

Article

Smart City Achievement through Implementation of Digital Health Services in Handling COVID-19 Indonesia

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Abstract: The digital transformation of health services is one of the impacts of the COVID-19 pandemic. Various overseas studies have shown a positive response to digital health services, especially in handling the COVID-19 pandemic. This study aims to compare the implementation of digital health services between regions in Indonesia and analyze strategies in the health sector that are appropriate in the era of digital transformation in handling COVID-19 in Indonesia. The focus of this research is on the implementation of digital transformation of health services as one of the derivatives of the Smart City implementation, especially the dimension of Smart Living. The research was conducted using qualitative methods with systematic literature reviews and SWOT analysis techniques. The typology map of the implementation of digital health services in Indonesia shows that digital health services dominate in the Western and Central parts of Indonesia, which varies widely from the Central and Eastern parts of Indonesia, which tend to have limited forms of digital transformation. Various factors certainly influence the difference in implementing digital health services in each region. Therefore, multiple strategies are needed, such as infrastructure improvement, stakeholder collaboration, and increasing the factors that influence the implementation of digital health services.

Keywords: smart city; smart living; application for post-pandemic recovery; COVID-19; Indonesia



Citation: Rohmah, A.'A.; Rachmawati, R.; Mei, E.T.W. Smart City Achievement through Implementation of Digital Health Services in Handling COVID-19 Indonesia. *Smart Cities* **2023**, *6*, 639–651. <https://doi.org/10.3390/smartcities6010030>

Academic Editor: Pierluigi Siano

Received: 27 December 2022

Revised: 15 February 2023

Accepted: 16 February 2023

Published: 20 February 2023



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1. Introduction

The COVID-19 pandemic has made health services a major sector highlighted in Indonesia and the world. Several innovative applications in the fields of government services, health, economy, and education are useful in preventing the COVID-19 pandemic [1]. Health care systems have not been able to cope with a pandemic disaster [2]. The regulation and discipline of health protocols are important to prevent the virus from reappearing in the new normal order [3]. The new order in the new normal era consists of several policies such as working from home; workforce and workplace; manufacturing industry sector policies; health service sector policies; and so on [4]. The work from home (WFH) system with the use of ICT can minimize the risk of spreading COVID-19 [5,6]. However, the COVID-19 handling through a smart society and smart economy does not spatially consider aspects of socio-economic vulnerability, but implicitly adjusts the needs and problems of the community [7].

Digital health services are an innovative breakthrough from technological developments as one of the impacts of implementing Smart Cities in Indonesia. Many technological developments have been developed for various purposes, especially in bringing up multiple innovations such as artificial intelligence, Big Data, IoT, and other digital technologies, and improving the quality of health services [8]. In particular, digital health services are included in the health sub-dimension of Smart Living. Smart living is one of the dimensions of a Smart City that aims to guarantee the eligibility of the community's standard

of living, one aspect of which is realizing access to health services (smart healthcare). Telemedicine is an effort to diagnose, treat patients, or provide health services remotely, as well as deliver information using communication technology [9,10], such as e-health, teleconference, teleradiotherapy, the Sehatpedia application, and Alodokter. According to [11], the telemedicine implementation represents key steps, especially for many low- and middle-income countries, in expanding access to telemedicine and maintaining essential health services.

In line with this, based on a study by [12], telemedicine health communication (telemedicine) makes it possible to cut costs in community health improvement. Telemedicine services allow doctors to provide services without meeting face to face. The development of telemedicine services in Indonesia in 2019 has reached 12 locations, namely North Sumatra, West Sumatra, Lampung, Central Java, Yogyakarta Special Region, East Java, Bali, West Sulawesi, Gorontalo, South Kalimantan, West Kalimantan, and East Kalimantan [13]. Telemedicine in Indonesia has developed quite rapidly, starting in 2015, where there were only four hospitals, then growing to forty-two hospitals in 2019. The development of telemedicine for 2015–2019 can be seen in Table 1.

Table 1. Development of Telemedicine Locus in Indonesia.

Year	Number of Provincial Referral Hospitals	Number of Regional Hospitals as Supervisors
2015	4	4
2016	8	9
2017	16	17
2018	26	30
2019	42	42

Source: [14].

The digital transformation of health services is seen as an important and influential process for health services, which is expected to further impact health services in the future [15]. The importance of digital transformation has caused several countries such as the UK, Australia, Denmark, Estonia, Israel, Mexico, Singapore, Thailand, and Uruguay to implement a national strategy or program for digital transformation [16]. In Indonesia, the COVID-19 pandemic has become one of the accelerations of digital transformation, especially in health services. Digital health services can be defined as an online service that makes it easier for patients to reach services, including consultations with doctors. The regulation of remote health service policies based on digital platforms has been stated in the Regulation of the Minister of Health of the Republic of Indonesia 20 Number 2019 [17].

The results of studies in Africa, including countries that have used mHealth, eHealth, and other electronic health records, show that telemedicine can increase access to health services and improve service delivery and service outcomes [18]. In addition, a study in India using telehealth also showed that digital technology could facilitate disease diagnosis and treatment [18]. However, Indonesia is the fourth most populous country and one of the largest archipelagic countries in the world [19]. Implementing digital health services in Indonesia will require infrastructure changes, health system readiness, and adaptations to the sociocultural context. This statement is in line with the research results of [20], where the use of digital health services in many low- and middle-income countries tends to have very low awareness and utilization of digital health.

The implementation of digital health services is influenced by various factors such as health service infrastructure facilities in each region [19,21], government policies [21], and the level of digital literacy of the community [19]. Spatial variations in the science of epidemiology can help see the trend in the distribution of the spread of COVID-19 in certain locations. In addition, since the digital transformation during the COVID-19 pandemic, especially in health services, began to be echoed in the last year and a half, it is not yet known how the challenges and problems in handling COVID-19 will be faced in Indonesia. The focus of this research is on the implementation of the digital transformation of health

services as one of the derivatives of the Smart City implementation, especially the Smart Living. This concept provides innovative solutions for accessing health services during the COVID-19 pandemic. For this reason, it is necessary to conduct research related to the implementation and strategy of the digital transformation of health services in handling COVID-19 in Indonesia in the aspect of geography, especially in regional development.

2. Materials and Methods

This research is qualitative descriptive research. Data were obtained using primary and secondary data. Primary data were obtained from official government websites, news, and other literature that could support research. While the secondary data used includes national journals, international journals, policies, regulations, government documents, statistical data from BPS (Provinces in Figures), as well as previous studies that support the depth of analysis. The analysis was carried out using a systematic literature review analysis technique.

The primary data in the research is used to identify types of digital transformation of health services using three indicators, namely the number of digital health services, digital information systems, and helpdesk in each province in Indonesia. Data collection on digital health services was collected from 11 February to 16 March 2022. The results show digital health service applications in each province in Indonesia are grouped into three: health services (63 services), health information systems (82 systems), and helpdesk or customer management systems (51 types).

A comparative analysis of implementation in each province was explored from secondary data such as digital literacy (index score), internet signal (village), digital health services (units), information systems (units), and regulations (units) in each province. Based on the results of a literature search, 13,900 journals were selected in the google scholar database and 334 journals in the Scopus database with keywords: {digital transformation} and {health care}. Based on the results of a literature search, a selection was made by skimming based on abstracts and journal components adapted to the topic and research objectives. At this stage, 50 open-access journals were selected. Furthermore, based on the conducted literature review, the results were analyzed, and conclusions were drawn based on the data obtained.

An analysis of the implementation of digital health services in handling COVID-19 in Indonesia was obtained from the results of a systematic literature review which was then analyzed using a discourse analysis. The data obtained were then carried out through a qualitative descriptive analysis. The steps carried out in the systematic literature review include the following:

1. Searching for literature

Based on the results of a literature search, 13,900 journals were selected in the google scholar database and 334 journals in the Scopus database with keywords: {digital transformation} and {health care}. Based on the results of a literature search, a selection was made by skimming based on abstracts and journal components adapted to the topic and research objectives. At this stage, 50 open-access journals were selected. Furthermore, based on the conducted literature review, the results were analyzed, and conclusions were drawn based on the data obtained.

2. Screening and assessing quality

Based on the results of a literature search, a selection was made by skimming based on abstracts and journal components adapted to the topic and research objectives. At this stage, 50 open-access journals were selected.

3. Extract data

Deeper digging was carried out on the selected journals by reading all the existing journals.

4. Analyze and synthesize data

Based on the results of the literature review conducted, conclusions were drawn based on the data obtained.

Based on digital literacy data, the proportion of the number of regions that receive internet signals in each province, the form of digital health services for each province, and the policies and regulations governing each province, a comparative analysis of the implementation of digital health services can be carried out by looking at the uniqueness in each province. In addition, the research conducted also focuses on how the digital transformation of health services is viewed from the perspective of regional development with a focus on analysis that will emphasize more specific comparisons between regions (islands/provinces/between regions both rural and urban) adjusted based on the study data obtained. The research aims to see how the innovation of geographic elements, especially in the “space” and “spatial approach” aspects as a differentiator of geography from other sciences that play an important role in the context of development itself. Furthermore, in terms of digital transformation associated with regional implementation in improving digital health services for each province in Indonesia, it becomes an analysis of the region including the potential within the region (regional preparedness) that is inseparable from the discussion of space in providing an overview of the activities within it and looking at the forms and space pattern. To facilitate analysis, the results of a comparison of the implementation of digital health services are visualized in the form of a digital typology map.

Furthermore, based on the results of identifying forms of digital health services and analyzing regional development strategies in the health sector that are appropriate in the era of digital transformation in handling COVID-19 in Indonesia, a SWOT analysis is carried out with various indicators such as benefits or positive impacts of implementing digital transformation in the health sector, obstacles or negative impacts on the implementation of digital transformations in the health sector, plans or opportunities for the development of digital transformation in the health sector in the future, and threats to digital transformation in the health sector. The analytical techniques used are a systematic literature review and SWOT analysis. A systematic literature review is useful in conducting cumulative generalizations of various studies so that research results become more comprehensive and balanced [22]. In addition, a SWOT analysis was carried out in the second objective. SWOT analysis is defined as an easy but useful analytical tool for increasing the ability to identify inefficiencies of internal and external threats [23]. In addition, a SWOT analysis was conducted to analyze a comparison of the implementation of digital health services for handling COVID-19 between regions in Indonesia and develop strategies that need to be implemented.

3. Results

3.1. Implementation of Digital Health Services for Handling COVID-19 between Regions in Indonesia

The Indonesian Ministry of Health, in collaboration with 11 telemedicine platforms, provides various services such as information services, doctor consultations, and free drug delivery to COVID-19 patients [24]. Various digital health service innovations have been carried out in areas such as DKI Jakarta Province, Makassar City, Semarang City, Surabaya City, and Banyuwangi Regency [25]. The emphasis on the implementation of digital health services in Indonesia is contained in the Indonesian Medical Council Regulation (KKI) Number 74 of 2020 [26].

According to [27], digital health service applications in each province in Indonesia are grouped into three: health services (63 services), health information systems (82 systems), and helpdesk or customer management systems (51 types). The availability of digital forms of transformation of health services is visualized in a typology map of the implementation of digital health services in Indonesia which is classified based on four categories, namely provinces that have all forms (health services, information systems, and help desks), provinces that have two forms, and provinces that have one form, as well as provinces

where no form of service was found. The typology map (Figure 1) of the implementation of digital health services in Indonesia shows that digital health services dominate in areas in the Western and Central parts of Indonesia, which varies widely from the Central and Eastern parts of Indonesia, which tend to have limited forms of digital transformation.

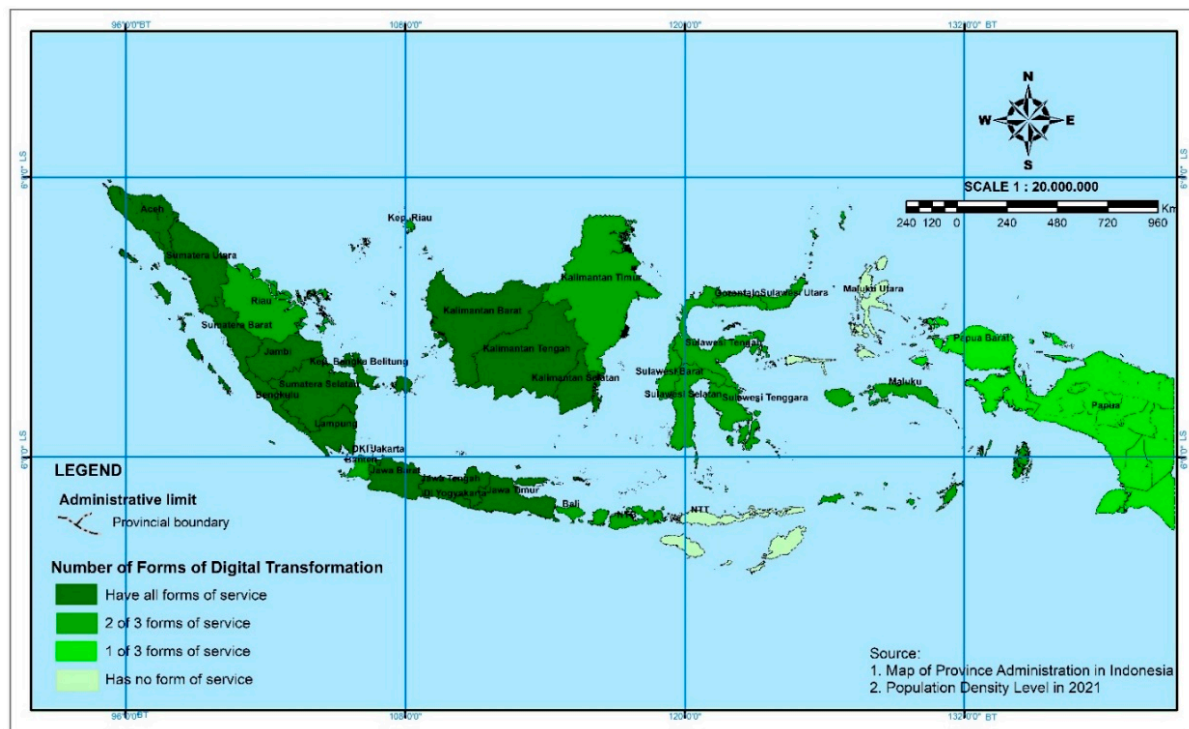


Figure 1. Typology Map of Digital Health Service Implementation in Indonesia. Source: Authors, 2022.

In line with this, regions with various forms of digital health service transformation are areas that implement the Smart City in regional management and planning such as DIY, DKI Jakarta, and Central Java Province. Furthermore, referring to the [28], it shows that the DIY Government's SPBE Index is 3.49 (Good Predicate), DKI Jakarta Province is 3.47 (Good Predicate), and Central Java Province is 2.74 (Good Predicate). In contrast to the SPBE index in NTT Province at 2.28 (Predicate Adequate), and North Maluku Province at 1.00 (Predicate Less). This shows that the implementation of the Smart City and the implementation of the Electronic-Based Government System (SPBE) at the regional level forms the capability and ability to innovate, one of which is in various forms of digital health service transformation in every province in Indonesia.

3.2. Strategies in the Health Sector That Are Appropriate in the Era of Digital Transformation in Handling COVID-19 in Indonesia

SWOT analysis can be defined as an analysis that is used to obtain information from an analysis of the situation of the internal environment and the external environment [29]. SWOT analysis is used as a tool to help the government identify strengths, weaknesses, optimize every opportunity that exists, and minimize external threats in the implementation of digital health services in Indonesia, especially in handling COVID-19. According to [30], strategy is a tool to create competitive advantage. In line with this, [23] stated that although the SWOT analysis is a very simple analytical tool, it is a very powerful tool to increase capabilities and identify resource inefficiencies, opportunities, and external threats for a better future.

Table 2. Implementation of Digital Health Services Indonesia in 2022.

No.	Province	Digital Literacy (Index Score)	Internet Signal (Village)	Digital Health Services (Units)	Information Systems (Units)	Regulations (Units)
1	Aceh	3.57	436	2	3	35
2	Sumatera Utara	3.50	800	4	5	8
3	Sumatera Barat	3.61	297	3	2	3
4	Riau	3.35	229	2	1	10
5	Jambi	3.41	112	3	5	2
6	Sumatera Selatan	3.44	272	2	5	5
7	Bengkulu	3.50	95	1	3	3
8	Lampung	3.52	273	1	3	2
9	Kep. Bangka Belitung	3.57	116	2	3	3
10	Kep. Riau	3.68	118	0	3	2
11	DKI Jakarta	3.51	236	6	2	112
12	Jawa Barat	3.47	2261	3	2	60
13	Jawa Tengah	3.46	1907	5	4	5
14	DIY	3.71	166	10	4	52
15	Jawa Timur	3.55	2042	4	5	2
16	Banten	3.37	514	0	4	6
17	Bali	3.43	240	2	3	18
18	NTB	3.45	290	3	3	3
19	NTT	3.60	163	0	0	5
20	Kalimantan Barat	3.58	136	2	3	3
21	Kalimantan Tengah	3.52	80	1	2	11
22	Kalimantan Selatan	3.49	198	3	2	3
23	Kalimantan Timur	3.62	169	0	3	7
24	Kalimantan Utara	3.57	29	0	1	2
25	Sulawesi Utara	3.53	229	0	4	10
26	Sulawesi Tengah	3.51	99	0	1	2
27	Sulawesi Selatan	3.47	411	0	1	31
28	Sulawesi Tenggara	3.43	118	1	0	0
29	Gorontalo	3.61	97	1	1	16
30	Sulawesi Barat	3.57	44	1	0	42
31	Maluku	3.46	76	1	2	13
32	Maluku Utara	3.18	57	0	0	2
33	Papua Barat	3.61	57	0	1	1
34	Papua	3.37	97	0	1	4

Source: Analysis of multiple sources, 2022.

4. Discussion

The implementation of digital health services in each province in Indonesia is different. Differences in the implementation of digital health services are influenced by many factors, some of which include digital literacy and the conditions of supporting infrastructure, in this case, internet signals, health services, information systems, government policies, and regulations (Table 2). The literacy level is one of the key factors that certainly affects realizing the digital transformation of society in each region. Communities with higher incomes and formal education perceive digital health services as more useful [31]. Based on data from the Indonesia Digital Literacy Index in 2021, it is at the “medium” level with a score of 3.49 [32]. This is in line with Indonesia’s HDI and literacy rates, which have increased from 2017 to 2021. Based on 34 provinces in Indonesia, DIY has the highest digital literacy index in 2021, with a score of 3.71 (on a scale of 1–5). Meanwhile, North Maluku is the province with the lowest index score, 3.18. The score shows that digital skills, digital ethics, digital safety, and digital culture in DIY are very good, in contrast to North Maluku Province, where people are not used to using digital information either in obtaining information and knowledge or in using technology. The digital literacy ability

of each community will certainly impact the community's ability to adapt to existing transformational changes, use community services, and implement digital health services during the COVID-19 pandemic. This is in line with [33]'s data where the acceleration of technology adoption and increased health literacy in the implementation of digital health services can be seen from the enthusiasm of the public in accessing health articles on Halodoc where the readership grows to 250% in 2021 when compared with before the COVID-19 pandemic.

The readiness of basic infrastructure (electricity, communication equipment, hardware requirements, and software applications) is still a major challenge in developing countries [34]. With ICT, it is easier for people to access information and services [35]. Technological disruption during the COVID-19 pandemic is an alternative to overcoming various challenges in health services in Indonesia. The number of internet signals at the village/kelurahan level shows (Figure 2) the ease and openness of accessing internet networks to access digital services. The uneven distribution of the internet in Indonesia is a problem in itself. Java Island has better internet signal conditions than Eastern Indonesia, such as North Kalimantan, West Sulawesi, North Maluku, and West Papua. The uneven distribution of the internet network is due to the geographical shape of Indonesia's territory which consists of forests, mountains, and oceans, which make it a challenge to install telecommunications network infrastructure [36]. This shows that Java Island has an acceptable digital infrastructure condition that allows the acceleration of the digital transformation of digital health services. It is different outside Java, where digital infrastructure is still relatively limited, internet signals are not evenly distributed, and various other challenges that cause little information and central government policies that residents outside Java can accept.

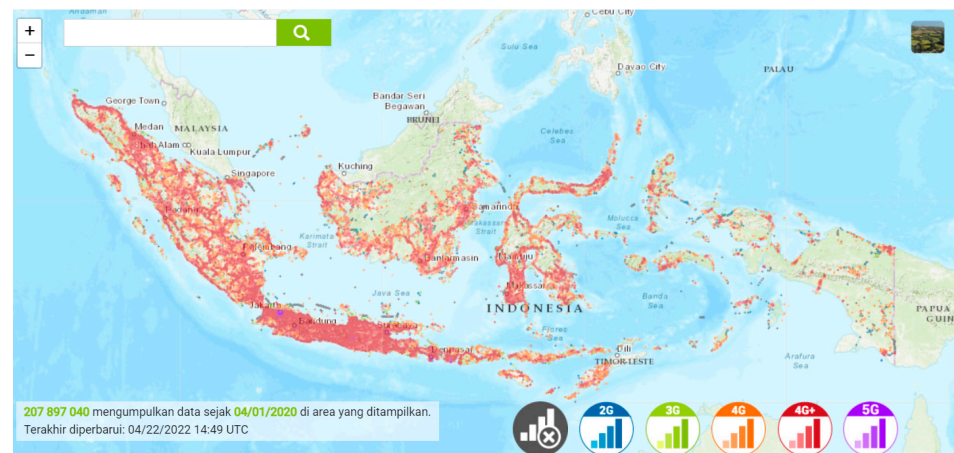


Figure 2. Map of Telkomsel Telecommunication Network Distribution in Indonesia. Source: [37].

In general, the condition of the internet network in each province has a linear relationship with the number of health services and information systems. The uneven distribution of internet access in Indonesia is one of the reasons that not all regions have implemented telemedicine services [38]. Provinces with adequate internet infrastructure have relatively varied numbers of health services and information systems. The higher the accessibility to telemedicine services, the more optimal implementation of telemedicine services during the COVID-19 pandemic [39]. For example, the DIY government created the Jogja Pass mobile application for screening and tracing as well as supporting the implementation of smart cities in the Special Region of Yogyakarta [40].

The inventory results through a literature study showed that the most health services in Indonesia were found in DIY with ten services, DKI Jakarta Province with six services, and Central Java Province with five services. Meanwhile, most information systems are in the Provinces of North Sumatra, South Sumatra, East Java, and Jambi, with five services each. However, many provinces still have no health services and information systems,

such as in NTT and North Maluku. In addition, the most common form of digital helpdesk transformation in Indonesia is the 112-emergency response call center.

The seriousness of the central government in implementing digital health services in Indonesia can be seen from policies and regulations both centrally and regionally. Various central policies during the COVID-19 pandemic such as the Large-Scale Social Restriction Policy, the Policy for the Enforcement of Restrictions on Community Activities (PPKM), and so on. One of the appeals given by the government to all health agencies and their staff is the development of remote services (telemedicine) or other online applications in providing services to patients in need [39]. This is in line with various countries that are also implementing physical distancing strategies, including advice to stay at home, travel restrictions, and the closure of public facilities to minimize physical interaction between humans [41]. Based on a PricewaterhouseCoopers (PwC) survey in [42], the majority of people plan to continue using virtual health services, even though the pandemic has subsided. This shows that the role or benefits of digital health services have been felt by the global community so that even though the COVID-19 pandemic has ended, digital health services will still be used.

In addition to affecting the social aspect, the implementation of digital health services also indirectly affects the economic sector. During the COVID-19 pandemic, digital healthcare users in Southeast Asia quadrupled and investment increased by 3 USD [41]. The momentum of COVID-19 was also taken advantage of by the state in the Asia Pacific Region to increase innovation, especially in carrying out the digital transformation of health services. Indonesia's readiness to implement digital health services compared with lower-middle-income countries is in a middle position based on aspects of health spending, the portion of health spending, the number of doctors, nurses, and hospitals. This shows only average health spending in Indonesia, which spends more than the average health spending in lower-middle-income countries. This is different for the number of doctors, nurses, and the number of hospitals that are close to the average, although still below the average value in lower-middle-income countries. In line with the implementation of digital health services in Indonesia, telemedicine health services are used in remote and rural areas in Nepal. In contrast, service readiness and better telemedicine service infrastructures are found in Sri Lanka [43]. In Sri Lanka, the readiness to implement telemedicine services can be seen based on the availability of a good health care system, a comprehensive digital health infrastructure, and the involvement of the private sector in e-health development. Meanwhile, in Bangladesh, identifying and triaging COVID-19 cases is carried out by utilizing the government hotline service [43]. The information provider service is in the form of an interactive hotline so that people can ask for more detailed information related to COVID-19 [44].

In general, the components of a SWOT analysis consist of strengths, weaknesses, opportunities, and threats based on existing conditions and existing strategic issues. Policies from the central government related to the use of digital health services and the level of digital literacy of the Indonesian people are quite good, and the demographic bonus is a strength in the use of digital health services. The existence of a demographic bonus where Indonesia has a projected 298 million population from 2020 to 2024 is one of the capital advantages in developing digital health services to increase Indonesia's competitiveness. In addition, the various benefits that people feel after using digital health services (saving costs and time and reducing the number of clinical visits as an effort to prevent the spread of the coronavirus) are the advantages of digital health services. The benefits of digital health services can be felt more by rural communities than urban communities. For rural communities, digital health services can facilitate access to services that previously required hours of travel to get health services so that they can be accessed more easily and affordably [34,45–47]. The existence of digital health services is able to increase the accessibility of health services, especially in rural areas or remote villages which have relatively fewer doctors, especially specialists [48,49]. In general, the main benefits of digital health services include that patients can talk to doctors directly via video or telephone,

saving time or travel costs [34,48,50–54], reducing waiting times for services [48], and reducing the number of clinical visits, keeping distance during social interactions, and facilitating close interactions in crowds [53].

The implementation of digital health services, apart from having strengths, also has weaknesses. Weaknesses are analyzed based on limitations or shortcomings that are felt to be obstacles, such as unequal health workforce resources, limited facilities, poor infrastructure, etc. Inequality and limited health personnel were analyzed based on the ratio analysis results of doctors. The biggest challenge in Indonesia is the ratio of doctors to the Indonesian population being below WHO standards [50]. Public concern and anxiety about contracting the COVID-19 virus in public facilities such as hospitals and health centers is one of the weaknesses of off-site health services. In addition to the public's fear of contracting COVID-19, the existence of government policies and regulations (PSBB), and activity restrictions such as the application of work from home are some of the reasons for the public's reluctance to access health during the COVID-19 pandemic [50]. With technology development, digital health services can overcome various obstacles, including the inequitable access to health, uneven distribution of health workers, and geographical problems. In line with this, Indonesia, with its various geographical characteristics, inadequate infrastructure conditions, and disparity in the number of doctors, certainly requires digital health services [38]. Health service innovations in the internet era help patients use their time more efficiently because they do not need to come to hospitals or health facilities in an effort to prevent the risk of coronavirus transmission [55].

Furthermore, external factors can be analyzed based on opportunities and threats. Opportunities are based on favorable situations due to environmental influences, such as technological developments, competition for the type/number of healthcare platforms, prospects for healthcare business opportunities, etc. Technological developments provide opportunities to develop innovations to improve quality service to the community [56]. The many types of health service platforms available at both puskesmas and hospitals allow the community to be free to choose the kind of platform they want and need. The number of users of telemedicine consulting services recorded an increase in the second quarter of 2020 [57]. In addition, referring to [58], Indonesia is ranked third with the largest number of health application users after China and India. The large number of health service users certainly provides investment opportunities for the government and developers in developing various health platforms in Indonesia.

In addition, threats are analyzed based on unfavorable situations due to environmental influences. Several threats in the implementation of digital health services during the COVID-19 pandemic are related to the security of personal data, limited funds, and the limited framework for private sector involvement, among others. According to [34], limited funds, especially in infrastructure procurement, is one of the obstacles in technology development. In addition, data security factors, as well as disturbances in internet connections, are a threat [48].

Differences in the implementation of digital health services are influenced by many factors. Western and Central Indonesia have adequate health facilities, digital literacy, health services, and better information systems, which have an effect on the ease of the implementation of digital health services in their regions. In contrast to Central and Eastern Indonesia, where existing facilities are limited, special efforts are required, such as the provision of supporting infrastructure facilities, as well as providing incentives, both financial and non-financial, to health workers in underdeveloped areas, borders, and the outer islands.

Referring to Table 3, various future strategies that need to be carried out are infrastructure improvements in the telemedicine sector. It is necessary to collaborate with several communication providers in achieving the equitable distribution of stable internet networks and the equitable distribution of electricity supply, especially in the archipelago, to support the implementation of digital health services in Indonesia [59]. Telemedicine is an alternative health service solution during the COVID-19 pandemic [41]. In the current

era, digital health services are prioritized in areas with high population density or urban areas [34]. Therefore, the strategy that can be undertaken is to carry out socialization to community groups in optimizing digital health services and increasing digital literacy. The importance of implementing digital health services is one of the solutions to handling COVID-19 [60].

Table 3. SWOT Analysis of the Digital Transformation Implementation of Health Services in Indonesia.

	Strength	Weakness
	Implementation of digital health services as one of the strategies of the central government The digital literacy of the Indonesian people is quite good Demography bonus Save cost Save time especially in waiting time for service Diagnosis and treatment can be performed faster Easy to use digital healthcare platform Reducing the number of clinical visits	Low and uneven distribution of health workers Geographical physical barriers in providing services Health care infrastructure is limited and unequal Poor technical quality Uneven condition of telecommunication network connectivity Patients are afraid and anxious to do face-to-face consultations and visit the hospital
Opportunity	Strategy S-O Optimizing the use of technology and regional innovation for the development of digital health services Increasing users of digital health services Outreach to unreached community groups to optimize digital health services Collaborating with various stakeholders in the development of a healthcare platform	Strategy W-O Adopt technology to improve the quality of healthcare Optimizing health service governance Provision of supporting infrastructure through government programs and cooperation schemes
Threat	Strategy S-T Carry out personal data security test studies on digital healthcare platforms Develop special regulations in the regulation of security and confidentiality of digital health service user data	Strategy W-T Raising awareness of the importance of health services in Indonesia Establishing a conducive climate for collaboration in the development of digital health service platforms Synergize and collaborate with various stakeholders in the development of digital health services in Indonesia
Personal data security		
Limited funding		
Limited framework for private sector engagement		

Source: Analysis of multiple sources, 2022.

Digital health service innovation in Indonesia is good; however, in the future, several efforts need to be made, such as: (1) There needs to be a synergy between stakeholders, including the government, the private sector, communication providers, and the community in supporting the digital transformation of health services used by the central and local governments (health services, health information systems, and helpdesk) in handling COVID-19 in Indonesia, (2) It is necessary to monitor and evaluate the implementation of digital health services periodically to analyze the dynamics that develop in the community, so that they can take the strategic steps to meet needs according to conditions in the community, and (3) commitment from all stakeholders is needed in implementing various strategies, such as optimizing digital health services, outreach to the community, infrastructure improvements, and so on.

5. Conclusions

The results show that digital health services, or telemedicine, can eliminate geographic isolation in meeting the basic needs of timely and quality medical care. The typology map of the implementation of digital health services in Indonesia shows that digital health services dominate in the Western and Central parts of Indonesia, which varies widely from the Central and Eastern parts of Indonesia, which tend to have limited forms of digital transformation. Differences in the implementation of digital health services are influenced by many factors, some of which include digital literacy and the condition of supporting infrastructure, in this case, internet signals, health services, information systems, government policies, and regulations.

Regions with various forms of digital health service transformation are areas that implement the Smart City. This shows that the implementation of the Smart City, especially the dimension of Smart Living at the regional level builds capability and an ability to

innovate, one of which is in various forms of digital health service transformation in every province in Indonesia. The better the achievements of smart cities, the more types and numbers of digital health services. This is one of the efforts to guarantee the eligibility of the community's standard of living, one of which is realizing access to health services (smart healthcare).

Strategies in the health sector that are appropriate in the era of digital transformation in handling COVID-19 in Indonesia include infrastructure improvements, the need for collaboration with several communication providers in achieving equitable implementation of digital health services in Indonesia, increasing the factors that influence the implementation of digital health services (digital literacy, internet signals, service system innovation, and so on), and improving the quality of digital health services.

Author Contributions: Conceptualization, A.'A.R., R.R. and E.T.W.M.; methodology, A.'A.R., R.R. and E.T.W.M.; writing—original draft preparation, A.'A.R.; writing—review and editing, A.'A.R., R.R. and E.T.W.M.; visualization, A.'A.R.; supervision, R.R. and E.T.W.M. All authors have read and agreed to the published version of the manuscript.

Funding: Universitas Gadjah Mada has supported this research activity and publication by providing funding through the scheme of Recognition of Final Student Project Batch I (Rekognisi Tugas Akhir/RTA Batch I) 2022 Number 3550/UN.1.P.III/Dit-Lit/PT.01.05/2022.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not available.

Acknowledgments: This research was a part of Recognition of Final Student Project Batch I (Rekognisi Tugas Akhir/RTA Batch I) 2022 Number 3550/UN.1.P.III/Dit-Lit/PT.01.05/2022 from Universitas Gadjah Mada, Indonesia led by Rini Rachmawati. Therefore, the authors thank Universitas Gadjah Mada who has supported this research activity and its funding.

Conflicts of Interest: The authors declare no conflict of interest.

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