Chapter IV Findings: Business Solution

This chapter consists of phases of the Scenario Planning for Indonesia's future digital health, right from exploration through the development of consequences and implications of the scenarios to the ESS.

IV.1 Orientation

The Orientation sub-chapter has been previously outlined in Chapter 1.2. Export Support Service (ESS) Indonesia; Chapter 1.3. ESS Strategy Improvement; and Chapter 1.4. Research Questions and Objectives.

IV.2 Exploration

The Exploration sub-chapter begins with a PESTEL (Political, Economy, Social, Technology, Environmental, and Legal) analysis assessing the correlation between internal factors and stakeholders within the transactional environment of Indonesia's digital health. It is then followed by the scanning of the contextual environment to identify actors and factors shaping the digital health sector.

Further, an online questionnaire will be shared with the FGD respondents to identify Driving Forces that shape the future of Indonesia's digital health. An FGD will then be conducted to test and re-scan new or missing KDFs, leveraging social learning from the FGD.

The author then creates three inductive Scenario Framework from selected KDFs to produce contrasting yet challenging scenarios, their respective CLD, and relevant scenario titles.

IV.2.1 PESTEL Analysis

Political. Indonesia's ranking in the Index of Economic Freedom has risen to 53rd globally in 2024, up from 60th in 2023 (Euromonitor, 2024).. This improvement is attributed to reforms enhancing 'business freedom' and 'trade freedom', strengthening a more competitive private sector in a decentralized economy. The recent presidential elections, which resulted in Prabowo Subianto taking office, suggest continuity in policy direction, potentially

providing a stable environment for ongoing reforms. This stability is crucial for the digital health sector, as it encourages investment and innovation.

With a top corporate tax rate of 22% and an overall tax burden of 10.9% of GDP, Indonesia maintains a relatively low tax environment conducive to business growth. This low tax burden can incentivize investments in digital health technologies, allowing companies to reinvest profits into expanding digital health services and infrastructure (Euromonitor, 2024).

The Indonesian government has unveiled a comprehensive digital health blueprint aimed at transforming the healthcare system. This initiative seeks to leverage digital solutions to enhance access to quality care, particularly in underserved areas. The blueprint emphasizes the integration of health data systems, which is essential for improving service delivery and operational efficiency in healthcare. The government's commitment to digital transformation aligns with global trends and the urgent need for interoperability among health information systems (DTO, 2021).

The World Bank and UNDP are actively supporting Indonesia's health sector development through financial programs and strategic partnerships. For instance, a USD 400 million loan from the World Bank aims to enhance local government spending efficiency, which is expected to bolster the overall fiscal position and support health initiatives. Such collaborations can facilitate the implementation of digital health solutions and improve healthcare outcomes (UNDP, 2021).

Despite the positive economic indicators, Indonesia faces significant challenges related to governance, particularly concerning the rule of law and corruption. The Index of Economic Freedom highlights weaknesses in 'government integrity' and 'judicial effectiveness', indicating that corruption remains a barrier to effective governance. This environment can hinder the implementation of digital health initiatives, as corruption may increase operational costs and complicate regulatory compliance (Euromonitor, 2024).

Economy. Despite a slight deceleration in GDP growth to 5.0% in 2023, Indonesia's economic performance remains robust compared to the Asia

Pacific average of 4.7%. The projected average annual growth rate of 5.1% from 2024 to 2028 further supports a favorable environment for digital health investments. This economic backdrop is crucial, as increased disposable income and consumer spending can enhance demand for digital health solutions, including telemedicine and health management applications (Euromonitor, 2024).

Indonesia's inflation rate decreased to 3.7% in 2023, with projections of further decline to 2.7% in 2024. This stability in prices is beneficial for consumers and businesses alike, as it allows for more predictable spending patterns. Lower inflation can lead to increased investment in healthcare technologies, as both consumers and healthcare providers may be more willing to spend on digital health services when inflation is under control (WorldBank, 2023).

The digital health market in Indonesia is experiencing explosive growth, with revenues expected to reach approximately USD 1 billion by 2025. Factors contributing to this growth include high smartphone penetration, increased healthcare awareness, and government support for digital health initiatives. The Indonesian government is actively promoting digital health adoption through initiatives like the 2024 Digital Health Transformation Strategy, which aims to integrate various health applications and improve healthcare access across the archipelago (DTO, 2021).

The digital health market in Indonesia is experiencing explosive growth, with revenues expected to reach approximately USD 1 billion by 2025. Factors contributing to this growth include: 1). High smartphone penetration: Over 96% of internet users access the web via smartphones, making mobile health applications a powerful tool for service delivery. 2). Increased healthcare awareness: As more Indonesians utilize the Internet for health information and consultations, the demand for digital health solutions is expected to rise. 3). Government support: The Indonesian government is actively promoting digital health adoption through initiatives like the 2024 Digital Health Transformation Strategy, which aims to integrate various health applications and improve healthcare access across the archipelago (Statista, 2024).

Social. In 2023, Indonesia held the 11th position among 22 Asia-Pacific nations in terms of average gross income, reaching US$ 3,123. The country enjoyed a 4.7% real terms increase in per capita disposable income levels, mirroring the growth rate of the previous year. This rise in income was supported by a decrease in unemployment rates and an upswing in labor productivity, which stood at US$ 9,370 in real terms, despite being well below the Asia Pacific average of US$ 18,566 in 2023. The minimum wage also saw a real terms increase of 2.4%, reaching US$ 122 per month. This income growth was underpinned by robust economic expansion driven by strong domestic consumption and increased government expenditure. The digital health sector is poised to benefit significantly from this rising income level. As disposable incomes increase, consumers are more likely to invest in health technologies and services, including telemedicine and health management applications (Euromonitor, 2024).

Population growth in Indonesia will continue to be driven by positive natural change, with projections indicating that the population will reach 308 million by 2040, making Indonesia the fourth-largest country in the Asia Pacific region (Euromonitor, 2024). This demographic shift is expected to lead to a significant increase in real terms per capita disposable income, with projected growth of 91.8% over 2024-2040. Rising disposable incomes and a large, growing consumer base will make Indonesia an increasingly attractive consumer market. The digital health sector is well-positioned to tap into this expanding consumer base. With over 178 million internet users and approximately 96% accessing the internet via smartphones, mobile health applications can effectively reach a vast audience (Euromonitor, 2024). The increasing prevalence of non-communicable diseases in Indonesia further fuels the demand for digital health solutions for remote monitoring and chronic disease management.

Rising living standards will cause life expectancy to climb, driving ongoing aging in Indonesia. By 2040, those aged 65 and older will account for 12.0% of the total population (Euromonitor, 2024). While the rise of senior residents will impact consumer trends, the median age in Indonesia will remain relatively young at 35.0 years, with younger populations continuing to

influence consumer lifestyles and spending habits. This demographic dynamic presents both challenges and opportunities for the digital health sector. As the population ages, there will be increased demand for healthcare services tailored to older adults, including telehealth services and remote monitoring solutions. However, the rising working-age population could create a demographic dividend if sufficient jobs are created to absorb those entering the workforce, further driving economic growth and investment in health technologies (Euromonitor, 2024).

Between 2024 and 2040, Indonesia's urban population is set to expand by 23.9%, accounting for 67.2% of the total population by the end of the forecast period (Euromonitor, 2024). As rural populations migrate to cities for work and education opportunities, urbanites will become an important consumer market. Major cities like Jakarta and Surabaya will remain key locations for business expansion, particularly in the digital health sector. Urbanization enhances access to digital health services, as urban residents are more likely to have internet connectivity and access to technology. The government's commitment to improving healthcare infrastructure in urban areas will further support the growth of digital health applications (Euromonitor, 2024).

Technology. By 2028, Indonesia is projected to have 359 million mobile telephone subscribers, representing an impressive growth of 11.1% since 2023 (Euromonitor, 2024).. This substantial subscriber base, the third largest in the world after India and China, presents significant opportunities for technology players involved in mobile commerce. The rise in mobile subscriptions is particularly beneficial for digital health applications, as a large segment of the population increasingly relies on mobile technology for health management. The availability of high-speed networks, especially in urban areas, is a key driver of this trend. With over 96% of internet users accessing the web via smartphones, mobile health applications can effectively reach a vast audience, facilitating telemedicine consultations, health monitoring, and access to health information (Euromonitor, 2024). The convenience of mobile health solutions aligns with the growing demand for accessible healthcare services, especially in a country where traditional healthcare infrastructure can be limited. As the digital health market in Indonesia is projected to reach revenues of over US$

1 billion by 2025, the growth in mobile subscriptions will be a critical enabler of this expansion (Euromonitor, 2024).

The Indonesian government is focusing on upgrading its digital infrastructure, which is essential for the growth of the digital health sector. Projects like the Palapa Ring Project aim to enhance connectivity by deploying a 35,000-kilometre land and sea cable, providing high-speed internet access to both rural and urban locations (KomInfo, 2019). The construction of base transceiver station (BTS) towers is also underway, which will significantly improve connectivity in rural areas, where access to healthcare services is often limited. Investments from major players like Amazon Web Services (AWS), which has committed USD 5 billion over 15 years to build data centers and enhance digital connectivity, further underscore the commitment to improving Indonesia's digital landscape (JakartaPost, 2022). Enhanced digital infrastructure will facilitate the development and deployment of digital health solutions, allowing for better service delivery, data management, and patient engagement.

Despite the promising growth in mobile subscriptions, internet usage in Indonesia stood at 78.1% in 2023 (APJII, 2024), ranking 25th out of 45 countries in the Asia Pacific region. This level of internet penetration is lower than that of peers like Thailand and Vietnam, which could hinder Indonesia's progress in the digital age, including the adoption of digital health solutions. Geographical challenges, stemming from Indonesia's status as an archipelago, complicate the rollout of fixed broadband internet services. Many rural areas still have limited access to reliable internet, making it difficult for residents to utilize digital health applications effectively. Although internet usage is expected to rise to 79.5% by 2027, the current disparities in access could slow the adoption of digital health technologies, particularly in underserved regions (Euromonitor, 2024).

Indonesia's research and development (R&D) expenditure is only 0.24% of GDP in 2022, significantly below the Asia Pacific average of 2.2% (Statista, 2024). This lack of investment in innovation limits the capacity of both the private and public sectors to develop competitive digital health solutions. The Network Readiness Index (NRI) highlights Indonesia's relatively low rankings

in innovation-related metrics, such as business-financed R&D and government investment in higher education. Without a robust innovation ecosystem, the digital health sector may struggle to keep pace with global advancements, potentially limiting the effectiveness and attractiveness of local solutions.

While there was initial urgency in rolling out 5G services across Indonesia, the pace has slowed due to a lack of perceived demand among consumers. Many users find that their current 4G services adequately meet their needs for social media and streaming, which diminishes the immediate necessity for 5G. The reluctance to deploy 5G comprehensively could limit the adoption of next-generation technologies, such as artificial intelligence (AI) and the Internet of Things (IoT), which have the potential to enhance digital health applications significantly (Euromonitor, 2024). The integration of these technologies could improve remote patient monitoring, data analytics, and personalized healthcare solutions, but their success hinges on the availability of advanced connectivity options.

Environmental. In Indonesian hospitals, energy efficiency is a key focus due to high electrical consumption, averaging 225 kWh/m² compared to Japan's 175 kWh/m². Efforts to improve energy use include: 1). Energy Efficiency Measures: Installing energy-saving lamps, managing air conditioner settings, and training staff. Examples include RSUD Batang and PERTAMINA Hospital Cirebon. 2). Alternative Energy: Limited use of solar cells, with only one reported instance in Surakarta (Octavianus et al., 2021).

In Indonesian hospitals, green building design emphasizes the use of sustainable materials and eco-friendly construction practices. Hospitals are encouraged to select durable, easy-to-clean materials that are locally produced to reduce emissions from production and transportation.

For instance, UIN Maulana Malik Ibrahim Hospital in Malang uses low VOC (non-harmful material), prefabricated, and locally sourced materials, adhering to green building principles. Similarly, Universitas Sumatera Utara Hospital focuses on protecting resources, preserving indoor air quality, and supporting occupant health through sustainable building practices. These approaches aim to enhance hospital performance while minimizing environmental impact

(Octavianus et al., 2021).

In Indonesian hospitals, waste management is a critical issue due to the large volumes of waste generated. On average, each bed produces 3.2 kg of solid waste and 416.8 liters of liquid waste daily, resulting in a national total of 376,089 tonnes of solid waste and 48,985 tonnes of liquid waste per day (Octavianus et al., 2021).

Green hospitals are expected to focus on waste minimization, segregation, and management practices such as avoiding, reusing, recycling, and sorting waste. However, research highlights varying levels of readiness among hospitals. For example, hospitals in Malang and Batang district struggle with managing hazardous waste, while hospitals in Manado fall short of green hospital standards. In contrast, A. Yani's Mother and Child Hospital in Surabaya has effectively implemented solid medical waste management. The hospital in Cirebon handles waste well but could enhance practices by incorporating composting methods. Overall, effective waste management in hospitals relies on having skilled environmental staff, sufficient budgets, and appropriate facilities and technology (Octavianus et al., 2021).

In Indonesian hospitals, water conservation is guided by the 2018 Guidelines for Environmentally Friendly Hospitals (MoH, 2018). Key practices include monitoring water use, increasing efficiency, recycling wastewater, and utilizing alternative water sources such as rainwater. These measures aim to reduce reliance on main water sources and minimize wastewater output. For instance, UNSRAT Hospital in Manado has achieved a 40.64% reduction in water use by implementing non-conventional plumbing tools, saving up to 27.12 cubic meters of water daily. Similarly, RS Cirebon has saved 94.9 cubic meters of water annually through reverse osmosis. These efforts not only cut water costs but also reduce waste and environmental impact (Octavianus et al., 2021).

Legal. Law Number 17 of 2023 on Health, enacted on August 8, 2023, marks a significant shift in Indonesia's healthcare system. Approved by the Indonesian House of Representatives on July 11, 2023, the Health Law aims to enhance health capacity, reduce disparities, and strengthen quality services to boost national development and competitiveness (AHP, 2023).

The Health Law legalizes telemedicine, allowing licensed practitioners to offer services directly through Health Service Facilities. Detailed provisions for telemedicine will be outlined in future regulations by relevant ministries.

The new regulations streamline the process for professional overseas graduates and foreign medical practitioners to practice in Indonesia, addressing staffing shortages and improving service quality.

The Law introduces updates to healthcare funding, healthcare practice licensing, professional healthcare organizations and councils, product and substance restrictions, and criminal sanctions. It revokes 11 previous regulations, including those on Hospitals, Medical Practice, and Medical Education.

The Government plans to implement supporting regulations that encompass government regulations, presidential regulations, and the Minister of Health regulations within one year and anticipates potential challenges from stakeholders at the Constitutional Court.

IV.2.2 Contextual Environment Mapping

As a reference for determining the key respondents for the FGD, identifying transactional and contextual environment aspects (Ramirez & Wilkinson, 2016) for ESS Indonesia, was conducted by scanning these environments with PESTEL analysis earlier. The transactional and contextual environments scanning map identified are as follows.

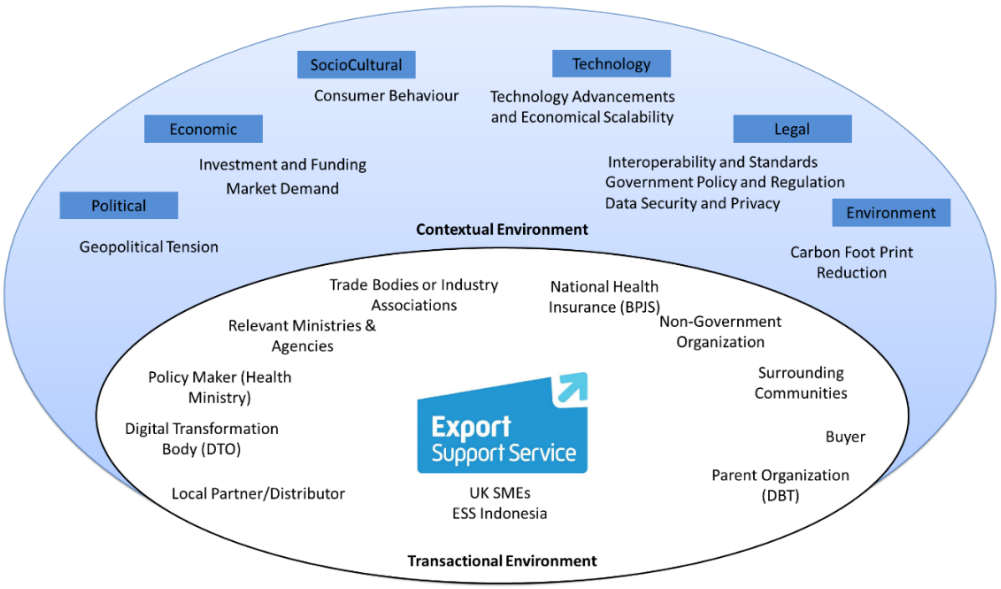


Figure IV. 1. Mapping of Transactional and Contextual Environments (Author's drawing, 2024).

Based on the mapping above, below are 20 key respondents representing their organizations and background profiles who will contribute as source persons subject to this research through their participation during the FGD. The author limits attendance to one person representative from each organization except Local Distributors/Partners which are existing UK SME partners. Furthermore, according to Ramirez and Wilkinson (2016), the key aspect of the scenario planning process is the diverse participants' learning process, therefore the author emphasized the heterogenous composition and role of key respondents to enrich the discussion.

No	Key Respondents
1.	Representative (Key Respondents 1 & 2) Local Distributors/Partners: They are crucial for companies expanding into new markets. These partners facilitate market entry by navigating regulatory complexities and ensuring compliance with local standards. They play a vital role in customization, aligning digital health solutions with cultural preferences, building trust through established relationships, and contributing to logistical efficiency. Local distributors also support marketing, promotion, and after-sales services, making them indispensable allies in successfully implementing and adopting digital health solutions globally.
2.	Representative (Key Respondent 3) Atensi – Indonesia Telemedical Alliance (Atensi,2024). Atensi is an initiative to establish a cross-disciplinary communication hub aimed

	at advancing the healthcare ecosystem in Indonesia, specifically in the realm of telemedicine, remote monitoring, wearable devices, and the Internet of Things (IoT). This involves advocating for regulations with the government to represent the interests of telemedicine services, fostering collaboration among healthcare professionals in Indonesia, and addressing the resource requirements for telemedicine services, remote monitoring, wearable devices, and IoT through advocacy, services, education, and research employing technology.
3.	Representative (Key Respondent 4) HealthTech.id – Association for Digital Health Indonesia (HealthTech.id, 2024). The association plays a pivotal role in advancing the Indonesian healthcare sector by promoting its adaptability to modern technology. Their members include digital health companies from startup to unicorn. They provide crucial support to the government in establishing safety regulations and standards for health technology. Concurrently, the association strives to create a collaborative health-tech ecosystem, fostering mutual growth among various entities in the sector. Their overarching missions include nurturing the health-tech ecosystem and advocating for regulatory standards and standardization. These efforts seamlessly align with the evolving landscape of healthcare technology, specifically in the domains of remote monitoring, wearable devices, and the Internet of Things (IoT). By facilitating the integration of such innovations, the association actively contributes to the advancement of a technologically sophisticated and well-regulated healthcare environment in Indonesia.
4.	Representative (Key Respondent 5) BPJS – Social Health Insurance Administration Body. The mission of BPJS Kesehatan, with its focus on enhancing service quality through technology-based solutions, is crucially significant in the context of the growing importance of remote monitoring, wearable devices, and the Internet of Things (IoT) in healthcare. By leveraging advanced technologies, such as remote monitoring and wearable devices, BPJS Kesehatan can improve the accessibility and efficiency of healthcare services for participants. This aligns with their goal of providing high-quality and inclusive health assurance throughout Indonesia. Additionally, the emphasis on strengthening engagement and building organizational capabilities underscores the need for incorporating digital transformation and sustainable innovation, including IoT applications, to optimize healthcare delivery. Integrating these technologies can enhance the monitoring of participants' health remotely, contribute to preventive healthcare measures, and enable more efficient and effective management of the National Health Insurance-Healthcare and Social Security Agency (JKN-KIS) program.
5.	Representative (Key Respondent 6) Digital Transformation Office (DTO), The Ministry of Health. DTO is digital transformation team in the Ministry of Health (MOH) of the Republic of Indonesia. The initiative aims to revolutionize healthcare

	in Indonesia by seamlessly integrating systems used by healthcare workers, ensuring operational efficiency for the delivery of high-quality healthcare services to the Indonesian population. Through the establishment of a secure data warehouse, the integration of national health data is prioritized, facilitating more accurate and efficient health policy-making. Their core missions include enabling accessible electronic medical records (EMR) for individuals across healthcare facilities, simplifying systems for health workers to focus on life-saving activities, and driving policy innovation to fortify the health-tech ecosystem. The development of the SATUSEHAT Platform plays a pivotal role in achieving these goals, providing data connectivity, analysis, and services to integrate various health applications, while SATUSEHAT Mobile represents a transformative step towards a new healthy lifestyle. Ultimately, this comprehensive approach seeks to harness the power of data and technology to enhance healthcare delivery and policy implementation throughout Indonesia.
6.	Representative (Key Respondent 7) PERSI – Association of Indonesian Hospitals and ARSSI - Association of Indonesian Private Hospital. PERSI and ARSSI serves as a communication and collaboration platform for public and private hospitals across Indonesia. Established as a non-profit organization in 2004, ARSSI aims to strengthen and advance public and private healthcare in the country. Both organizations focus on enhancing the capacity of its members in areas such as hospital management, patient safety, accreditation, and human resource development.
7.	Representative (Key Respondent 8) AAUI – Association of Indonesia General Insurance (covering health insurance industry). The association represents the majority of insurance industries including health insurance. The health insurance sector is pivotal in driving the future of digital health through IoT, wearables, and remote monitoring. Insurers leverage these technologies to improve patient outcomes and lower healthcare costs. By encouraging policyholders to use wearables and remote monitoring, insurers gain real-time health data for accurate risk assessment and personalized premiums. This proactive health management approach prevents chronic conditions, reducing insurance claims and benefiting both insurers and policyholders. The adoption of digital health technologies by the health insurance industry acts as a catalyst, shaping the future landscape of healthcare.
8.	Representative (Key Respondent 9) IDI – The Indonesian Medical Association, abbreviated as IDI, is a professional medical organization in Indonesia. IDI serves as the umbrella organization for doctors across Indonesia. This organization is affiliated with the government through the Ministry of Health of the Republic of Indonesia. Two key missions of IDI pertinent to the adoption of digital health among Indonesian doctors include fostering a culture of research and innovation in the medical science domain and expediting the transfer of medical technology. Additionally, they

	aim to modernize, professionalize, and open up IDI as an organization.
9.	Representative (Key Respondent 10) ASKLIN – Indonesia Clinics Association. The association represent the clinics that provides individual health services, offering basic and/or specialized medical services, organized by more than one type of healthcare professional and led by a medical practitioner. They work closely with the government for various purposes such as: for Human Resources, they support the enhancement of expertise, skills, and positive behaviors among staff to ensure the provision of top-notch services; play a pivotal role in expediting the realization of Indonesia Sehat's vision, and support the development of an optimal referral system, and strive to make healthcare services more readily available and affordable for everyone.
10.	Representative (Key Respondent 11) ASIOTI – Indonesia Internet of Things Association. Founded in September 2016, the association encompasses over 100 members, comprising a diverse community of users, academia, device manufacturers, hardware and software providers, system integrators, network connectivity providers, and regulators. ASIOTI's missions encompass education and awareness initiatives, the advocacy of standards and regulations, and fostering collaborations both on a national and international scale.
11.	Representative (Key Respondent 12) Yayasan Jantung Indonesia – Indonesia Heart Foundation. The Indonesian Heart Foundation is a non-profit organization that focuses on increasing public knowledge and awareness of the importance of efforts to prevent Heart and Vascular Diseases through the popularization of the Five Pillars of a Healthy Heart. The Five Pillars includes Balanced nutrition, Quit smoking, Avoid stress, Monitor blood pressure, and Regular exercise.
12.	Representative (Key Respondent 13) ABDI.id – Big Data and AI Association. Representing big data technology and analytics providers, the association has several objectives such as: establishing a secure and competitive ecosystem for Data Technology, Analytics, Controller, and Science industries in Indonesia which aimed at benefiting the nation's people, economy, and industries, and maintaining the sustainability of these industries to they remain adaptable to the fast-paced technological changes, regulations, and globalization.
13.	Representative (Key Respondent 14) IAKMI – Indonesia Public Health Association. As a professional organization in Public Health, IAKMI has been officially requested by the Health Human Resources Development Agency of the Indonesian Ministry of Health to conduct the selection process, in-depth competency material exploration, and issuance of SKP certificates for

	participants of the Nusantara Sehat program. The completion of SKP (Profession Credit Units) is the mandatory accumulation of professional credit units that must be undertaken by Medical and Healthcare Professionals within a period of 5 years to be declared competent and eligible to practice their profession.
14.	Representative (Key Respondent 15) OREI - The Electronics and Informatics Research Organization. OREI is one of the Research Organizations under the Indonesian Institute of Sciences (BRIN) with missions to conduct research, development, studies, and applications in the fields of Electronics and Informatics. Currently, OREI has three research program focuses for the Fiscal Year 2022-2024: Autonomous Systems for Battery-Based Electric Vehicles, AI and Big Data for Biodiversity and Satellite Imagery, and Research and Innovation in the field of Bioinformatics and its Application in Biological Sciences and Health.
15.	Representative (Key Respondent 16) APJII – Indonesia Internet Service Provider Association. APJII focuses on enhancing internet accessibility in Indonesia by assisting members in delivering quality services, promoting usage for human resource development, and supporting business opportunities. Tasks include fostering unity among members, facilitating communication with the government, and collaborating for integrated information facilities. Overall, APJII is dedicated to advancing internet accessibility for the benefit of the Indonesian population that play a crucial role in Indonesia's digital health adoption.
16.	Representative (Key Respondent 17) East Ventures. They are one of the pioneering and leading venture capital firm in Indonesia and Southeast Asia. The firm has been active in investing in healthcare startups and companies in the region, with 30 portfolio companies in healthcare vertical today. It includes recent investments such as Mesh Bio, AMILI, Aevice Health, Etana, Diri Care, etc. Moreover, East Ventures has invested in genomics startups, such as NalaGenetics and Nusantics, even though investments in genomics-related ventures were relatively novel in 2018.
17.	Representative (Key Respondent 18) Common Room Network Foundation. An Indonesian based Non-Governmental Organization (NGO) where people can contribute and execute activities focused on developing public knowledge and creativity. Common Room has facilitated numerous exhibitions, screenings, workshops, lectures, and cultural festivals, becoming a hub for dialogue and multidisciplinary cooperation. In partnership the UK Government, they have launched a two-year digital public health project that aims to provide wider internet access to people of Kasepuhan Ciptagelar, a remote community in West Java.
18.	Representative (Key Respondent 19)

	Indorunners. The Indonesia's Independent Running Community. They play a significant role in promoting a healthy and active lifestyle. Key trends in running communities often include themed runs, charity runs, and not limited to eco-friendly runs. These events often align with social and environmental causes, attracting runners who want to contribute to a larger purpose while pursuing their fitness goals. Another prevalent trend is the integration of technology, such as running apps and wearable devices, for tracking and sharing running achievements.
19.	Representative (Key Respondent 20) KLPI – The Indonesian Pre-Elderly and Elderly Fitness Community. A group focused on the well-being of individuals aged 45 to 59 (Pre-Elderly) and those above 60 (Elderly). Their vision aims to promote self-sufficiency and prosperity among the Elderly population. KLPI provides fitness programs and exercises tailored to prevent degenerative diseases.

Table IV 1. Mapping of Transactional and Contextual Environments (Author's drawing, 2024).

IV.2.3 Pre-FGD Questionnaire

As outlined earlier, the following is a list of questions provided to the respondents before the FGD.

	Questions
Introduction to set the context	The implementation of digital technology in the healthcare sector has experienced a significant increase post-pandemic. The abundance of healthcare solutions offered through digital technology presents an opportunity that can be explored to enhance healthcare services in Indonesia. *Implementasi teknologi digital di sektor kesehatan setelah pandemi mengalami peningkatan yang cukup signifikan. Banyaknya solusi kesehatan yang ditawarkan lewat teknologi digital merupakan salah satu peluang yang bisa dijajaki dalam peningkatan pelayanan kesehatan di Indonesia.*

Questions to scan driving factors in a contextual environment.	In 2035, what are the main/structural factors that might shape the future of the digital health sector in delivering healthcare services to millions of Indonesians? The factors could be from either inside or outside the healthcare sector as well as globally. *Pada tahun 2035, faktor utama apa saja yang mempengaruhi masa depan sektor kesehatan digital dalam pelayanan kesehatan untuk jutaan masyarakat Indonesia? Faktor-faktor tersebut bisa dari dalam atau luar sektor kesehatan maupun dari global.*
	Follow-up questions: *1.* How those factors shape the future digital health sector in Indonesia? *Bagaimana factor tersebut membentuk masa depan sektor kesehatan digital di Indonesia?* *2.* How significant those factors influencing the future digital health sector in Indonesia? *Seberapa besar pengaruh factor-faktor tersebut terhadap masa depan sektor kesehatan digital di Indonesia?* *3.* Who might dominate the shaping / changing of these factors? *Siapa yang mungkin mendominasi pembentukan/perubahan faktor-faktor tersebut?* *4.* Who might be affected by these factors? *Siapa yang mungkin terkena dampak dari faktor tersebut?* 5. In your mind, can you explain how one factor influence/interact with other factors in the digital health sector? *Menurut Anda, bisakah*

	anda jelaskan bagaimana suatu faktor mempengaruhi/berinteraksi dengan faktor lain pada sektor kesehatan digital?
Questions to scan driving factors in the PESTEL analysis, ensuring the breadth of response taken from the wider PESTEL perspective.	These questions are categorized based on the PESTEL analysis. If any of the factors have been answered in the previous questions, you may skip some of them or you can further elaborate your previous answer if appropriate. *Pertanyaan-pertanyaan berikut dikelompokkan berdasarkan analisa PESTEL. Jika ada faktor yang sudah anda jawab pada pertanyaan sebelumnya, anda bisa melewati pertanyaan ini atau jika diperlukan, jelaskan lebih detail faktor tersebut pada kolom jawaban.* Political 6. How will Indonesia's political situation and direction heavily dominate its digital health sector in future? *Bagaimana situasi dan arah politik Indonesia yang akan dominan mempengaruhi perkembangan sektor kesehatan digital Indonesia di masa depan?* Can you elaborate and explain why and how? *Bisa anda jelaskan mengapa dan bagaimana?* Economy 7. What economic factors or trends that might shape/dominate Indonesia's digital health sector in future? *Faktor ekonomi apa saja yang mungkin bisa mempengaruhi masa depan sektor kesehatan digital di Indonesia?*

	Can you explain how? *Bisa anda jelaskan bagaimana?* Social *8.* What social trends might shape/dominate Indonesia's digital health sector in future? *Trend sosial apa sajakah dalam masyarakat yang mungkin bisa mempengaruhi masa depan sektor kesehatan digital di Indonesia?* Can you explain how? *Bisa anda jelaskan bagaimana?* Technology *9.* What sort of technology might shape/dominate the future digital health sector in Indonesia? *Teknologi seperti apa yang mungkin membentuk/mendominasi perkembangan sektor kesehatan digital Indonesia di masa depan?* Can you explain why and how? *Bisa anda jelaskan mengapa dan bagaimana?* Environment *10.* What environmental concern(s) can have a significant influence on Indonesia's future digital health? *Isu lingkungan apa saja yang secara signifikan dapat mempengaruhi situasi kesehatan digital Indonesia di masa depan?* Can you explain why and how? *Bisa anda jelaskan mengapa dan bagaimana?* Legal 11. What kind of regulation that dominate in shaping the future digital health sector in

	Indonesia? *Peraturan apa yang akan dominan mempengaruhi perkembangan sektor kesehatan digital Indonesia di masa depan?* Can you explain how? *Bisa anda jelaskan bagaimana?*

Table IV 2. List of Pre-FGD Questionnaire (the Author, 2024).

There were 91 KDFs provided from 11 respondents who participated. The author aggregated these unique 51 factors into 16 KDFs. The 51 identified factors are presented below, underlining and highlighting their position in the contextual map of Indonesia's digital health sector.

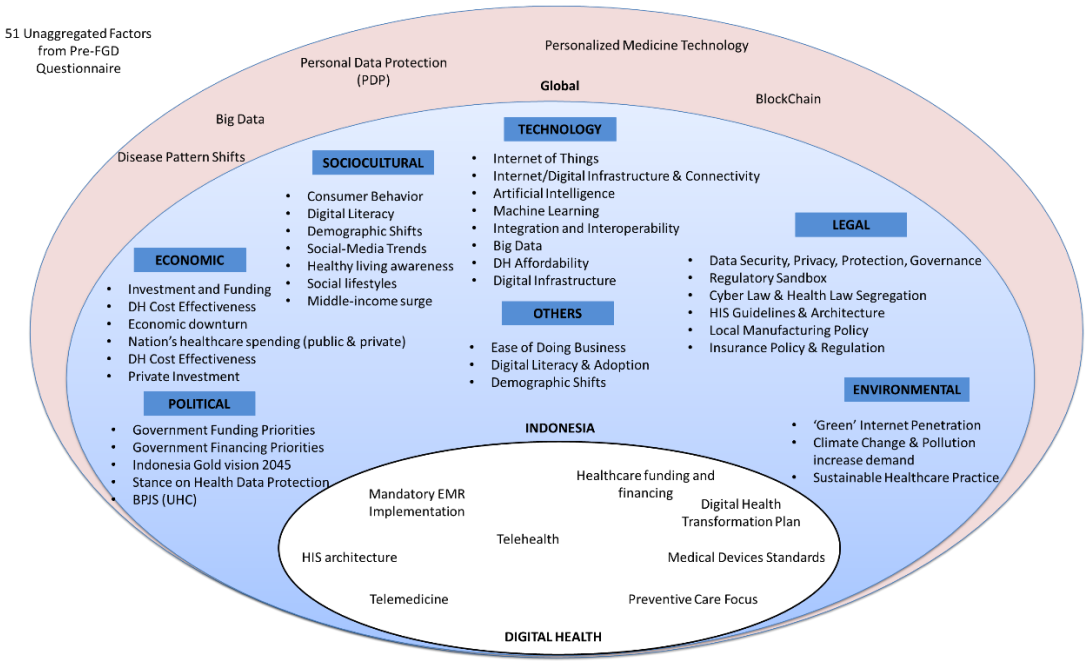


Figure IV. 2. 51 unaggregated KDFs of Indonesia's Digital Health sector, collected from the Pre-FGD Questionnaire (the Author, 2024).

The 16 aggregated KDFs are also presented below in the combination matrix of impactful-ness and time occurrence.

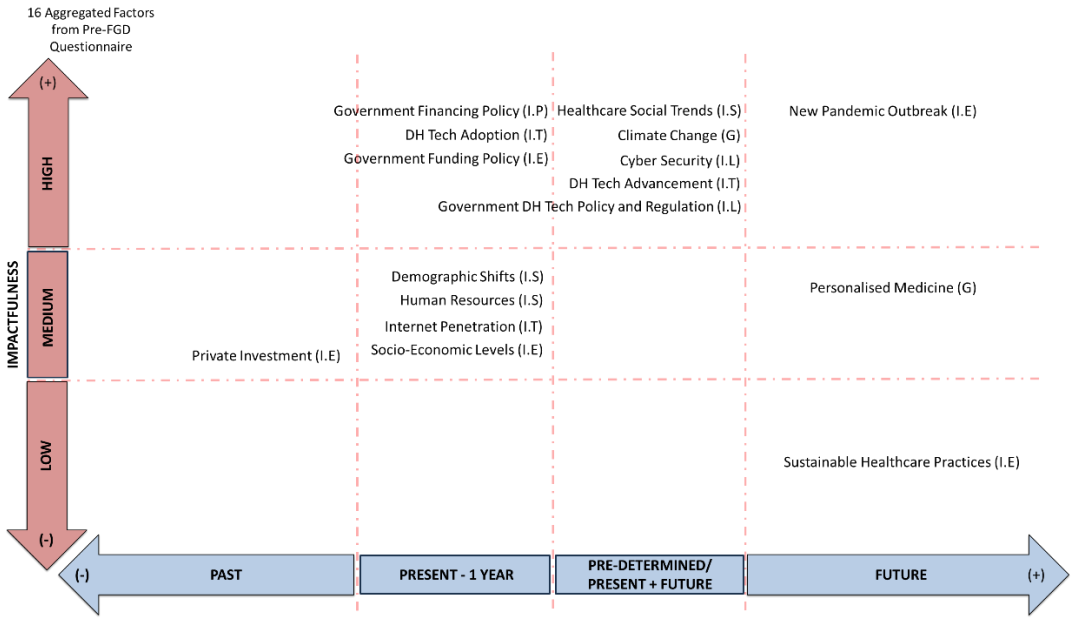


Figure IV. 3. 16 Aggregated KDFs of Indonesia's Digital Health sector, presented in Impactful-ness & Time Occurrence matrix, collected from the Pre-FGD Questionnaire (the Author, 2024).

Based on the observation of the Key Driving Forces (KDFs) identified from the questionnaire, the author highlighted three significant future factors: Personalized Medicine, Sustainable Healthcare Practices, and New Pandemic Outbreaks. These factors are pivotal for shaping future scenarios as they represent emerging trends and potential disruptions.

16 KDF Aggregations (Pre-FGD Questionnaire Impact and Time Occurrence Analysis)		
Sort by Impactfulness (High-> Medium -> Low) & Time Occurences (Future -> Current -1 year -> Past)		
Pre-FGD Questionnaire	**Impactullness High/Med/Low**	**Time Occurences Past/Present - 1year/Pre-Determined (Present + Future)**
New pandemic outbreak	High	Future
Climate Change	High	Pre-Determined
Cyber Security	High	Pre-Determined
Digital Health Technology Advancement	High	Pre-Determined
Government DH Tech Policy and Regulation	High	Pre-Determined
Healthcare Social Trends	High	Pre-Determined
Digital Health Technology Adoption	High	Current -1 year
Government Financing Policy	High	Current -1 year
Government Funding Policy	High	Current -1 year
Demographic Shifts	Med	Current -1 year
Human resources	Med	Current -1 year
Internet Penetration	Med	Current -1 year
Socio-Economic Levels	Med	Current -1 year
Personalised Medicine	Med	Future
Private Investment	Med	Past
Sustainable Healthcare Practice	Low	Future

Figure IV. 4. 16 Aggregated KDFs of Indonesia's Digital Health sector, presented in Impactful-ness & Time Occurrence matrix, collected from the Pre-FGD Questionnaire (the Author, 2024).

Additionally, five pre-determined factors were identified. These factors are currently in effect but have a relatively minor impact at present. Although they are not dominant now, their influence could grow over time, making them important considerations for future scenario planning.

However, eight factors were noted as either historical or currently occurring events, rendering them unsuitable for scenario creation focused on the future. These factors do not contribute to the foresight process, as they do not represent potential future developments or significant changes from the status quo.

The author observed that the quality and quantity of KDFs identified can be significantly improved. The current set predominantly captures factors that have already happened or are happening now, limiting their utility for future scenario planning. To enhance the scenario creation process, it is crucial to identify and incorporate more factors that are truly forward-looking, capturing emerging trends and potential future disruptions.

IV.2.4 Forum Group Discussion (Iteration 1 and 2)

The FGD is structured to facilitate the author's further iterations in identifying KDFs. It begins with an opening session to explain the FGD context, describe Scenario Planning and its use, and gauge the participants' interests in reframing and reperceiving from how they currently see the future.

The opening session aims to help participants check, challenge, and change how the participants think, perceive, and prepare for the future. The un-iterated KDFs from the questionnaire earlier are then presented very briefly as the author highlight the findings from the exercise.

The author would outline the important findings, especially on the KDFs characteristics, and how the participant views the future based on the KDFs collected. By doing so, the participants would be expected to come up with more well-scanned KDFs, considering areas they never thought, had thought of but still ignored, unable to control, and have the most impact on their respective institutional or personal strategy to cope with the future.

As the session starts, the author will take the role of facilitator, guiding brainstorming and discussion sessions, steering conversations toward identifying the KDFs all over again, and comparing the KDFs identified earlier from the questionnaire. The author hoped that all participants would start with a fresh mind, and use a very different approach in re-conducting the exercise after re-framing and re-perceiving their thinking about coping with the future, which resulted in a more well-scanned KDFs.

The author will then divide the participants into five groups of six people, each named after a city in the UK: Manchester, Liverpool, Newcastle, Tottenham, and Leeds. Each participant will write their Key Driving Forces (KDFs) on sticky notes and place them on the flipchart figure below according to the timeline. The author will ensure that each participant works independently, promoting comprehensive identification of Key Driving Forces (KDFs), diverse perspectives and creativity, enhanced analytical thinking, balanced integration of insights, and mitigation of dominance risks compared to a collective exercise (Wade, 2012). To keep everyone on the same page, the

agreed-upon timeline on the flipchart is set to one year before the date of the FGD, which was held on May 14, 2024 as shown in the Figure III.4 below.

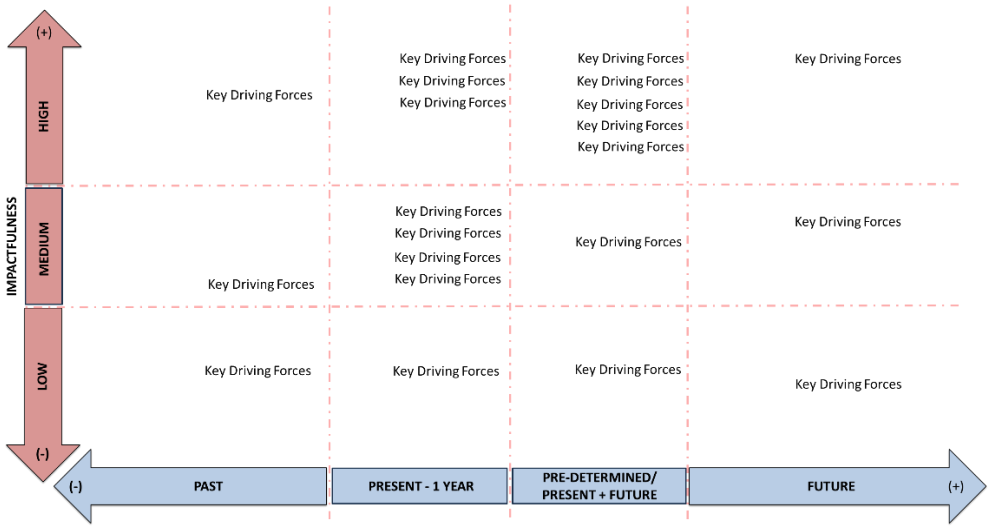


Figure IV. 5. Indonesia's Digital Health Key Driving Forces (KDFs) Timeline Template (the Author, 2024).

Each group will rearrange the KDFs based on the respective timeframes of their occurrence and impactful-ness to the digital health sector. Due to time constraints, they will select the two most uncontrollable and impactful weak signals from the future, along with pre-determined factors that have significant potential to shape Indonesia's future in digital health. Using a contrasting approach, the exercise requires social learning to develop robust scenarios, and thus it is done collectively (Wade, 2012). The author noted interesting moments where participants in table Manchester, Liverpool, and Newcastle faced a dilemma: they had more than two KDFs to choose from. These particular KDFs will be included in the FGD findings thoroughly.

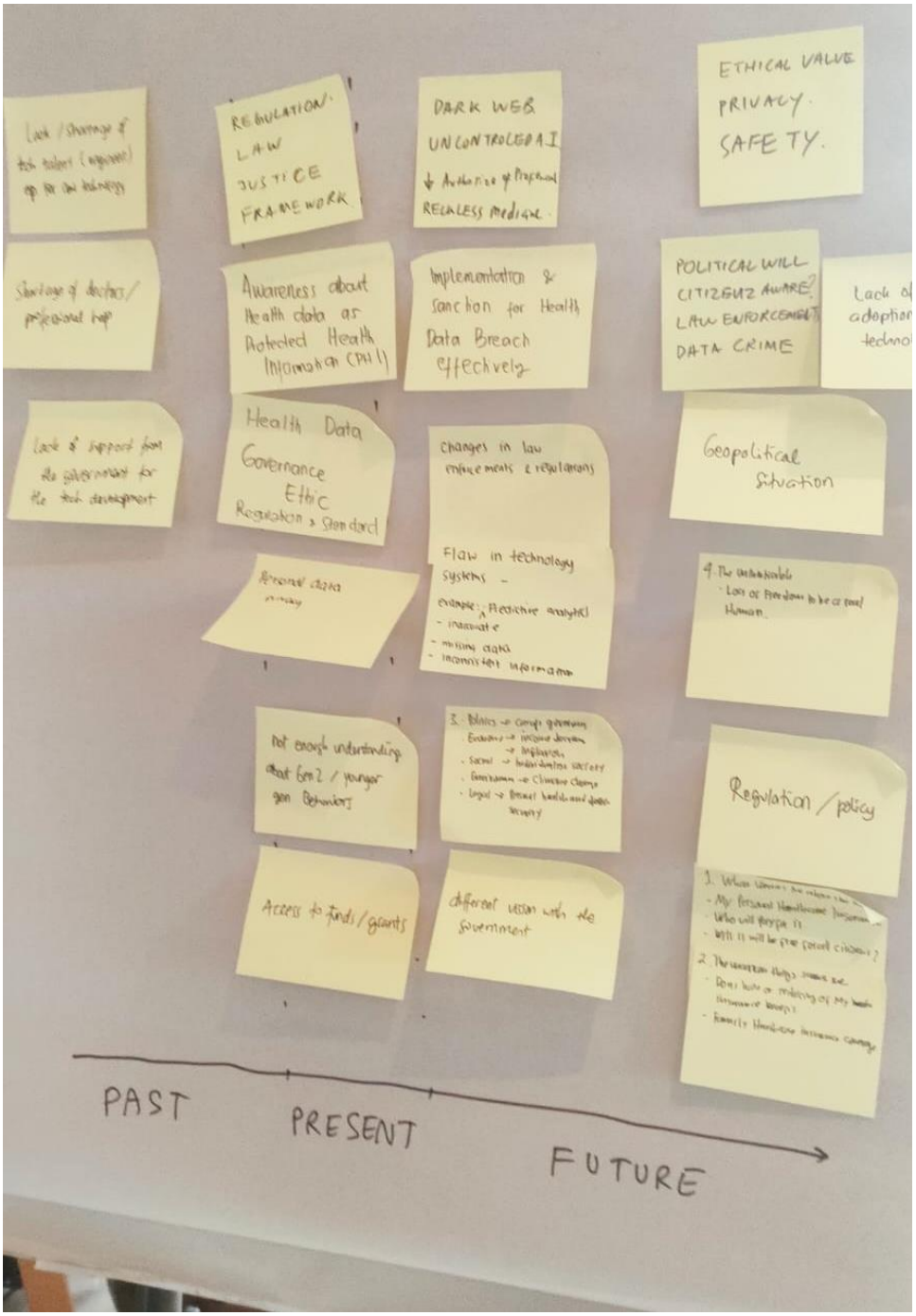


Figure IV. 6. Newcastle Table - Indonesia's Digital Health Key Driving Forces (KDFs) and Time Occurrence (the Author, 2024).

Subsequently, they will engage in discussion and brainstorming sessions focused on the two KDFs previously selected within their respective groups. The author joins in the group discussion by observing and ensuring (no right or wrong, boundless realm, infinite expanse) amongst the group members to allow vast exploration of the KDFs. The author involves setting aside any KDFs with subjectivity from each participant, while still expecting them to

use the perspective of their respective sub-sector. This is the first iteration process of Scenario Planning of the research.

After the group discussions, representatives from each group will be invited to elaborate on their findings, fostering a broader social and collective learning experience among all FGD participants. Simultaneously, the facilitator will encourage each participant to note down their 'aha' moments during the discussion. The facilitator will then collect and aggregate these insights to identify a total of 10 KDFs emerging from the discussions, while also noting any commonalities between the groups. Subsequently, participants will be asked to join a WhatsApp group to vote for their Critical Uncertainties, marking the conclusion of the FGD. This exercise constitutes the second iteration process of the research.

The FGD managed to gather 76 KDFs and 49 unique KDFs as shown in the following figure.

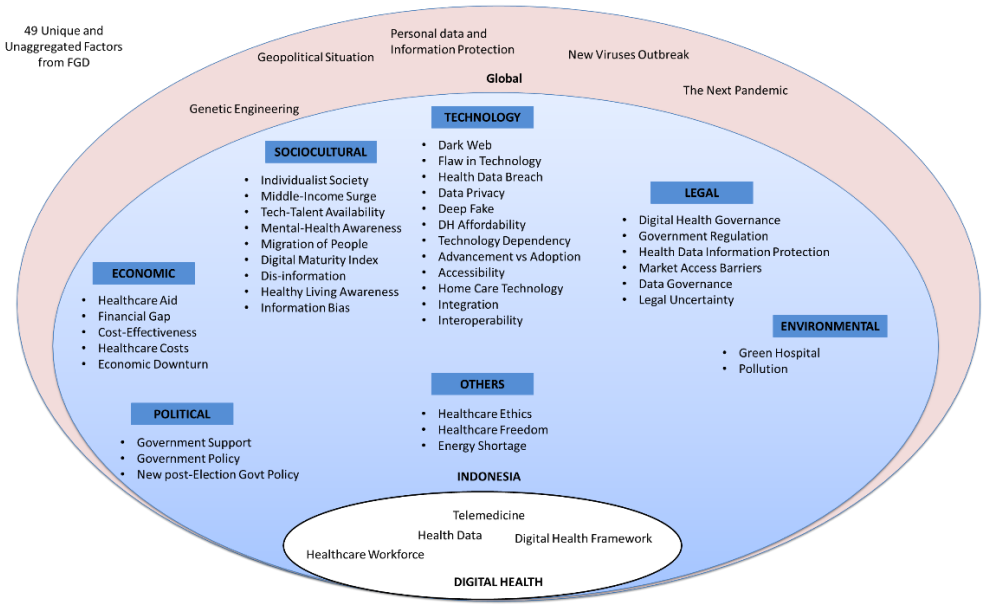


Figure IV. 7. 49 Unique and Unaggregated KDFs of Indonesia's Digital Health sector, collected from the FGD (the Author, 2024).

The author further aggregated these unique KDFs into 24 aggregated KDFs. They are presented and ranked accordingly based on, impactful-ness, and time occurrence matrix, highlighting the group selection and the final vote in the following figure.

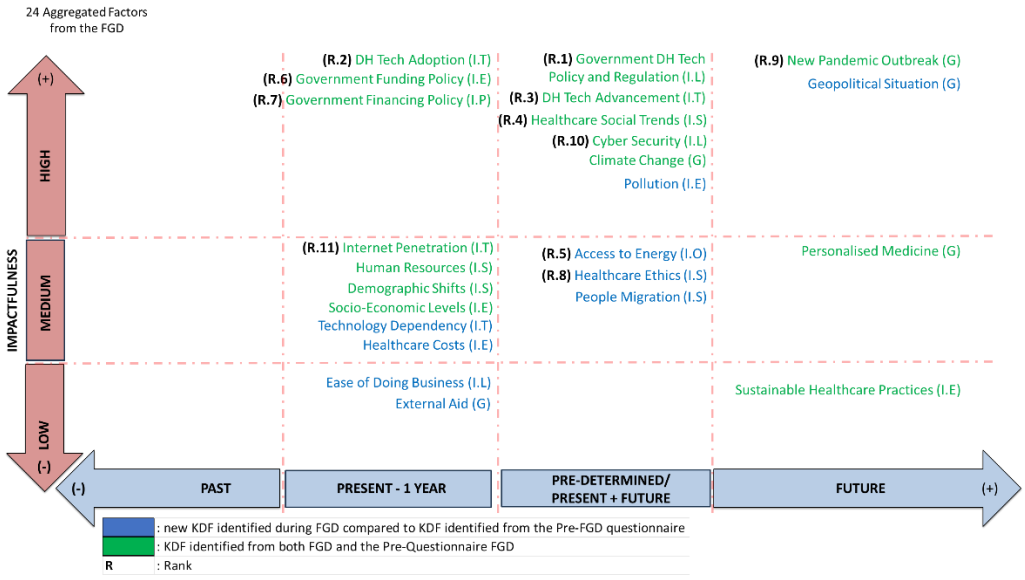


Figure IV. 8. 24 Aggregated KDFs of Indonesia's Digital Health sector, presented in the Impactful-ness & Time Occurrence matrix, and ranked based on FGD voting, collected from the FGD (the Author, 2024).

Below are some key findings from the analysis of the KDFs identified during the pre-FGD questionnaire and during the FGD.

1. Private Investment, is the only KDF raised only from the pre-FGD questionnaire and not discussed during the FGD. Private investment refers to investment made by private entities into healthcare sector, which can be identified by the number of funding from venture capital, merger and acquisitions, initial public offerings, private equity deals, or joint ventures in healthcare.

2. 9 new KDFs identified during the FGD include Access to Energy, Ease of Doing Business, External Aid, Geopolitical Situation, Healthcare Costs, Healthcare Ethics, People Migration, Pollution, and Technology Dependency.

3. The FGD made the consensus by voting and ranked the following 12 KDFs based on their impactful-ness and uncontrollability

    1. Government DH Tech Policy and Regulation.
    2. Digital Health Tech Adoption.

3. Digital Health Tech Advancement.
4. Healthcare Social Trends.
5. Access to Energy.
6. Government Funding Policy.
7. Government Financing Policy.
8. Healthcare Ethics.
9. New pandemic outbreak.
10. Cyber Security.
11. Internet Penetration.
12. Cyber Crime

4. Several ‘aha’ moments of strong KDFs were identified during the FGD below.

13. Geopolitical Instability
14. Pollution
15. Climate Change

To summarize, the figure below outlines the final Key Driving Forces identified to make up for the Scenario Framework.

Final Aggregated KDFs		
Concluded in FGD (8 KDFs, ranked by vote)	**Impactullness High/Med/Low**	**Time Occurences Past/Present - 1year/Pre-Determined (Present + Future) /Future**
1. Government DH Tech Policy and Regulation	High	Pre-Determined
2. Digital Health Tech Adoption	High	Current -1 year
3. Digital Health Tech Advancement	High	Pre-Determined
4. Healthcare Social Trends	High	Pre-Determined
5. Access to Energy	Med	Pre-Determined
6. Government Funding Policy	High	Current -1 year
7. Government Financing Policy	High	Current -1 year
8. Healthcare Ethics	Med	Pre-Determined
Concluded in FGD (strong candidate not ranked)	**Impactullness High/Med/Low**	**Time Occurences Past/Present - 1year/Pre-Determined (Present + Future) /Future**
9. New pandemic outbreak	High	Future
10. Cyber Security	High	Pre-Determined
11. Internet Penetration	Med	Current -1 year
12. Cyber Crime	High	Pre-Determined
WILD CARD (High + Pre-Determined - Author's Analysis)	**Impactullness High/Med/Low**	**Time Occurences Past/Present - 1year/Pre-Determined (Present + Future) /Future**
13. Geopolitical Instability	High	Pre-Determined
14. Pollution	High	Pre-Determined
15. Climate Change	High	Pre-Determined
The Rest KDFs	**Impactullness High/Med/Low**	**Time Occurences Past/Present - 1year/Pre-Determined (Present + Future) /Future**
16. Personalised Medicine	Med	Future
17. People Migration	Med	Pre-Determined
18. Sustainable Healthcare Practice	Low	Future
19. Demographic Shifts	Med	Current -1 year
20. Healthcare Costs	Med	Current -1 year
21. Workforces DH Skill Gap	Med	Current -1 year
22. Socio-Economic Levels Disparity	Med	Current -1 year
23. Private Investment	Med	Past
24. Ease of Doing Business	Low	Current -1 year
25. External Aid	Low	Current -1 year

	: new KDF identified during FGD compared to KDF identified from the Pre-FGD questionnaire
	: KDF identified from both FGD and the Pre-Questionnaire FGD
	: KDF identified from the Pre-FGD questionnaire but not identified during the FGD
Ranked by vote	: 10 KDFs from 5 table @2 each (with similar KDFs) total 8 KDFs
Not ranked	: 4 KDFs raised not selected nor voted due to limit of 2 KDFs per tables
Wild card	: Author analysis on all KDFs with High impactfulness and Future & Pre-Determined Characteristics

Figure IV. 9. 25 Aggregated KDFs of Indonesia's Digital Health sector, collected from the Pre-FGD Questionnaire and the FGD (the Author, 2024).

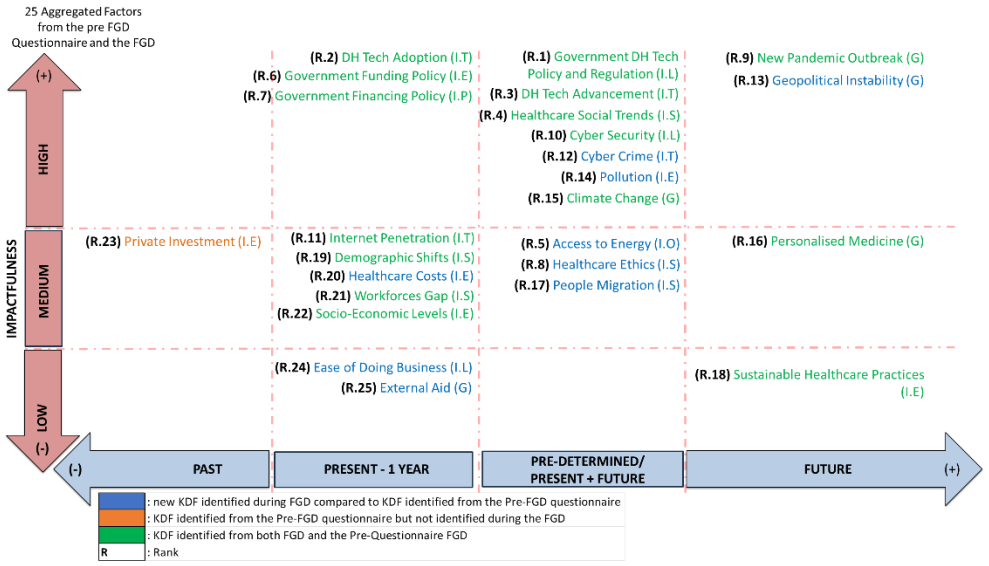


Figure IV. 10. 25 Aggregated KDFs of Indonesia's Digital Health sector, presented in the Impactful-ness & Time Occurrence matrix and ranked based on FGD voting, collected from the Pre-FGD Questionnaire and the FGD (the Author, 2024).

Considering the multitude of strong Key Driving Forces (KDFs) identified, the decision was made to use the inductive method for the Scenario Framework rather than the deductive method. This choice was driven by the need to retain the nuanced impacts and interactions of numerous KDFs, which could be lost if only two Critical Uncertainties were selected. The inductive method allowed for a more creative, richer exploration of Indonesia's potential future by incorporating various influential factors, ensuring that the complexities and "vibes" of the strong KDFs were fully represented in the scenarios (Kahane, 2012). The inductive method will use some of the 25 KDFs identified and combine them into 3 Scenario Frameworks and corresponding CLDs.

IV.2.5 Causal Loop Diagram and Inductive Scenario Framework

Further before developing multiple contrasting scenarios using an inductive method, the author produced a Causal Loop Diagram (CLD) from the selected KDFs as a base system of the framework for each Scenario Framework. The author then selected several factors as a shock to the system and visualize what the end line of impacted factors from each scenario.

Three inductive Scenario Framework produced are as follows:

1) The Cherry Blossom Park (CB). The frameworks consist of 12 KDFs, with 3 factors defined as shocking factors including strong Government Digital Health Tech Policy and Regulation, strong Government Funding and Policy, and widespread Internet Penetration. The (+ and -) signs indicate the modifications made and/or the resulting state of each factor.

The Cherry Blossom Park

Digital Health Utopia

Selected KDFs:

(+)Government DH Tech Policy and Regulation (H.PD)
(+)Digital Health Tech Advancement (H.PD)
(+)Digital Health Tech Adoption (H.C)
(+)Government Funding Policy (H.C)
(+)Personalized Medicine (M.F)
(+)Internet Penetration (M.C)
(-)Healthcare Costs (M.C)
(-)Workforces Gap (M.C)
(+)Private Investment (M.P)
(+)Ease of Doing Business (L.C)
(+)Sustainable Healthcare Practice (L.F)
Cyber Crime (H.PD)

Structural Dominant Factors
(+)Government DH Tech Policy and Regulation (H.PD)
(+)Government Funding Policy (H.C)
(+)Internet Penetration (M.C)

Pre-Determined Factors
(+)Government DH Tech Policy and Regulation (H.PD)
(+)Digital Health Tech Advancement (H.PD)
Cyber Crime (H.PD)

Figure IV. 11. Scenario Framework – The Cherry Blossom Park – KDFs selection. (Author's drawing, 2024).

The author then re-scanned the transactional environment of the six Structural Dominant and Pre-Determined factors and identified several stakeholders who have not yet been identified in the earlier Exploration sub-chapter shown in the following figures.

Figure IV. 12. New dominant actors identified post-Cherry Blossom Park Scenario-Framework creation (Author's drawing, 2024).

To help with scenario creation further, the author produced the following CLD to build the base of the system, and demonstrate how the selected shocking/disruptor factors influence it especially targeted factors at the end of the scenario.

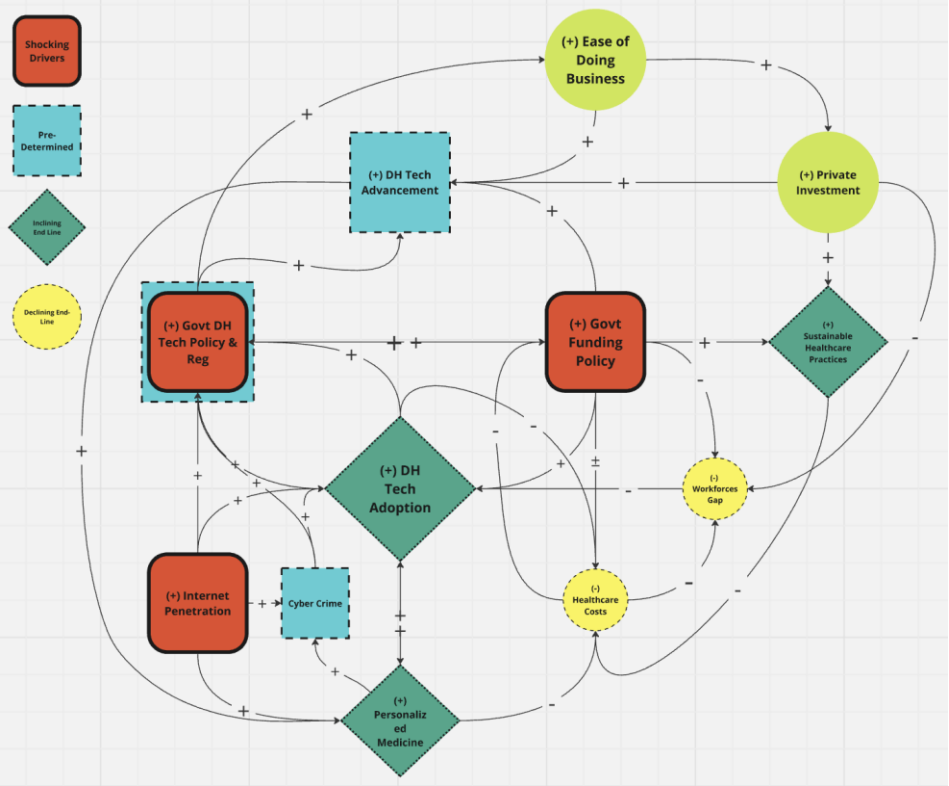


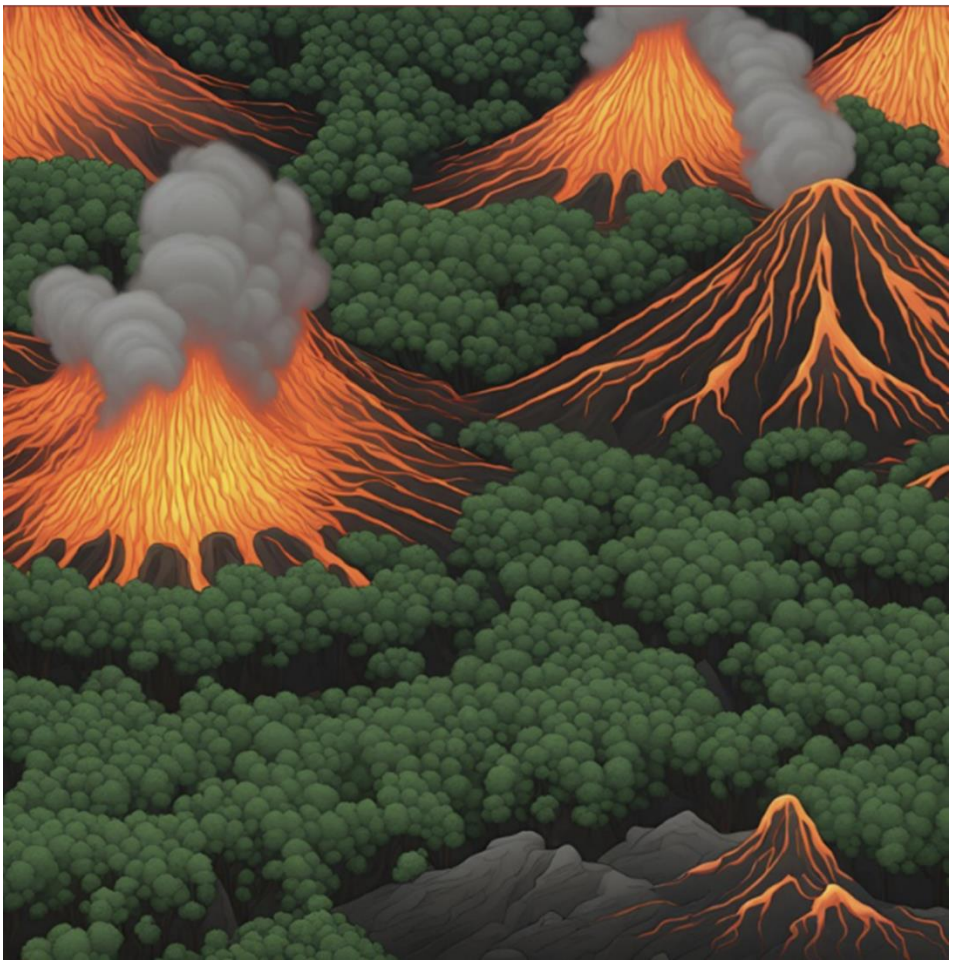
Figure IV. 13. CLD – The Cherry Blossom Park / the Digital Health Utopia (Author's drawing, 2024).

According to the scenario, by 2035, Indonesia would enjoy high digital health adoption indicated by the increasing personalized medicine practice and at the same time face surging sustainable healthcare practice. Inevitably, healthcare costs are reduced, and less of a workforce gap in terms of number or skills due to space on Government Funding thanks to accelerated digital health implementation.

2) Volcanic Eruption Amidst a Forest (VE). The frameworks consist of 12 KDFs, with 4 shocking factors New Pandemic Outbreak, Pollution, Climate Change, and Geopolitical Instability.

Volcanic Eruption Amidst a Forest

Global Health Turbulence



Selected KDFs:

(+)New Pandemic Outbreak (H.F)
(+)Pollution (H.PD)
(+)Climate Change (H.PD)
(+)Geopolitical Instability (H.PD)
(-)Government DH Tech Policy and Regulation (H.PD)
(-)Digital Health Tech Adoption (H.C)
(+)People Migration (M.PD)
(+)Demographic Shifts (M.C)
(+)Healthcare Costs (M.C)
(+)Workforces Gap (M.C)
(+)External Aid (L.C)
Cyber Crime (H.PD)

Structural Dominant Factors
(+)Government DH Tech Policy and Regulation (H.PD)
(+)New Pandemic Outbreak (H.F)
(+)Geopolitical Instability (H.PD)
(+)Climate Change (H.PD)
(+)Pollution (H.PD)

Pre-Determined Factors
(+)Government DH Tech Policy and Regulation (H.PD)
(+)New Pandemic Outbreak (H.F)
(+)Geopolitical Instability (H.PD)
(+)Climate Change (H.PD)
Cyber Crime (H.PD)

Figure IV. 14. Scenario Framework – The Volcanic Eruption Amidst a Forest – KDFs selection. (Author's drawing, 2024).

The dominant actors based on 6 Structural Dominant and Pre-Determined factors and the relevant CLD are shown in the figures below.

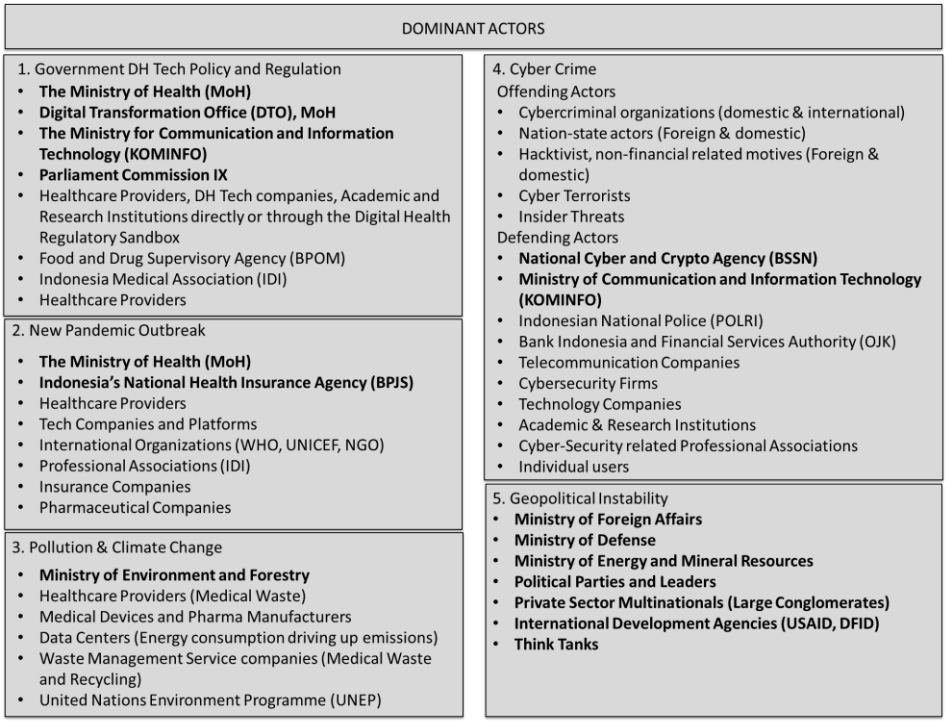


Figure IV. 15. New dominant actors identified post-Volcano Eruptions Amidst a Forest Scenario-Framework creation (Author's drawing, 2024).

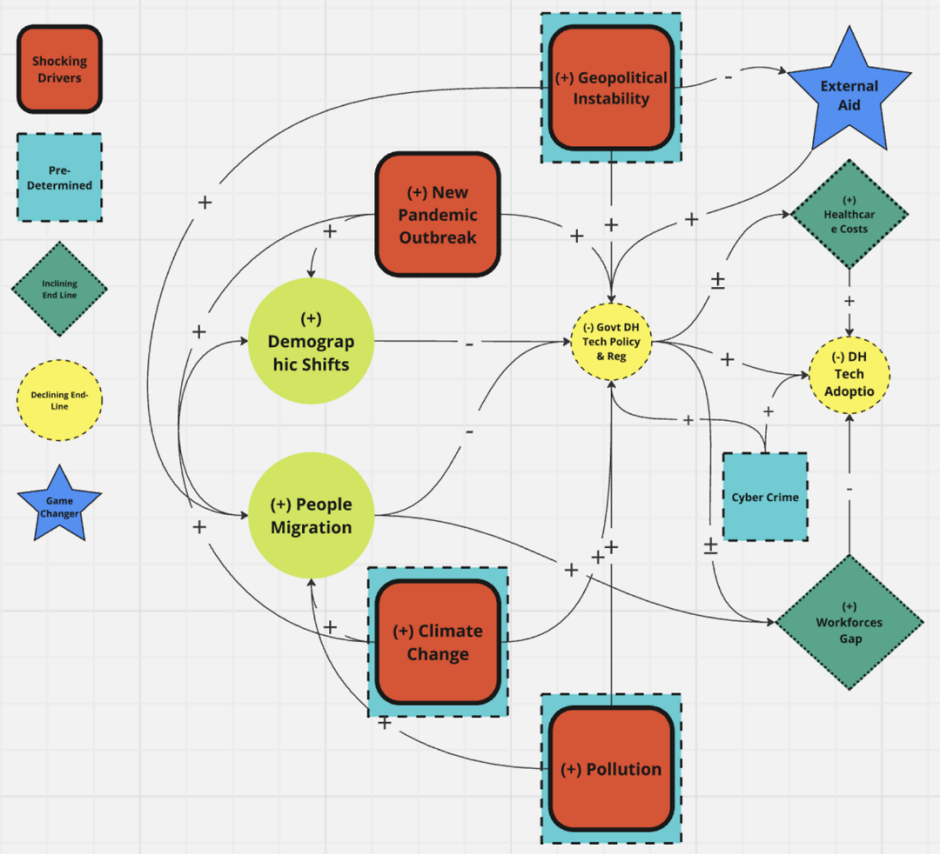


Figure IV. 16 CLD – The Volcanic Eruption Amidst a Forest – Global Health Turbulence KDFs selection. (Author's drawing, 2024).

The scenario sees the decline of digital health adoption due to strained government digital health policy and regulation caused by the shocking factors globally that includes Climate Change, New Pandemic Outbreak, and Geopolitical Instability. The healthcare cost also increases dramatically and leave wider gap in the healthcare workforces, skills and numbers. External aid plays a pivotal role in counter-balancing the shock created earlier by working closely with the government.

3) A High-Tech Greenhouse in a Desert (HG). The frameworks consist of 10 KDFs, with 3 shocking factors including Cyber Security, high prevalence of Cyber Crime, and rapid Aging Population as the demographic shifts.

A High-Tech Greenhouse in a Desert

Cyber-Health Security State in an Aging Population

Selected KDFs:

(+)Cyber Security (H.PD)
(+)Cyber Crime (H.PD)
(+)Government DH Tech Policy and Regulation (H.PD)
(+)Internet Penetration (M.C)
(+)Personalized Medicine (M.F)
(+)Digital Health Tech Adoption (H.C)
(-)Healthcare Costs (M.C)
(+)Private Investment (M.PD)
(+)Demographic Shifts (M.PD)
(+)Healthcare Ethics (M.PD)

Structural Dominant Factors
(+)Cyber Security (H.PD)
(+)Cyber Crime (H.PD)
(+)Demographic Shifts (Aging Population) (M.PD)

Pre-Determined Factors
(+)Government DH Tech Policy and Regulation (H.PD)
(+)Cyber Security (H.PD)
(+)Cyber Crime (H.PD)
(+)Healthcare Ethics (M.PD)

Figure IV. 17. Scenario Framework – A High-Tech Greenhouse in a Desert – KDFs selection. (Author's drawing, 2024).

The dominant actors based on 5 Structural Dominant and Pre-Determined factors and the relevant CLD are shown in the following figures.

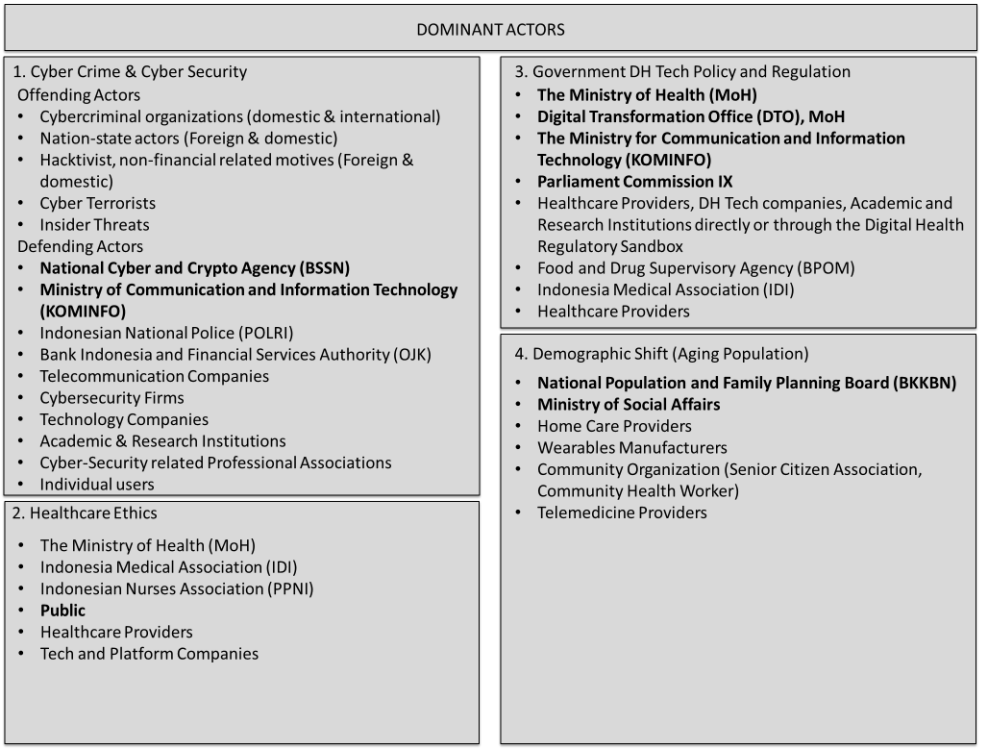


Figure IV. 18. New dominant actors were identified after the creation of High-tech Greenhouse in a Desert Scenario Framework (Author's drawing, 2024).

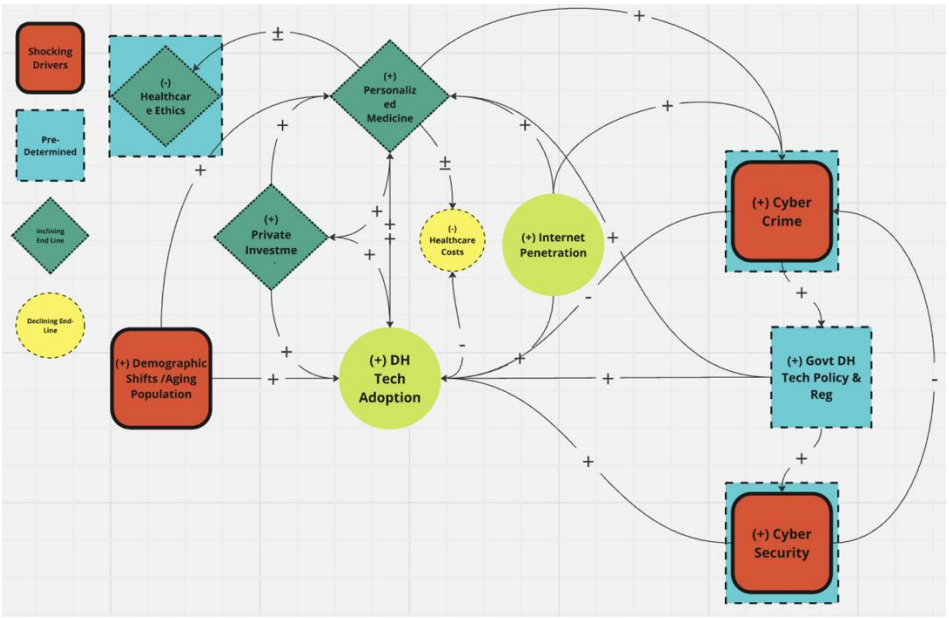


Figure IV. 19. CLD, A High-Tech Greenhouse in a Desert – Cyber Health Security State in an Aging Population - KDFs selection. (Author's drawing, 2024).

The scenarios turned out to be a blessing in disguise as they positively

shaped the future of Indonesia's digital health. The government took really strict measures to combat healthcare cyber-crime, and the nation rides on the shifting aging population which creates demand for digital health. Later, personalized medicines also come into play in optimizing healthcare costs and slowly influencing healthcare ethics nationwide.

IV.3 Scenario Creation

The following are 3 scenarios produced based on the Scenario Framework identified earlier. The author enhanced each scenario's atmosphere by incorporating artificial stories and fabricated 'breaking news' to provide supporting context.

Scenario 1: The Cherry Blossom Park.

In 2035, Indonesia has become a global model for digital health adoption and innovation. The healthcare quality had significantly improved, costs were reduced, and the workforce was adept at managing the demands of digital health. The public was well-informed and engaged with these technological advancements.

Throwback five years earlier, Indonesia embarked on a transformative journey to revolutionize its healthcare system through digital health. Recognizing the immense potential of digital health in improving healthcare outcomes and reducing costs, the government, led by the Policy Maker (Health Ministry) and with strong backing from the National Parliament's Commission IX, laid out a comprehensive policy framework. This policy, developed in close collaboration with the Ministry of Communication and Information Technology (KOMINFO), emphasized increasing private investment in wearables and the Internet of Things (IoT), promoting personalized medicine, and enhancing the ease of doing business in the digital health sector. KOMINFO played a crucial role in setting a conducive regulatory framework, ensuring streamlined and integrated regulations for digital health innovations to thrive.

In early 2030, the Indonesian government allocated substantial funds to support digital health initiatives with support from the Ministry of Finance and National Health Insurance (BPJS). This funding was pivotal in developing telemedicine services, AI-driven diagnostic tools, and stringent cybersecurity measures. Alongside these efforts, KOMINFO spearheaded an effort by a breakthrough regulation in the investment of ISPs and the telecommunication business led to vast improvements in internet penetration across the country, particularly in outer and remote areas. Investments from private and state-owned companies, such as Telkom Indonesia, Indosat Ooredoo, and XL Axiata, ensured that even remote areas had reliable internet access. KOMINFO's initiatives included incentives for ISPs to expand their networks and collaborative projects to lay down the necessary infrastructure in underserved areas.

In a remote village in West Papua, a telemedicine pilot project transformed healthcare delivery. Supported by Telkom Indonesia and XL Axiata, government-funded telemedicine hubs enabled villagers to access specialist consultations without the need for long and arduous travel. A local midwife, trained in digital health, monitored pregnancies and chronic conditions with the help of wearable devices. A few years later, maternal and infant mortality rates in the village had dropped significantly.

By mid-2030, the government launched a nationwide initiative to upskill the healthcare workforce. Partnerships with international universities and tech companies facilitated advanced training programs. These programs, supported by Academic and Research Institutions and Tech Companies and Platforms, focused on integrating digital health technologies, such as AI-powered diagnostic tools and electronic health records, into everyday healthcare practices. By late 2030, the first cohort of healthcare professionals completed their training, ready to implement these new skills.

In late 2030, public awareness campaigns kicked off, leveraging social media, television, and community events. These campaigns, orchestrated

by Civil Societies and Telecommunications Companies, highlighted the benefits of digital health technologies, such as wearables and IoT devices, showing real-life success stories. As awareness grew, adoption rates soared, and more people began taking proactive steps in managing their health. Later in the year, a nationwide campaign called "Sehat Dari Ujung Jari" used influencers and celebrities to promote digital health technologies. Stories of people managing their chronic illnesses with wearables and IoT devices flooded social media. These campaigns demystified technology and encouraged widespread adoption, especially among the elderly population.

The government actively sought to position Indonesia as a leader in digital health innovation. By early 2031, collaborations with leading tech firms and research institutions were established, turning Indonesia into a testing ground for cutting-edge digital health advancements. Numerous trials and investments followed, with backing from Private Investors & Venture Capitals and International Organizations (ADB, World Bank), solidifying Indonesia’s reputation as a hub for innovation.

Recognizing the risks associated with digital health, and learning from the Pusat Data National cyber security case in 2024, the government implemented robust cybersecurity standards in early 2031. These measures, developed by the National Cyber and Crypto Agency (BSSN) and Cyber Security Companies, protected patient data and safeguarded against cybercrime. Regular audits and updates ensured that these standards kept pace with evolving threats.

Jakarta's bustling metropolitan hospitals introduced AI-driven personalized medicine in 2033. Patients received treatment plans tailored to their genetic profiles and lifestyle. For instance, a diabetic patient received dietary recommendations and exercise routines designed specifically for their metabolism, resulting in better health outcomes and reduced hospital visits.

The nation’s journey was not all smooth. A significant cyberattack in 2032 targeting a major hospital chain was swiftly thwarted thanks to the

robust cybersecurity measures implemented by the government. This incident highlighted the importance of digital security and led to even stricter regulations and more advanced protection protocols, ensuring patient data remained secure.

By 2035, Indonesia's healthcare landscape had been transformed through strategic investments, robust policies, and a strong focus on innovation and sustainability. The swift adoption of digital health technologies had significantly decreased healthcare costs, making quality healthcare more affordable for the entire population. The combined efforts of Parliament Commission IX, KOMINFO & BAKTI, BPOM, Trade Bodies or Industry Associations, Indonesia Medical Association (IDI), Digital Transformation Body (DTO), and Local Partners/Distributors ensured the success of this transformation, setting a benchmark for other nations to follow.

Scenario 2: Volcano Eruptions Amidst a Forest.

In 2035, Indonesia is grappling with the compounded challenges of a persistent pandemic and the escalating impacts of climate change, each exacerbating the other in a web of interconnected crises. The lack of effective digital health technologies, funding scarcity, and competing priorities worsen the healthcare crisis. While external aid provides some relief, the long-term effects of these compounded crises will be profound, necessitating sustained global cooperation and innovative solutions to rebuild and strengthen healthcare systems worldwide.

The year 2029 marked a pivotal and harrowing period in global history. It began with the emergence of a new, highly contagious strain of COVID-19, dubbed COVID-29. The initial panic was amplified when genetic modification techniques, hastily used to create a vaccine, resulted in unforeseen and severe side effects. Uncontrolled clinical trials intended to fast-track the vaccine's deployment instead led to widespread health complications, exacerbating the pandemic.

As governments worldwide grappled with the escalating health crisis, attention diverted from the ongoing clean energy transition. Coal-powered plants, seen as a quick solution to meet the surging energy demands, remain the primary energy source, leading to unprecedented air and water pollution levels. Cities like Jakarta and New Delhi reported record-breaking pollution indices, while respiratory diseases surged among their populations. The Ministry of Energy and Mineral Resources, facing immense pressure to meet energy demands, had to make tough decisions, often prioritizing short-term solutions over long-term sustainability.

Simultaneously, climate change accelerated dramatically. By mid-2029, extreme weather events became the new norm, including severe droughts in Africa, catastrophic heatwaves in Europe, and unrelenting hurricanes in the Americas. The environmental degradation compounded the pandemic's effects, as diseases spread rapidly through contaminated water and polluted air. In South Asia, the monsoon season brought unprecedented flooding, contaminating water supplies and leading to outbreaks of waterborne diseases such as cholera and dysentery.

As the world struggled with the health and environmental crises, geopolitical instability further strained global resources. The conflicts in Ukraine and Palestine-Israel escalated, despite multiple ceasefire attempts. These conflicts triggered massive migrations, as people fled to safer regions with better healthcare access and income opportunities. Europe and North America saw significant increases in refugee populations, creating cultural and social tensions. The influx of migrants overwhelmed healthcare systems and infrastructure, particularly in countries like Germany and Canada, where the healthcare system was already stretched thin.

In Indonesia, cities like Surabaya and Medan became hotspots for internal migration. People from rural areas, severely affected by the pandemic and environmental degradation, flocked to urban centers seeking better healthcare and job opportunities. The sudden population

surge led to overcrowded hospitals and clinics, with many unable to receive timely medical attention. The Ministry of Health, The Indonesia Medical Association (IDI) and Healthcare Providers struggled to keep up with the increasing demand, often finding themselves overwhelmed and under-resourced.

The demographic shifts within the healthcare workforce added another layer of complexity. By late 2029, it was evident that fewer young people were pursuing careers in healthcare. The pandemic, coupled with widespread disinformation, had deterred many from entering the field. Additionally, those who did choose healthcare careers often lacked the necessary skills to handle the multifaceted challenges posed by the pandemic and climate change. The Digital Transformation Body (DTO) and Tech Companies and Platforms attempted to provide digital training programs, but these efforts were hindered by funding limitations and the immediate need for traditional healthcare services.

Healthcare workers who were on the frontlines faced immense pressure and risk. Many became infected, leading to a significant reduction in available healthcare professionals. The gap widened as digitally skilled health workers were redirected to support traditional care, leaving their technological expertise underutilized. Cyber Security Companies worked tirelessly to protect digital health infrastructure from Cyber Criminal Organizations, but the constant threat of cyberattacks added to the stress on the system.

Amidst this chaos, governments worldwide struggled to deploy digital health technologies effectively. In early 2030, several countries, including Indonesia, formulated policies to allocate funds for digital health. However, these policies were often contradictory and underfunded due to competing priorities and the pressing need to address the immediate pandemic crisis. It became clear later that scaling up digital health technologies was fraught with challenges. Successful pilot projects struggled to transition into large-scale implementations. Funding scarcity, limited healthcare infrastructure, and the relentless pressure on

healthcare resources hampered these efforts. The National Cyber and Crypto Agency (BSSN) worked to ensure data security, but the lack of integration and support from other sectors made progress slow.

As the pandemic dragged on, healthcare costs skyrocketed. Governments, struggling with depleted budgets, revoked funding for general health services, leaving the public to bear the brunt of medical expenses. By 2033, many people faced financial ruin due to excessive healthcare costs. In countries like Indonesia, the lack of a robust health insurance system exacerbated the situation, with families spending their life savings on medical care. The National Health Insurance (BPJS), facing immense pressure, tried to cover as much as possible but often struggled to meet the increasing demands.

Amidst these dire circumstances, external aid from developed countries bilaterally or multilaterally grew significantly to boost government efforts in tackling the pandemic and climate change issues. Notable contributions came from the United States, Japan, and the European Union. Some aid specifically targeted increasing digital health adoption as a cost-effective way to deliver healthcare services. By 2035, several digital health initiatives, funded by external aid and supported by Private Investors & Venture Capital, began to show promise in remote and underserved regions. The Ministry of Foreign Affairs played a crucial role in negotiating and securing this aid, ensuring that it was effectively utilized to rebuild and strengthen the healthcare system.

The importance of global cooperation and innovative solutions became evident during this crisis period. Think tanks and Trade Bodies or Industry Associations advocated for sustainable and integrated approaches to address the compounded challenges of pandemics and climate change. Local Partners/Distributors and Surrounding Communities played pivotal roles in implementing and adapting these solutions to local contexts, demonstrating resilience and resourcefulness in the face of unprecedented challenges.

Scenario 3: A High-Tech Greenhouse in a Desert

In 2035, Indonesia successfully navigated the complex interplay of digital health, cybersecurity, and demographic shifts. Indonesia stood at the forefront of a digital health revolution, a beacon of innovation in Southeast Asia. The nation had embraced digital health technologies with sincerity, significantly boosting adoption rates. Conventional healthcare practices were being overshadowed by cutting-edge digital solutions, thanks to widespread internet penetration across the archipelago.

The early 2030s saw a surge of new companies offering digital health services. Names like MedTech Nusantara and DigitalCare Indonesia became household staples, providing everything from telemedicine to AI-driven health diagnostics. This shift was driven by both the public and private sectors, which invested heavily in digital health infrastructure to ensure even the most remote islands had access to quality healthcare.

With the rapid growth of digital health, cybersecurity became a top priority for everyone, including the government. By 2032, Indonesia had adopted international cybersecurity standards and fostered collaborations with academia, private sectors, and incubation hubs. Despite these efforts, cybercrime continued to evolve. In 2033, a major cyber-attack targeted the health data of thousands of Indonesians, sparking widespread fear.

Rumors circulated that the attack was orchestrated by disrupted traditional healthcare businesses or was a ploy to accelerate digital health adoption. Regardless of the cause, the incident reignited concerns over health data privacy and protection. Consequently, the healthcare data insurance industry saw substantial growth, providing new layers of protection for consumers.

In response to the escalating cyber threats, the Indonesian government took decisive action. By 2034, strict digital health policies and regulations were in place. The government worked closely with data centers and internet provider associations to combat cyber-attacks. These

measures were designed to safeguard the burgeoning digital health ecosystem and ensure the benefits of digital health could be enjoyed without compromising security.

The demographic landscape of Indonesia was also changing. An aging, yet tech-savvy population demanded high-quality, personalized healthcare services. This demographic shift put additional pressure on the healthcare system but also spurred innovation. Personalized medicine became a major trend, with tailored health solutions becoming increasingly popular. Influencers in this field flourished, securing lucrative contracts with healthcare providers and promoting personalized health services to their followers.

As digital health technologies became more prevalent, ethical issues came to the forefront. Data privacy, equitable access to healthcare, and the fair allocation of resources were critical concerns. The emphasis on cybersecurity sometimes clashed with ethical considerations like patient autonomy and data privacy, prompting new ethical guidelines and debates.

Interestingly, the widespread adoption of digital health led to a decrease in overall healthcare costs. This reduction incentivized the government to focus on other areas, including attracting investment in digital health technologies such as IoT, wearables, and personalized medicine. By 2035, Indonesia had become the leading digital health investment destination in ASEAN, drawing interest from international investors and fostering a thriving ecosystem of innovation.

The healthcare sector was more connected and efficient than ever before, offering high-quality, personalized care to its citizens. The challenges were immense, but so were the opportunities. With continued focus on innovation, collaboration, and ethical considerations, Indonesia’s healthcare future promised to be both transformative and inclusive, setting a precedent for the rest of the world.

IV.4 Implications/Consequences and Opportunities/Options

Before finalizing the analysis of the implications/consequences and opportunities/options to the Indonesia digital health industry and the UK ESS/DBT, the author shared the three scenarios and sought feedback from the FGD participants on the scenarios' sensibility to all FGD participants. This has resulted in slight changes in the timeline occurrence for sub-narratives in the scenario such as adding a reference to the cyber security case that happened recently to the National Data Center (PDN) (EmediaDPR, 2024).

Feedback also asked to re-confirm whether the consequences/implications and opportunities/options are sensible and doable for Indonesia's digital health industry. Once finalized, the author moved on to articulate the consequences/implications and opportunities/options for the UK ESS, one of the users of the scenarios created earlier by conducting a SWOT analysis for present time.

The following tables outline the consequences/implications and opportunities/options for both Indonesia's digital health and the UK ESS.

Indonesia Digital Health Sector	
The Cherry Blossom Park	
Consequences/Implications	**Opportunities/Options**
(+)Healthcare Cost efficiency thanks to DH Adoption especially in prevention/promotion areas.	Room to look for adoption of new tech advancement.
(+)Improved healthcare outcomes nationwide (DH Adoption, prevention/promotion, and budget saving).	To make Indonesia even healthier by massively shifting healthcare focus to such as healthier food, healthier weather, and healthier lifestyle.
(+)Strong and comprehensive DH policy and regulations - that are responsive to further DH tech advancement and adoption.	Indonesia sit on digital health regulatory leadership, setting global standards, and continuous policy innovation - while considering trade diplomacy around them.
(+)Tech-savvy healthcare system led by BPJS and other related public and private healthcare services providers in the adoption of DH.	* Telehealth expansion for Indonesians living abroad. With possible access to non-Indonesian seeking consultation with Indonesian doctors from Indonesian healthcare providers. * Integration with other sectors such as Smart Cities - for example leveraging DH solution to provide access to healthcare throughout the IKN development phase.
(+)A healthcare system that offers equity and inclusivity, with strong public engagement and awareness creates a more receptive society to new technology changes and healthier living.	* More people connected to DH means more health patient data are collected. Leveraging Big Data for further AI, machine learning, and Personalized Medicine is possible.
(+)Indonesia become DH Tech Advancement hub and DH Investment destination with increasing R&D projects.	* Attracting more private investment into DH that contributes to economic growth by creating new employment. * Continuous and Sustainable Technological Advancement leading to growing start-ups in the country which creates employment. * Indonesia to become a Sustainable healthcare industrial hub potentially combining DH solutions and modular hospital/clinic. * Export of Digital Health solutions regionally and globally.
(+)Abundance skilled workforce across the whole DH supply chain (upstream, midstream, and downstream)	* Utilization of Health/Ed-Tech for domestic healthcare workers and international cooperation initiatives * Catching up with international standards for healthcare workers. * Exporting Healthcare workforces overseas
(-)The large volume of data and information stored online attracts cyber attacks.	An opportunity to strengthen the system by testing it with simulated cyber attacks.
(-)The trade-off between leveraging digital health technologies to address healthcare workforce shortages and the potential displacement of jobs due to automation or AI-taking over.	Develop a comprehensive nationwide healthcare workforce talent pool in collaboration with the Indonesian Medical Association. This will enable effective deployment and redeployment of personnel, ensuring a balanced alignment between available resources and job opportunities.
(-)Overreliance on technology could reduce the personal interaction often needed in conventional healthcare delivery.	Potential new research and development topic to explore.
(-)The rise in digital healthcare activities increases the potential for misdiagnoses or ineffective treatments.	

Figure IV. 20. Implications/Consequences and Opportunities/Options for Indonesia's Digital Health sector in the CB scenario

Indonesia Digital Health Sector	
THE VOLCANO ERUPTIONS AMIDST A FOREST	
Consequences/Implications	**Opportunities/Options**
(+)Indonesia widely receives international aid (bilateral and multilateral) for pollution control, pandemic handling, climate change, and refugee handling. This potentially leads to uncoordinated policy and delivery implementation, and dependency on external aid.	* Effectively utilize international aid to develop robust digital health infrastructure and sustainable programs. * Create sustainable funding models that reduce dependency on external aid and ensure long-term viability of digital health projects. * Build resilient healthcare systems that can adapt to future shocks and crises, integrating digital health as a core component. * Engage in cross-border cooperation to share knowledge, technologies, resources, and global best practices - and adapt successful digital health models to the local context. * And allign the aid for the following areas:
(-)Strained healthcare system and stagnation of existing pilot projects in digital health due to shifting focus to address the new COVID-29 - overall resulting in delayed Digital healthcare adoption.	Alignment of external aid to prioritize pilot project continuation and pivot towards COVID-29 handling.
(-)Scarcity of skilled workforce throughout the entire digital health supply chain, including upstream, midstream, and downstream sectors.	* Invest in extensive training and education programs to build a skilled digital health workforce. Including providing incentives to those who specifically pursue digital health careers
(-)Soaring healthcare costs have made it unaffordable for many and resulted in uneven access to services.	* Working with strategic partners such as Internet Service Providers and utilizing external aid to expand telemedicine and develop mobile health applications.
(-)Indonesia has become the next destination for refugees, necessitating additional resources to provide adequate healthcare support.	Opportunity to pilot project DH deployment to mitigate limitation of resources (infrastructure, healthcare workforces).
(-)The emergence of numerous new diseases as a result of complications from climate change, pollution, and pandemic.	Alignment of external aid to address these problems such as working with pharmaceutical companies to discover new treatment - with DH deployment to collect the data of patients with these disease.
(-)Many foreign companies are pulling out due to the market's inability to absorb their products and services, worsening the unemployment situation.	State Owned Company to take part the gap left with the support of government, utilizing external aid support.
(-)Cyber attack threat exists regardless of delayed digital health adoption.	Alignment of external aid to include cyber security mitigation to any digital health solution deployed to address pandemics and refugees.

Figure IV. 21. Implications/Consequences and Opportunities/Options for Indonesia's Digital Health sector in the VE scenario

Indonesia Digital Health Sector	
THE HIGH-TECH GREENHOUSE IN A DESERT	
Consequences/Implications	**Opportunities/Options**
(-)Indonesia faces cyber-attack risks due to increasing data storage, and susceptible health data.	Strengthen CyberSecurity standards while demonstrating data safety assurance to public.
(+)Indonesia leads in cybersecurity best practices, regulations, standards, and enforcement.	* Exporting Cyber Security expertise * Develop local talent in health informatics, cybersecurity, and data science, contributing to job creation and economic growth. * Attract private investment in these areas
(+)Healthcare shifts from hospital-centric to home-based care.	* Integrate digital health with smart home sectors to serve individual and family healthcare needs. * Expand digital health adoption to geriatric segments.
(+)Indonesia is a model for digital health deployment for aging populations.	* Export digital health solutions for aging populations, including wearables and IoT. * Develop local talent in DH solutions for the aging population contributing to job creation and economic growth. * Attract private investment in these areas
(+)Wearables are no longer luxury items but essential needs.	* Attract private investment in wearables and provide necessary incentives with the proposition for making Indonesia a center for the wearables industry in the region. Appoint SOE to take part in the initiatives when appropriate. * Export digital health solutions for aging populations, including wearables and IoT.
(+)Advanced data analytics expertise and capacity are needed as healthcare delivery becomes more patient-centric.	* Leverage Big Data for public health surveillance, starting with aging populations. * Attract private investment to these areas and provide necessary incentives
(+)Healthcare ethics shifts drive digital health adoption.	* Opportunity to expand and introduce digital health adoption to a more 'ethics sensitive' innovation such remote treatment, including remote robotic operations.
(+)Private investment in digital health increases competition, improving healthcare quality at lower costs.	Promote public-private partnerships to reduce the financial burden on the state budget and while introducing new DH Innovation
(+)Integration across healthcare providers becomes essential.	* DH policy updates to accommodate such requirements between healthcare providers and regulations around data sharing for public health purposes. * Grow the health insurance market benefiting from healthcare providers integration
(-)Fragmentation of care between advanced digital health systems designed for the aging population and other healthcare systems that are progressing at different rates in their digital health transformation - which can cause interoperability problem.	* Create massive campaign of successful digital health adoption for the aging-population to help speed up other market segments development such as obstetric (for example: teleconsultation service for pregnant women who needs full bed rest and prefer to be staying at home than in hospital.
	Across many implications/consequences: there is an opportunity to establish R&D hubs for collaboration between academia, industry, and government, driving advancements in digital health technologies.

Figure IV. 22. Implications/Consequences and Opportunities/Options for Indonesia's Digital Health sector in the HG scenario

The UK ESS (Export Support Service)	
The Cherry Blossom Park	
(+) Budget spare from DH Cost-Saving leaves room for adopting new tech advancement.	Overall budget savings to be invested in DH solution - particularly to acquire UK solutions that are yet to exist or insignificantly implemented in the market such as: * AI-driven robotics, genomic mapping-powered DH solution, Xtended Reality for education and training, IoT, Wearables, Education & Training Tech, Hospital to Hospital partnership, Primary Care DH solution, promotive prevention DH care, sustainable healthcare, a more advanced personalized medicine.
(+) Market advancement leads to a narrow technology gap, making it more receptive to new tech advancement and similar healthcare landscape between UK & Indonesia.	Demand from a new market segment that seeks for healthier options such wellness , wellbeing, and healthy lifestyles.
(+) A better DH business environment to navigate with, making it more attractive to new UK DH players.	* Further UK-ID collaboration on DH best practices and international standards at regional and global levels. * Awareness raising for Indonesia DH market - as currently, Indonesia is not a priority market for most UK DH players
Healthcare prevention/promotion dominates over curative treatment.	Potential demand for healthcare prevention and promotion solutions particularly in improving telemedicine and remote consultation such as offering AI-driven symptom checking or deployment of wearables with the ability to collect patient's health data
An improved healthcare system that able to monitor the public health digitally.	New market segments exist such as: 1. Genomic mapping-driven DH solutions. 2. New drug or vaccine discovery expertise. 3. Wearables for healthcare monitoring - even made possible with many options on the contract sales. Such as massive order with leasing contract.
(-) Indonesia's DH adoption attracts new competition and even stronger efforts from existing competitors (local & foreign). (-) Indonesia's adoption of DH attracts UK players who have never looked at Indonesia as a more prospective market to penetrate. The conventional route to market (i.e. via distributor) still works but is no longer relevant. Investment into the market in any form is now deemed preferred or even become mandatory.	* Promote Indonesia differently as a hub for the region instead of Indonesia on its own, looking towards selling locally, setting up a local presence and manufacturing, and re-exporting from Indonesia as a longer-term goal * Attract UK universities or training bodies to set up a presence in the market given the increasing demand for R&D * Matchmake UK DH players to a larger pool of local players who can also be the local partners/distributors in the market
* Growing trends amongst younger society for employment opportunities around DH industry. * Growing interest of international partner for joint R&D including from the UK.	* Attract UK universities, training bodies, or Ed-Tech providers to set up a presence in the market given the increasing demand in student enrollment. * To propose a greater focus on DH in Indonesia's UK Chevening scholarship program.
(+) Demand for UK cyber-security solutions.	* Strengthen the existing G2G UK-ID collaboration in cyber security * UK-Cyber security trade campaign in Indonesia
(+) The Indonesian healthcare workforce is in a transitioning period thus leaving some gaps for complementary roles.	* Inclusion of healthcare workforces-management related to the existing UK development (aid-funded project) * Promote UK healthcare education and training expertise
(+) The surging side-effect of digital transformation is becoming a new-subsector	Gateway for UK academia, research bodies, and companies to enter the market.

Figure IV. 23. Implications/Consequences and Opportunities/Options for ESS in the CB scenario

The UK ESS (Export Support Service)	
THE VOLCANO ERUPTIONS AMIDST A FOREST	
* Due to external aid in various areas, the evolving and more fragmented policy landscape poses additional challenges for UK businesses in understanding and complying with local regulations. * Demand for UK aid will possibly increases, this require shifting in viewing Indonesia from trade market destination to market that relies on external aid.	Bilateral or multilateral aid programs can provide a subtle platform to promote UK digital health expertise. Aid-funded business initiatives can be explored in the collaboration on digital health regulation framework.
Shifting in the funding and investment directed towards solutions that are seen as critical for managing the pandemic.	* Pursue aid-funded business from the initiatives (continuation of existing pilot projects) for relevant UK DH players such as temporary modular hospitals/clinics combined with teleconsultation services, remote monitoring, and data analytics for tracking and managing the disease.
New aid-funded business market segment in DH education and training opens.	DH capacity building for healthcare workforces especially those that utilizes Ed-tech and online learning courses (remote learning).
* Healthcare gaps require extra effort for UK digital health solutions. Pursuing DH opportunities is now a long-term 'game'. * Market becomes extremely cost-sensitive. * Market's reduced buying power makes UK digital health products unsuitable for normal procurement.	* More focus on UK DH solution that offers cost-saving or cost-efficiency.
Increasing demands for private participation in form of joint collaboration, volunteering, and channeling CSR initiatives.	* Pursue aid-funded business from the initiative for relevant UK DH players such as temporary modular hospitals/clinics combined with teleconsultation services. * Leverage UK corporate social responsibility for COVID-19 and refugee care, enhancing branding globally.
New market segments within DH solutions in pharmeceutical industry opens.	* Promote and attract UK suppliers providing DH solutions to these diseases, such as tracking and tracing, or digital solutions for integrated and streamlined data collection, storing, and analysis. * When possible, pursue possible opportunities/tender from these initiatives either from the pharma companies, government, or these aid-funded businesses.
Players exit the market, reducing competition and market size	* Pursue any aid-funded business opportunities for relevant UK players * The last option is to temporarily stop promoting Indonesia DH to UK businesses and direct them to another market.
	* Encourage UK digital health companies to collaborate with key stakeholders on the importance of cybersecurity measures, even for limited-scale and temporary digital health operations for pandemics and refugees.

Figure IV. 24. Implications/Consequences and Opportunities/Options for ESS in the VE scenario

The UK ESS (Export Support Service)	
THE HIGH-TECH GREENHOUSE IN A DESERT	
Indonesia is increasingly cybersecurity-conscious.	* Strengthen UK-Indonesia cybersecurity cooperation particularly in DH through best practices and international standards. * Awareness raising for Indonesia DH market for leveling up their CyberSecurity standards and implementation, making it more friendly for most UK DH players considering to enter the market
A more integrated and connected healthcare system designed to improve public health level.	* IoT, smart-home care, and wearables for aging populations are new market segments. * Promote Indonesia differently as a hub for the region instead of Indonesia on its own, looking towards selling locally, setting up a local presence and manufacturing, and re-exporting from Indonesia as a longer-term goal
Crucial involvement of international partners, including the UK, in joining R&D initiatives and collaborations on digital health solutions for aging populations in Indonesia.	
Indonesia is adopting data-driven healthcare.	* Education and training in digital health and aging populations are emerging market segments. * Attract UK universities or training bodies to establish a presence in the market, driven by growing demand in R&D and student enrollment in digital health and aging populations.
* Prevention and promotion dominate healthcare in Indonesia over curative treatment. * A more receptive market to adopt the latest DH advancement and innovation.	Attract UK DH players who never looked at Indonesia before as their technology was just impossible to adopt due to the tech advancement and adoption gap such as remote robotic operations or AI and Predictive Tools.
* Private investment boosts competition in Indonesia's digital health market. * Indonesia's digital health success enhances its purchasing power.	* Overall budget savings to be invested in DH solution - particularly to acquire UK solutions that are yet to exist in the market. * Attract UK businesses interested in investing in the market and partnering with local healthcare providers.
A more integrated and connected healthcare system designed to improve public health level.	* UK-ID collaboration for data sharing for public purposes best practices leveraging NHS's 76 years of experience
The market is gradually expanding its digital health adoption thus thriving for a successful case studies on digital health adoption in different patient segments.	* AI-powered symptom-checking to reduce unnecessary appointments and insurance claims is a new market segment.

Figure IV. 25. Implications/Consequences and Opportunities/Options for ESS in the HG scenario

IV.5 Early Warning Signals

Further, upon observing the Implications/Consequences and Opportunities/Options, the author produced sets of early warning signals relevant to each scenario, to assist ESS in observing and analyzing drivers that indicate ESS is moving towards one scenario or another (Lindgren & Bandhold, 2003).

: To monitor closely	Early Warning Signals		
Current Values for each Parametres	**Cherry Blossom Park**	**Volcano Eruptions amidst a Forest**	**High-Tech Hub in a Desert**
2023 Health Law - Digital Health Apps Regulatory Uncertainty: There is currently no comprehensive regulation governing digital health apps, which operate in a gray area. This lack of clarity creates uncertainty for investors and innovators.	The government announces further implementing regulation with greater clarity on digital health app governance, including guidelines for data security, privacy, and interoperability.	There is no evidence of further implementing regulations issued to the no 17/2023 Health Law partially or the whole.	The government announces further implementing regulation with greater clarity on digital health app governance, including guidelines for data security, privacy, and interoperability.
2023 Health Law - Data Integration: Data is currently fragmented between many health service providers, making it difficult to create a unified health data system in Indonesia. This lack of integration hinders the effective use of digital health platforms.	The government announces further implementing regulation mentation to establish a unified health data system, integrating data from various health service providers to improve healthcare services and reduce data fragmentation.		The government announces further implementing regulation mentation to establish a unified health data system, integrating data from various health service providers to improve healthcare services and reduce data fragmentation.
2023 Health Law - Telemedicine Practice: While preceding Regulation No. 20/2019 provides guidelines for telemedicine services, there is a need for more detailed regulations on the practice of telemedicine, including the roles and responsibilities of healthcare providers and the security measures for patient data	The government announces further implementing regulations that provide detailed guidelines for telemedicine services, including standards for remote consultations, data protection, and quality of care.		The government announces further implementing regulations that provide detailed guidelines for telemedicine services, including standards for remote consultations, data protection, and quality of care.
Indonesia has established a Digital Health Regulatory Sandbox to pilot and refine regulations for digital health technologies. However, the scope and scale can be greatly improved. Currently, the priority cluster being run is the telehealth cluster comprising of teleconsultation, telemonitoring, telemedicine, communication, information, and health education	* Realization of 17 total business models (clusters) as currently planned. * Significant expansion of the number of pilot projects (5 times more than in 2024) * Increasing the number of participants with an inclusive rate to 90% across the industry players	Stagnant Regulatory Sandbox creating even more frustration to all industry players.	Realization of at least 80% of the 17 total business models (clusters) as currently planned. * Quite notable expansion of the number of pilot projects (3 times more than in 2024) * Increasing the number of participants with an inclusive rate to 75% across the industry players
* Reports of new viral infections. * Reports on infection rates of respiratory illness globally. * Report of new COVID-19 variants	* No indicative reports of new viral infections. * No report on infection rates of respiratory illness globally. * No report of new COVID-19 variants	* Increase in reports of new viral infections with high transmission rates from global health organizations like WHO. * A significant spike in infection rates of respiratory illnesses globally, monitored through health surveillance systems. * Reports of new COVID-19 variants with high mutation rates and increased resistance to existing vaccines.	* No indicative reports of new viral infections. * No report on infection rates of respiratory illness globally. * No report of new COVID-19 variants
* Ongoing conflicts in Ukraine and Palestine-Israel.	* Steadily improving conflicts in Ukraine and Palestine-Israel.	* Escalation in conflicts in Ukraine and Palestine-Israel, with increased military activity and civilian casualties.	* Steadily improving conflicts in Ukraine and Palestine-Israel.
* Currently 6.5 Million Ukrainian refugees have been recorded globally as of Feb 2024 (Link)	* Slowly declining number of refugees migration from the conflicts.	* Significant increase in the number of refugees and internally displaced persons, with a 20% rise in migration to Europe and North America.	* Slowly declining number of refugees migration from the conflicts.
* Currently 5.9 Million Palestinian refugees have been recorded globally as of Feb 2024 (Link)			

* Overwhelming reports on healthcare systems in providing services to Ukrainian refugees * Overwhelming reports on healthcare systems in providing services to Palestinian refugees	* No reports on overwhelmed healthcare systems in refugee destination countries.	* Reports of increasing overwhelmed healthcare systems in countries receiving large numbers of refugees, such as Germany and Canada.	* No reports on overwhelmed healthcare systems in refugee destination countries.
The Health budget allocation for 2024 was 186.4 IDR Trillion or 5.4% of the State budget. An 8.1% increase compared to 2023. Around 90 IDR Trillion will be allocated for Healthcare Transformation Program	* Substantial increase in budget allocation especially under digital health transformation which eventually impacts the digital health initiatives, with 20% annual increase.	* Insignificant healthcare budget allocation. Growing only less than 1% annualy.	* Substantial increase in budget allocation for digital health initiatives, with an annual increase between 5-10% in funding
* Notable incidents involved unauthorized access to systems like the electronic health alert card (e-HAC) and the Social Health Insurance Administration Body (BPJS).	* Moderate cyber-attack attempts on healthcare systems but successful data breaches declined due to improved cybersecurity defenses.	* Moderate cyber-attack attempts on healthcare systems. * High rate of successful data breaches despite a low number of cases	* Massive increase in cyber-attack attempts on healthcare systems, with nearly 80% of incidents being thwarted due to robust cybersecurity measures. Consequently, successful data breaches declined to none due to improved cybersecurity defenses.
* Personal Data Protection Law (PDP Law) 17 2022 mandates the establishment of a data protection authority and sets specific regulations for biometric data processing. * Presidential Regulation No. 47 of 2023 on National Cyber Security Strategy and Cyber Crisis Management. (BSSN) is responsible for coordinating cyber crisis management and has issued regulations on cyber incident response teams and cri.sis management frameworks	* Further enforcement applied to those regulations. - More stringent CyberSecurity framework, regulations, standards, and enforcement that align with international practices - Possibly by increasing capability and capacity (including advanced technical support) to ensure that any violations of personal data protection are investigated and punished by the law to create a formidably strong deterrent effect.	* Not many significant improvements to the existing regulations eventually leave cybersecurity framework, regulations, standards, and enforcement inadequate. * Still relatively poor law enforcement on CyberSecurity violation	* Further enforcement applied to those regulations. - More stringent CyberSecurity framework, regulations, standards, and enforcement that align with international practices - Possibly by increasing capability and capacity (including advanced technical support) to ensure that any violations of personal data protection are investigated and punished by the law to create a formidably strong deterrent effect.
Report of take-up in cybersecurity training programs for healthcare professionals and IT Staff	* More than 15% increase in cybersecurity training programs for healthcare professionals and IT staff.	* Limited take-up of cybersecurity training programs for healthcare professionals and IT staff.	* More than 25% increase in cybersecurity training programs for healthcare professionals and IT staff.
There is no official report on ISO 27001 adoption by healthcare institutions nationally. Although Certification Bodies can provide upon request.	* 50% take-up of ISO 27001 on information security management systems by healthcare institutions nationally.	* Relatively low take-up of ISO 27001 by healthcare institutions nationally at just below 20% adoption rate.	* More than 75% take-up of ISO 27001 on information security management systems by healthcare institutions nationally, just slightly below compared to the Cherry Blossom scenario
* No official report on health data insurance business emerges in healthcare Cyber Crime	* A slow surge in healthcare data insurance claims.	* A moderate surge in healthcare data insurance business	* Significant growth in healthcare data insurance claims, indicating rising awareness and precautionary measures against cyber threats.
* In 2024, there are 10.1% of the Indonesian population aged 60 and above. Insignificant demand for personalised care and home-care from elderly population.	* A growing elderly population, with 15.7% of the population aged 60 and above (as forecasted by UNFPA), with relatively moderate demand for personalized and home-based healthcare services.	* A growing elderly population, with 15.7% of the population aged 60 and above (as forecasted by UNFPA), with no significant demand for personalized and home-based healthcare services.	* A growing elderly population, with 20% of the population aged 60 and above (as forecasted by UNFPA), with remarkably surging demand for personalized and home-based healthcare services.
* There is no specific number of geriatric specialists in Indonesia, but they are not among the top 10 specialists by number. In contrast, radiologists rank 10th with 2,212 people.	* 15% increase in the healthcare workforce specializing in geriatric (elderly) care.	* Stagnant healthcare workforce specializing in geriatric care	* 30% increase in the healthcare workforce specializing in geriatric (elderly) care.

* Global sea levels rising in average rate of approximately 3.3mm per year.	* No extreme weather was recorded. * Global temperatures rising as forecasted. * Disaster Reports: No notable disaster was reported. * Global sea levels rising as forecasted	* Increase in frequency and severity of extreme weather events such as droughts, heatwaves, and hurricanes globally, with a 30% rise in reported incidents. * Global temperature anomalies show a consistent increase, with annual average temperatures rising by more than 1°C above pre-industrial levels. * Reports of unprecedented flooding in South Asia, leading to contaminated water supplies and outbreaks of waterborne diseases. * Reports of significant sea levels rising more than 5mm yearly.	* No extreme weather was recorded. * Global temperatures raising as forecasted. * Disaster Reports: No notable disaster was reported. * Global sea levels rising as forecasted
Jakarta ranked 22 of most polluted city in the world with AQI values at 69.	* Moderate pollution levels in major cities, with Air Quality Index (AQI) values remain constant. * Insignificant cases of respiratory illnesses and hospital admissions due to air pollution. * Insignificant changes in the number of operational coal-powered plants	* Record-breaking pollution levels in major cities like Jakarta and New Delhi, with Air Quality Index (AQI) values consistently exceeding 300. * Surge in respiratory illnesses and hospital admissions due to air pollution, with a 25% increase compared to previous years. * Increase in the number of operational coal-powered plants, tracked through energy production reports and environmental assessments.	* Moderate pollution levels in major cities, with Air Quality Index (AQI) values remain constant. * Insignificant cases of respiratory illnesses and hospital admissions due to air pollution. * Insignificant changes in the number of operational coal-powered plants
It currently take from 2 weeks to 1.5 months to set up an Indonesian company	* Reduction in the time required to start a business to less than 7 days.	The time required to start a business remains the same with only insignificant progress	Reduction in the time required to start a business to less than 14 days.
Ease of doing business was discontinued in 2021 and will be replaced by the B-Ready index that will be launched by the World Bank in Sept 2024	Significant improvement in Indonesia's World Bank B-Ready ranking compared to 2024.	Indonesia's World Bank B-Ready ranking moved up and down for the last 3 years compared to 2024.	Improvement in Indonesia's World Bank B-Ready ranking compared to 2024.
National Internet User Statistics: 79.5% of the population uses internet (approximately 221M people)	Nearly fully coverage with 95% of the national population uses the internet	Stagnant development with only below 85% of the population uses internet.	Relatively consistent growth every year with 90% of the population uses internet
Rural Internet User is projected to reach 74% in 2024, contributing 30.5% of total internet user nationally.	Remarkable coverage 85% of the rural population uses the internet	Stagnant development with only below 80% of the population uses internet.	80% of the rural population uses the internet
	Reports showing a 25% growth in the number of digital health startups in Indonesia compared to the previous year.	Stagnant growth of the number of digital health startups in Indonesia, just below 5% growth compared to the previous year.	Reports showing a 25% growth in the number of digital health startups in Indonesia.
	Significant rise in venture capital funding for digital health ventures, with investments totaling over $250 million annually.	Insignificant rise in venture capital funding for digital health ventures, just under $25 million annually.	Significant rise in venture capital funding for digital health ventures, with investments totaling over $250 million annually.
	* Telemedicine Uptake: A **50**% increase in the number of healthcare facilities using telemedicine platforms compared to the previous year * Wearable Device Adoption: **40**% of the population uses wearable health monitoring devices. * Digital Health Integration: Reports indicate that 85% of healthcare facilities have integrated digital health technologies into their operations.	* Telemedicine Uptake: under a 5% increase in the number of healthcare facilities using telemedicine platforms. * Wearable Device Adoption: less than 7% of the population uses wearable health monitoring devices. * Digital Health Integration: Just under 5% increase in the number of healthcare facilities that have integrated digital health technologies into their operations.	* Telemedicine Uptake: A 50% increase in the number of healthcare facilities using telemedicine platforms compared to the previous year * Wearable Device Adoption: 30% of the population uses wearable health monitoring devices. * Digital Health Integration: Reports indicate that 60% of healthcare facilities have integrated digital health technologies into their operations.

Figure IV. 26. Early Warning Signals (Author, 2024)

IV.6 SWOT and TOWS Analysis

As a next step, the author conducted a SWOT analysis of each scenario produced earlier to capture how external factors (Opportunities and Threats) change ESS's internal Strengths and Weaknesses as they become either more

relevant, less influencing, or swing by. A detailed SWOT analysis for each scenario can be found in Appendix 5. The SWOT analysis will be used to evaluate ESS's existing strategies' relevance to each scenario as they begin to unfold in the future, as shown in the following table.

ESS' Strategy Relevancy Test

			Current Strategies	CB	VE	HT
1	Enquiry handling (EH)	1	ESS operates on a supply-led, reactive approach based on inquiries received. ESS has no control over the types of Products/solutions offered.	Not Relevant (NR)	NR	NR
		2	Proactive engagement is done by identifying and approaching distributors via cold calls, networking events, LinkedIn Sales Navigator, and attending trade exhibitions - reactive based on inquiries received.	Relevant (R)	R	R
		3	Proactive engagement is limited to opportunities identified from distributor engaged	R	NR	NR
		4	There are no specific sector or sub-sector priorities.	R	NR	NR
2	Stakeholder Engagement Plan (SEP)	5	Stakeholder engagement is managed on a personal, one-on-one basis, driven by enquiries received.	R	NR	NR
		6	Engagement with internal Embassy colleagues on the DH agenda, such as the UK-ID DH regulatory sandbox, is minimal.	NR	NR	NR
		7	Both Internal and Stakeholders engagement is limited and on a case-by-case basis or rather reactive driven by enquiries received	NR	NR	NR
		8	There is no comprehensive stakeholder engagement plan due to the generalist nature of ESS services.	NR	NR	NR
		9	ESS does not engage directly with end-buyers, whether government or private.	NR	NR	NR
		10	ESS does not engage with donors or aid-funded businesses.	NR	NR	NR
		11	ESS does not engage with investors or investment companies.	NR	NR	NR
		12	ESS does not engage with State Owned Enterprises.	NR	NR	NR
		13	ESS does not engage with UK alumni including Chevening.	NR	NR	NR
		14	ESS has fewer than 5 contacts with companies that have local manufacturing capabilities in DH.	R	NR	NR
		15	ESS has access to associations, importers, distributors, integrators, and the industry supply chain. ESS has fewer than 10 close contacts in these areas.	R	NR	NR
		16	The CRM system is Excel-based, with plans to acquire a digital system.	NR	NR	NR
3	Trade Promotion Funding and Activity (TPFA)	17	ESS funding is limited for business hospitalities for engagement with local partners, distributors, or integrators and is done on a reactive basis.	NR	NR	NR
		18	ESS don't conduct and lead trade missions	NR	NR	NR
4	Marketing & Communications (MarComm)	19	Market awareness efforts are very limited, with only one webinar on DH opportunities in Indonesia planned annually. In addition, topics are chosen on a case-by-case basis	R	NR	NR
		20	There is no active digital health campaign targeting Indonesia.	NR	NR	NR
		21	The Digital Health Playbook, the only platform to showcase the UK DH expertise exists but is underutilized. No bespoke or tailored sub-thematic DH repository is available.	R	NR	NR
		22	The export opportunities website is underutilized, as there is no proactive demand identification activities set.	NR	NR	NR
		23	Annual UK Inward Roadshow - not sector-specific.	NR	NR	NR
5	Tools & Resources (T&R)	24	Subscription to Euromonitor International for sector reports	R	NR	R
		25	Subscription to Rocket Reach for distributor contacts	R	NR	R
		26	ESS doesn't conduct market intelligence in-house but subscribes to private research providers. DH sector intelligence is limited.	R	NR	R
		27	Engagement with local companies under an Overseas Referral Network arrangement for commercial services	R	NR	R
6	Others (O)	28	UKEF exists, but there is currently no UKEF-backed DH project in the pipeline.	R	NR	R
		29	ESS doesn't currently pursue aid-funded business opportunities	NR	NR	NR
		30	ESS doesn't currently engage with the local integrator leading DH project	NR	NR	NR
		31	ESS' participation in trade exhibitions is limited to attending only.	R	NR	R
		32	IP and Market Access-related work is led by DBT, ESS's parent organization. ESS is not currently involved in any Market Access and IP-related work.	NR	NR	NR

	Relevant to all scenarios : None
	Relevant to 2 scenario : 4 Strategies
	Relevant to 1 scenario : 7 Strategies
	Not relevant at all : 19 strategies

Figure IV. 27. ESS current strategy testing (Author, 2024).

Based on the above analysis, ESS's current strategies are inadequate to address future changes as outlined in the three scenarios created. Of the existing strategies, four are relevant to two scenarios, seven are relevant to one scenario, and nineteen are not relevant to any scenario. Only less than 10% are relevant in the future if ESS stays with the current strategies.

IV.7 Strategic Imperatives

The author then conducted a TOWS analysis to formulate numerous strategies that are suitable for each scenario created. These strategies will make for a strategy replacement for ESS as the current strategies are only less than 10% relevant when faced with three scenarios created. A detailed strategy framework for each scenario consisting of the combination of SO (Maxi-Maxi), ST (Maxi-Mini), WO (Mini-Maxi), and WT (Mini-Mini) can be found in Appendix 6.

These strategies are then grouped into two strategic imperatives, Core Strategy which consists of strategies that will stay relevant in any scenario that happens in the future, and Adaptive Strategy which consists of strategies that are only relevant to specific scenarios.

Further, each Core and Adaptive strategy will consist of three strategic pillars tailored to ESS' business nature including: 1) Demand Generation - Core Function Strengthening; 2) Demand matchmaking - Strategic stakeholder engagement and alliance forming, and 3) In-market Support - Strategic business adaptation.

Description of each strategic imperative, strategies relevant to them, and which scenarios those strategies should be implemented for, are explained in the following tables.

Strategic Pillars	Description
Demand Generation - Core Function Strengthening	The Core Function Strengthening strategy reinforces ESS's core function as the local expert in the Digital Health sector to drive

	growth, innovation, and market leadership. The purpose is to develop a list of potential projects in the pipeline, develop sector knowledge, raise UK exposure among the key stakeholders, and raise awareness of Indonesia DH opportunities to UK DH Companies. Relevant activities include: Producing market intelligence, regulatory updates, UK and Indo-facing webinars, a Marketing and Communication (MarComm) Campaign, and a Stakeholder Engagement Plan to support and enrich the activities' impact. The activities within this strategy are quick to implement and require minimal time and resources. They are the preferred options for ESS to undertake during the first year of a proactive campaign for Indonesia's Digital Health sector.
Demand-Supply matchmaking - Strategic stakeholder engagement and alliance forming	As a follow-up to the growing interest from both the demand (Indonesia) and supply (UK) sides, the strategic imperatives aimed to accelerate and progress relationships between the UK and ID parties, setting up their basic presence requirement in the market. The activities include the development of a more strategic SEP for different scenarios, utilization of Export Opportunities as they are identified, conducting offline Trade Missions, and participating in Trade Exhibitions. Activities in this strand vary. Some require extra focus but no significant funding, such as

	the Stakeholder Engagement Plan. Other activities demand additional preparation, resources, and buy-in from HQ, including approvals and budgets. Typically, a minimum ROI calculation is used to evaluate these activities.
In-market Support - Strategic business adaptation.	As more UK companies enter the market, the three scenarios in the future come with their respective threats and challenges for them to cope with. ESS uses the strategy to support UK companies requiring support on their Strategic business adjustment to capture opportunities, reduce threats, address weaknesses, and exploit Strengths such as alliance forming, consortia approach, or some other form of local presence. ESS activities are targeted towards consortia establishment, supply chain strengthening, joint ventures, joint operations, local manufacturing arrangements, tender involvement, local content requirement compliance, and not limited to IP protection. Activities in this strand are complex and require ESS's commitment to manage relationships for active DH projects. Strong output from the other two strands is critical to the success of the Strategic and Innovative Business Adaptation strands and is not limited to IP protection.

Table IV 3. Strategic Pillars (Author, 2024).