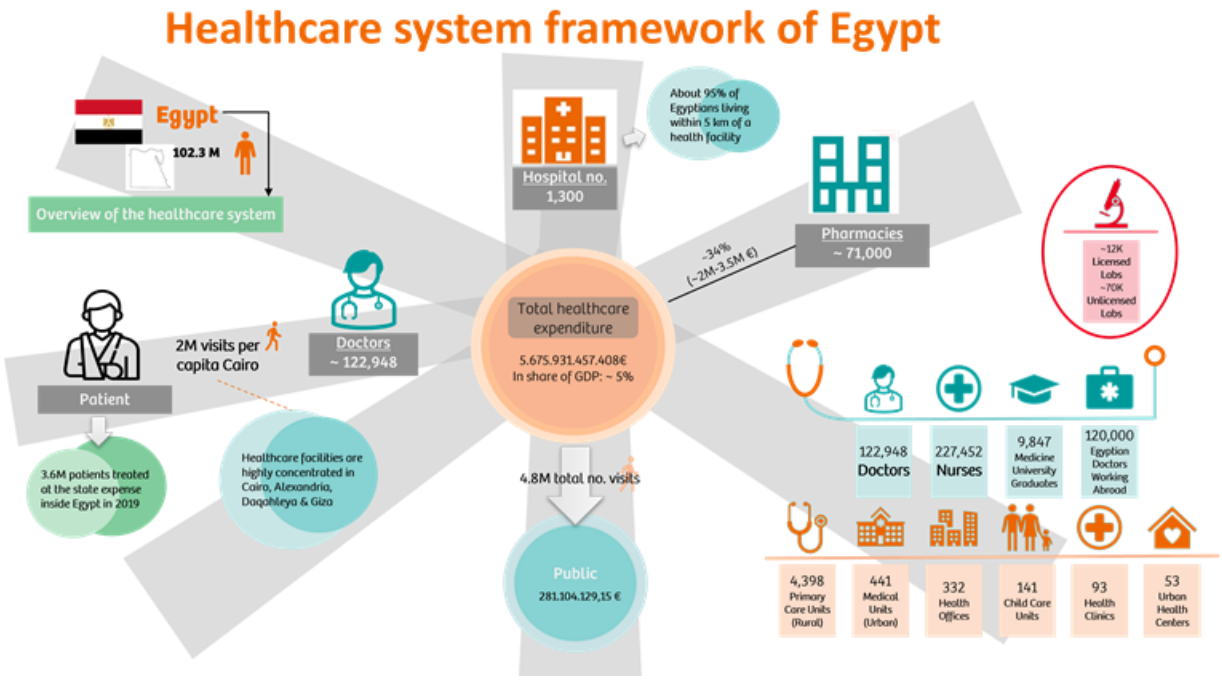


**Figure 8: Healthcare system framework of Egypt**

Participants were provided with a visualization of the healthcare system framework of Egypt **[Figure 8]** which gives an overview of the Egyptian healthcare system in terms of the country's population, healthcare expenditure, various healthcare establishments, stakeholders, and their interdependencies. They were then asked to validate it and share their perspectives on the same. The following suggestions were provided:

- Connecting the entire healthcare system, i.e., connecting the databases of hospitals and clinics and having an organized structure that would enable synchronization of patient records and aid in prediction of potential diseases based on the available patient history.
- An integrated model of clinics, laboratory, and radiology centers, along with ambulatory services like dental services and physiotherapy centers can be added to the visualization.
- Increasing the total expenditure on healthcare.
- Raising the number of primary health centers and ensuring access and availability of quality health services in rural areas.
- Providing training, ensuring availability of qualified workforce, and increasing healthcare staff salaries.
- Aiming towards licensing of the unlicensed laboratories in Egypt.
- Technological advancements and digitalization can help improve the healthcare system.
- Growing research and development in the country.

**Category 4:** *Challenges and potential solutions for Egypt's future for access to care*

Participants were asked to rate the most pressing challenges for improving access to care in Egypt based on their degrees of importance **[Figure 9]**. Over 50 percent of the participants considered poor healthcare education, language barriers, and equipment maintenance as challenges with high to very high importance. Local healthcare policies, resource allocation, and quality of life also had a relatively high importance according to approximately 40 percent of the participants. Availability of appointments with physicians, pharmacists, specialists, dentists, etc. had a relatively moderate importance whereas physical barriers,

crime/theft of medical devices, and unreliable power sources had a relatively low to very low importance. Based on the survey responses, poor system of patient management within governmental hospitals, lack of resources for the poor and people's awareness, training and experience were some additional problems affecting the access to care in Egypt.

**Figure 10-A** shows a pie chart depicting the rate of difference between healthcare access in rural and urban communities within Egypt. Majority of the participants (79%) believed that there is a drastic difference in healthcare access between the two regions. Similar results were observed for impact of income disparity on healthcare access **[Figure 10-B].** According to 78% of the participants, it had a high to very high impact on access to care in Egypt. Impact of online platforms for remote care was rated as high to very high by 47% and moderate by 34% of the participants **[Figure 10-C].**

When enquired about the most common disease categories and diseases in underserved communities in Egypt, participants emphasized upon cardiovascular disease, stroke, hypertension, diabetes mellitus, cancer especially breast cancer, chronic kidney disease, liver disease, respiratory diseases like asthma, chronic obstructive pulmonary disease and lung fibrosis, immunological disease, and infectious diseases like tuberculosis, COVID-19, and hepatitis C virus infection.

Overall, the topmost challenges identified by the participants were:

- Lack of patient education
- Shortage of skilled workforce
- Paper-based system and lack of patient data with no digitized national database, leading to difficulty in accessing data
- Difficulty in accessing the right health care in rural areas
- High cost of some health services
- High cost of medical devices
- Insurance fraud and abuse
- Overcrowded hospitals
- Non availability of ambulances and beds in hospitals
- Delayed cancer detection
- Long time for maintenance of biomedical devices

The topmost solution proposals for Egypt's future for access to care stated by the participants are mentioned below:

- Digitalization of the healthcare system
- Well established healthcare system structure by proper resource allocation and media campaigns
- Ensuring employee health by making healthcare accessible and available at the workplace
- Patient education
- Telemedicine
- Training courses for healthcare professionals sponsored by companies. Integration of VR/AR in education while providing gamified experience
- Better compensation for healthcare workers
- Better insurance strategies for healthcare
- Infection control via robotic interventions
- Providing integrated health units in rural areas
- Providing full medical services at the government level at an appropriate cost
- More automated services to optimize workflow in hospitals
- Applications like uber to book the ambulance and facilitate checking the bed availability in nearby hospitals
- Shared economies and services between organizations
- Digitalization of identification through fingerprint and face to prevent insurance fraud
- Periodic medical inspections by the government
- Patient-centered care
- Centralized connection between all hospitals for proper bed management and fast access and admission linked to a fast ambulance response

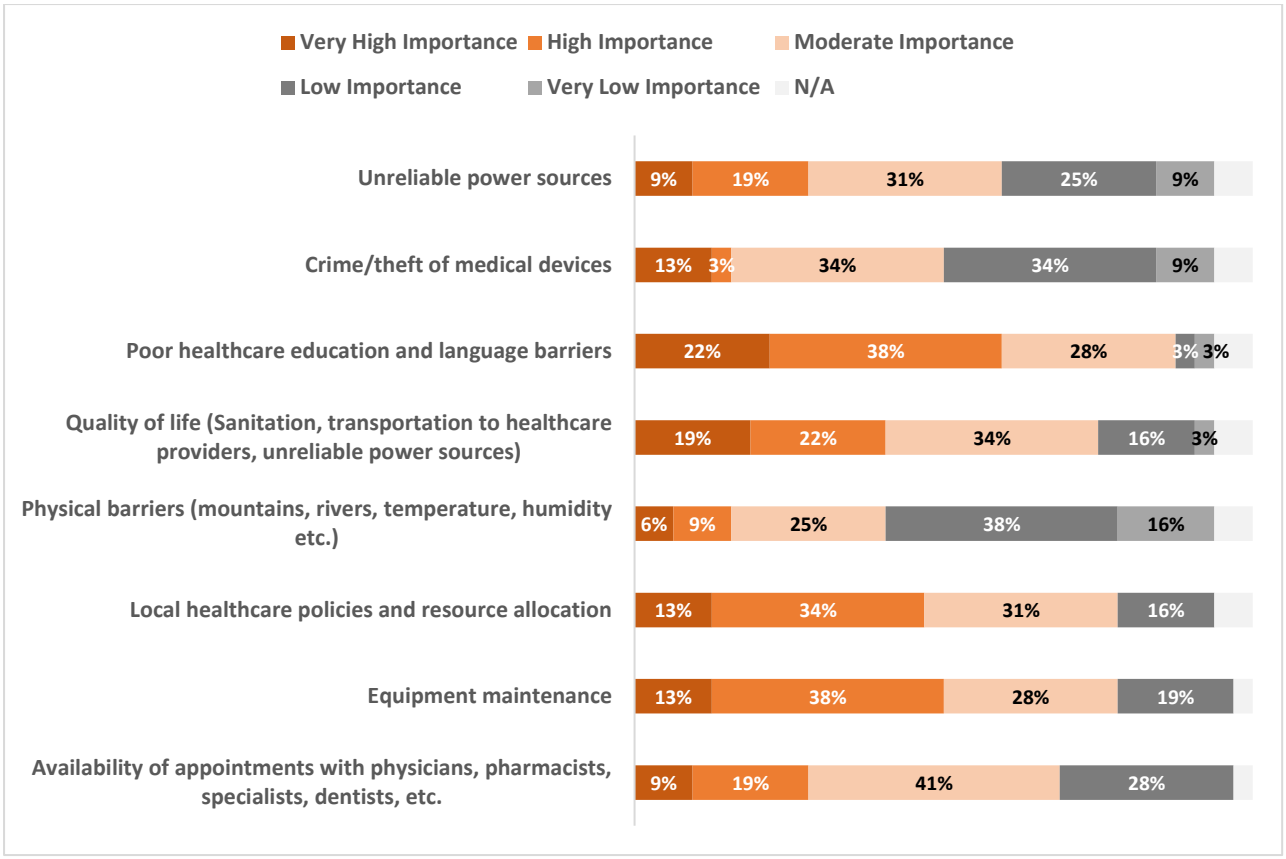


**Figure 9: Access to care challenges in Egypt and their degrees of importance**

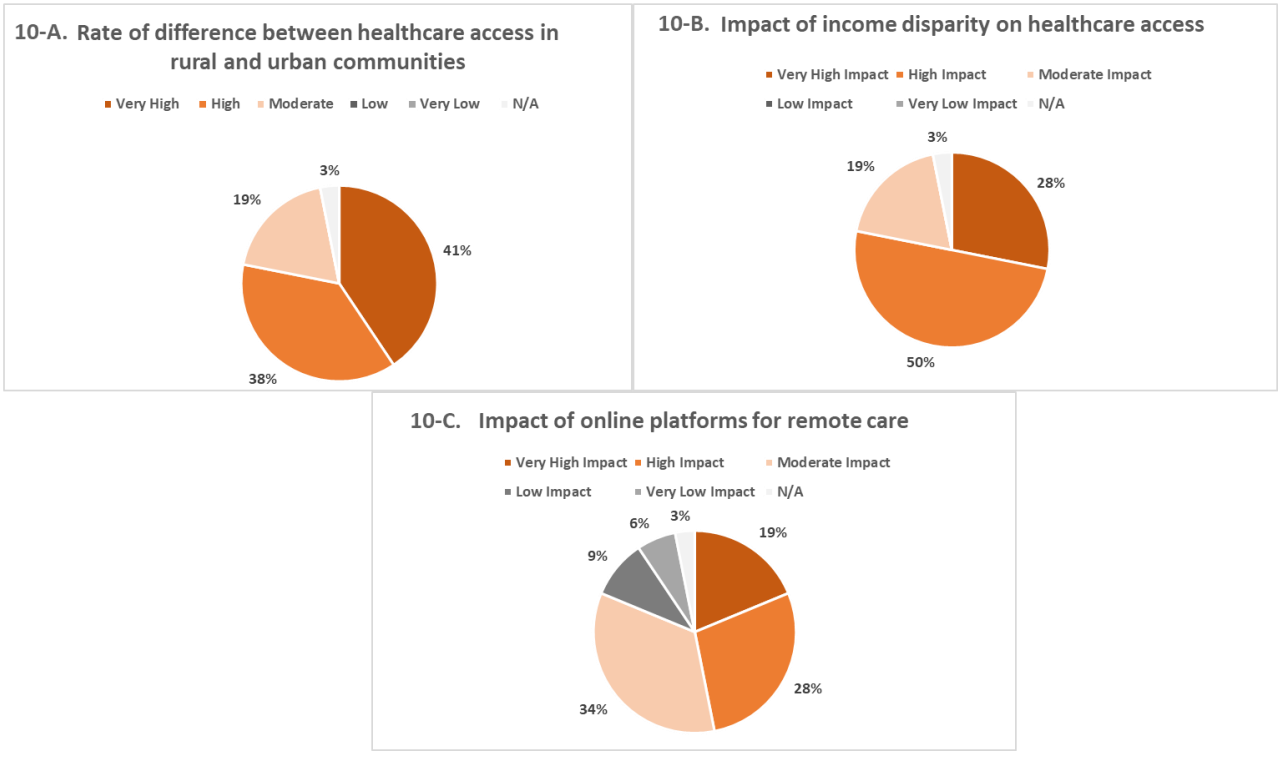


**Figure 10 A-C: Impact of various factors on healthcare access in Egypt**

## Discussion

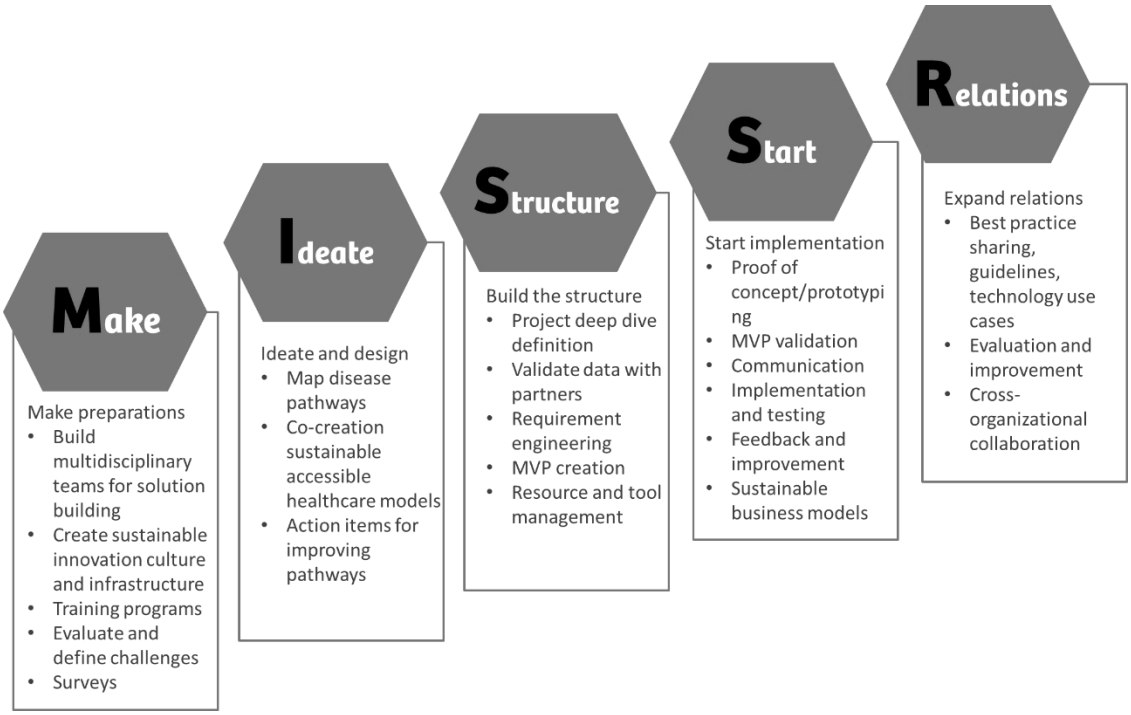


**Figure 11: Implementation Roadmap draft**

Digital health innovations provide a substantial prospect to address multiple health challenges relevant to accessing healthcare. Egypt has been progressing significantly in the past years with its telecommunication, internet, and technology facility ramp-ups. Nonetheless, the gap between rural and urban areas respective to healthcare access remains large. The healthcare in Egypt is mostly absorbed by the highly dense urban areas of the country while more rural regions remain with inadequate access to affordable and quality healthcare services. Results from the insights collected through the survey taken during this program have made the visibility and urgency of digital solutions apparent.

However, to effectively leverage digital health solutions for tackling access to care, new models of cohesive public-private collaborations with the involvement of the Egyptian government and Ministry of Health must be adapted for high-impact interventions to be made. Together, the different organizations may come together to collaborate on new disruptive trends that may improve access to care in underserved areas and to the disadvantaged populations.

Compiling the discussions and brainstorming sessions, KOL voices, solution proposals, and survey insights, an implementation roadmap has been suggested that may act as a roadmap for early disruptive ideas to articulate efficiently into improved access to care **[Figure 11]**. This roadmap has been abbreviated into 'MISSR' which translates to the Arabic word for Egypt.

The first step of this roadmap is to 'Make'. In this step, preparations are made for the setting up of strategic planning. The key players of this phase are organizational boards and local key opinion leaders/decision makers. This phase heavily constitutes mapping out the current situation of healthcare in the country, defining and analyzing gaps and problem spaces, and developing sustainable models and communication strategies for the basis of the infrastructure. Brainstorming and innovation programs such as the one described in this paper are the steppingstones to implementing this phase. The government may also contribute in identifying problem areas and assigning private players to resolve them. It is also in this phase where training builds a foundation for the capacity of this roadmap. ITT capacity building programs are an apt example of how multidisciplinary teams may come together and be trained to speak the same language despite their different fields under a program where innovation methodologies, entrepreneurship,

commercialization, and leadership are all taught under one setting.

The second phase of this roadmap is to 'Ideate'. This phase constitutes the ideation and design of the new working model to measure and gauge the baseline situation, team and innovation culture, patient experience and disease pathways. Together, multidisciplinary teams including physicians, healthcare professionals, administration, business, managers, pharmacists, engineers, students, scientists, social care experts, etc. collaborate between their different disciplines to explore and map the disease pathway resulting in action items on how to improve different angles burdened by lack of healthcare access. Solutions are bridged between three major focuses: affordability, accessibility, and quality. The ITT network that comprises of key local and global healthcare institutions and universities allows for the ease of innovation culture adoption through our different joint and global events including the external ITT exhibition held annually.

The next step for implementation is to 'Structure'. Here is where more concrete actions are beginning to be taken towards the solutions. This step gauges the pre-existing interventions, root cause analysis, surrogate measures, requirement engineering, and resource management. This information is used to initiate project deep dives into the more specific areas and identified solution projects. ITT labs implemented at different institutions builds the capacity for project deep dives under the guidance of the ITT team through workshops and continuous follow-up to ensure projects are being grounded and managed ideally. Introducing industrial experience into technical research and validation is becoming an essential element in this era of rapid digitalization transformation.

The 'Structure' step is then thrown into a 'Start' phase where the outcomes are visualized, processes are indicated, and solutions are created via prototyping, testing, and validation. It is vital for this step to integrate sustainable business models and mitigation strategies that fit under access to care to maximize the benefits and accessibility of the created solutions.

Finally, the final phase of implementation is 'Relations'. Best practice sharing guidelines, evaluation, and improvement are highlighted in this phase to expand and create cross-institutional collaborations. This also gives opportunity for public-private collaborations and government involvement which is vital and should be promoted in each critical area. ITT has been holding a platform with its global network of prestigious global institutions for best-practice sharing across different institutions, countries, and even continents allowing for growth, awareness, and harmony of global healthcare in different settings.

**Barriers**

Successful implementation of the 'MISSR' roadmap is predicted to foresee barriers in areas including but not limited to financial, technical, organizational, geographical, psychological, and managerial. To overcome barriers, it is first important to identify and analyze the dimensions and elements under each area. The most prominent barriers that stand at the front of implementation include the lack of cost, time, training, standardization, leadership, technical skills, equal access to technology, trust and motivation.

To overcome these barriers, it must be ensured that there is a 1) strong managerial board from different institutions and locations, 2) standards, policy, and criteria are set by the management board for the infrastructure and elements included within it, 3) allocating and exploring concrete and sufficient funding and grant sources to ensure sustainability, 4) establishing and institutionalizing training programs in the different and relevant areas for guidance and grounding 5) adopting electronic health records and systems, 6) set up and make clear the benefits and key performance indicators (KPIs) of the implementation road map and its successful execution with continuous follow up for incessant improvement and meeting KPIs.

## Conclusion

While Egypt moves towards healthcare improvement initiatives, it is vital to ensure that the access to these improvements embraces the wider population of the country. Innovation Think Tank as a part of Siemens Healthineers has gathered the insights of multidisciplinary experts and participants on the diversity of impact of the different clinical, technological, and business trends that contribute to the nation's future of healthcare. In order to ensure that these trends efficiently achieve access to care, an implementation roadmap that gives recommendations on the elements of co-definition,

co-creation, project deep-dives, commercialization, and cross-institutional expansion has been endorsed by the scope of this study.

To create a sustainable innovation infrastructure for the future of healthcare in the country, it is highly recommended to engage the most relevant stakeholders, key opinion leaders, and decision makers to help shape and define the steps forward for implementation.

## Authors Statement

SH has established and confirmed the paper's framework as well as guided and initiated the paper's context. All authors have provided crucial insights and aspirations for the frugal innovation context. SAM, DH, AG and JV collected the data, analyzed the survey results, and added content to the whitepaper. All authors contributed to the paper's drafting and approved the final version. The authors do not state any competing interests.

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## Disclaimer

The information shared in this whitepaper is not an all-inclusive or comprehensive picture of the Egyptian healthcare system and is a result of data collection received through surveys. The key purpose of this whitepaper is to provide pertinent information on the co-creation addressing the future of access to healthcare innovation to allow for healthcare providers, decision makers, and budding innovators to systematically analyze the healthcare system and its respective impactful trends and challenges. Some statements in this paper may be forward-looking statements that are based on trusted source research. Survey data may differ factually based on the subjectivity of the surveyors. There were no identified conflicts of interest for this study.

**Siemens Healthineers Headquarters**
Siemens Healthcare GmbH
Henkestr. 127
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