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Digital Transformation in Indonesia Health Care Services: Social, Ethical and Legal Issues

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ABSTRACT

During the Covid-19 pandemic, digital transformation in the health sector grew rapidly through digital health applications (health apps). This momentum had indeed accelerated these transformations that encouraged several opportunities but also experienced many challenges. This main question is to address the current condition of healthcare application (HA) utilization in Indonesia during the pandemic CCovid-19. This study performed a systematic review of trends and utilization of health apps in the Indonesian context. Our findings showed that digital transformation in healthcare services in Indonesia had several challenges and opportunities in its development through health apps i.e., medical, social, legal, and ethical issues. Health apps used as an emergency exit of healthcare services during pandemics, also reduced the healthcare access barriers for people. But the challenges were about digital health literacy, lack of awareness of data privacy and security, and also the space for errors in medical practice. The study concluded that the attention of all parties (state, providers, and the community) was needed to overcome various challenges and optimize opportunities because digital transformation in the health sector was a necessity in the future.

I. INTRODUCTION

The Covid-19 pandemic became a momentum for digital transformation (DT) in various sectors of life. DT is a transition process that recently became very popular because it triggered change through a combination of information, computing, communication, and connectivity that revolutionized the business sector writ large and value creation to society (Kraus et al. 2021 and Vial, 2019). Under the physical and social distancing policy, there was a migration of social activities from physical to virtual through many digital platforms. That made people's lives during the pandemic more comfortable even when their smartphone or laptop had no direct interaction.

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At that moment, there was a public wave to browsing valid and update medical information, and medical literacy in an effort to mitigate their health. It can be accesed not only by website, discussion forums, blogs, social media (e.g. Instagram, Facebook, Twitter, etc.), but also via a mobile platform in smartphone which is can be downloaded through Appstore on iOS or Playstore on Android (Ashurst & Jones, 2017).

The healthcare application (HA) known as digital healthcare (DH) services are one of the platforms experienced high acceleration usage and a rising trend (Paglialonga et al., 2018). Because conventional healthcare Centers (HC) are the most vulnerable area of transmission of the CCovid-19 between people. Therefore, virtual services become a very rational choice for people who need HC services without having to come to a HC like a clinic or hospital. It means that the innovation in medical sector, especially using the smartphone platform, are changing people's lives including the way they seek medical information or services (Grundy et al., 2016)

In the literature, HA have many designations, such as Health App, Telemedicine, M-Health, Mobile Health App, Tele-Health. The application is basically similar. HA can be classified into broad functional categories, i.e., general solutions for healthcare professionals (e.g., drug-referencing tools, clinical decision-support tools, electronic medical record systems, and medical knowledge sources); apps for medical education, teaching, and learning; telemedicine support tools and consultation; apps for patients and for the general public over a wide array of services; and disease-specific apps for patients (Boulos et al., 2014).

The popularity and usage of mobile technology is growing along with several varieties of HA due to many factors such as, practicality in communicating, portability, affordability, and widespread availability (Paglialonga et al., 2018). Moreover, the apps are being catalyzed by the CCovid-19 pandemic to reduce people's mobility and interaction. HA has enabled the delivery of health-related services and applications through smartphones or tablets (Davis et al., 2016).

In Indonesia, the use of HA are growing rapidly during pandemic. The Ministry of Communication and Information Technology noted that the use of HA had increased rapidly by 443 percent since the CCovid-19 pandemic. The HA users from various applications in Indonesia approached 4 million in the beginning, and during the pandemic users of various HA had exceeded 15 million people[1]. Today HA is helping the government to encourage the realization of herd immunity for the Indonesian people by participating in providing vaccine services and information through the platform.

In line with that, we all know that conventional HC center are not evenly distributed in the context of Indonesian. Then, not only have this not reached all levels of society in all regions, but also do not have the same quality, facilities/infrastructure, and service standards. So that the increasing the supply of HA can be a solution for equitable access to health consultations with doctors. Drawing on the high trend of HA use during the Covid-19 pandemic, and how low the ability of conventional HC to serve the community properly, and also many HC services problems faced by society until today, the research question of the present article is: What is the current condition of healthcare application (HA) utilization in Indonesia during the pandemic Covid-19? The aims of this article are to show the opportunities and challenges for the community and stakeholders towards the presence of digital transformation in the health sector, so that they have sufficient literacy to make decisions and policies.

II. BACKGROUND LITERATURE

A. Digital Transformation (DT)

In recent years, the discourse on DT has begun to be widely discussed. The emergence of DT was driven by society and industry trends and organizational decisions with target entities including organization, platform, ecosystem, industry, society (Vial, 2019). The fourth industrial revolution is considered identical with the presence of DT (Hussain, 2021). DT is a social

[1] https://kominfo.go.id/content/detail/27509/penggunaan-aplikasi-telekonferensi-naik-443-persen-sejak-pandemi/0/sorotan_media access on May 9, 2021

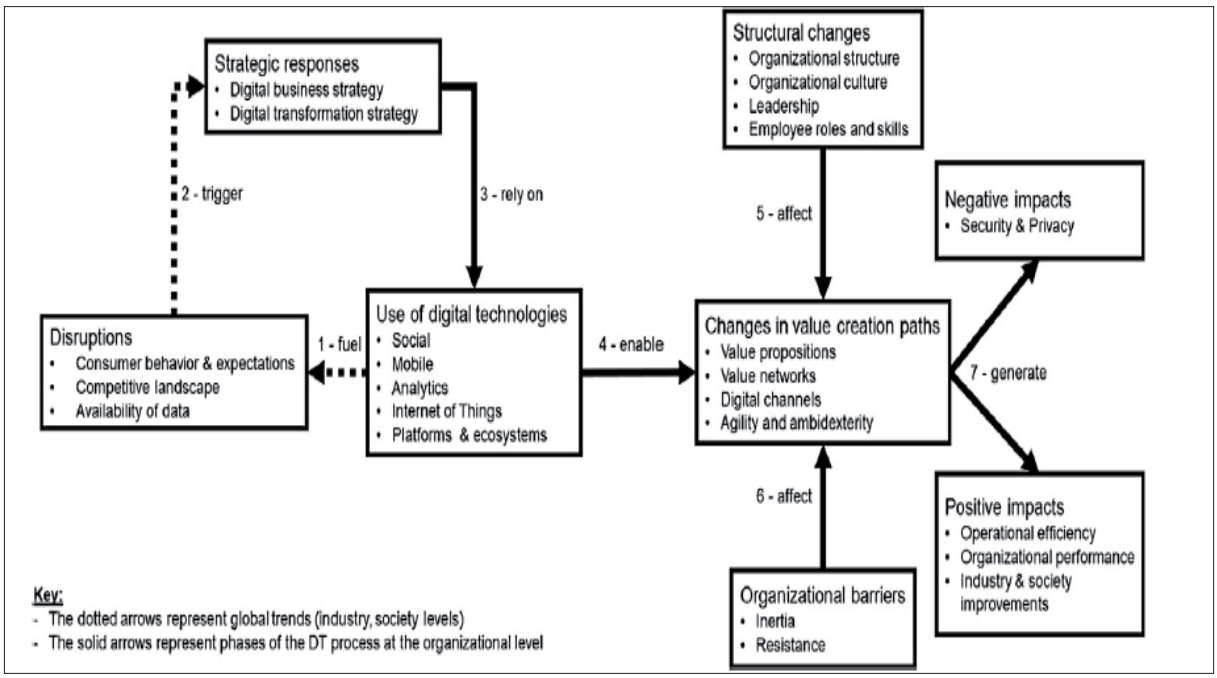
change facilitated by a technological revolution which includes blockchain, internet of things (IoT), 5G, digital currencies, cloud computing, artificial intelligence (AI), serverless computing, 3D printing, industry 4.0, quantum computing, machine earning, natural language processing, large data analysis, big data, robotics, virtual and augmented reality (Hussain, 2021).

DT is suitable for strengthening a culture of efficiency and effectiveness because it is able to ensure that people do things more simply (Hussain, 2021). DT inhibitors are those that are resistant to change, complicated decision making, management commitment and data security (Junge & Straube, 2020). Another opinion states that DT is a process where social existence leads to the level of influence of digital processes, digital tools, and the abundance of information (Ossewaarde, 2019). Efficiency and innovation through the digitization process are the main things in the DT process (Berghaus & Back, 2016). The figure below will give a little idea of the DT process.

Figure 1 shows that digital technology is in a central position in the emergence of DT in society and industry. the value creation process from the presence of DT aims to survive in the competition that has been intervened by the digitization process. The following is the DT process, where at the society and industry levels there is a process of structural change so that a product of distraction appears which becomes a tool for transformation (Vial, 2019).

B. Digital Healthcare

The interaction between patient and HC center is a relationship that shows function in a social structure. Parson explains about functional structure in his book The social system, raising examples of modern medical practice. From a functional structural perspective, power governance is dominated by HC providers (Parsons, 1991). The reality shows that patients who access HCs, seem to have no power in the interactions that exist because the patient is the party who needs HC services (Parsons, 1991). After one decade, DT developed to answer Parson though. HC transformation creates new business practices to answer challenges in medical practice (Kraus et al. 2021). HC transformation is a product that elaborates the visions of various stakeholders for the development of patient-centered HC services evolving technology-based innovations like DH (Bhavnani et al., 2017). DH is a health service for people who use information and communication

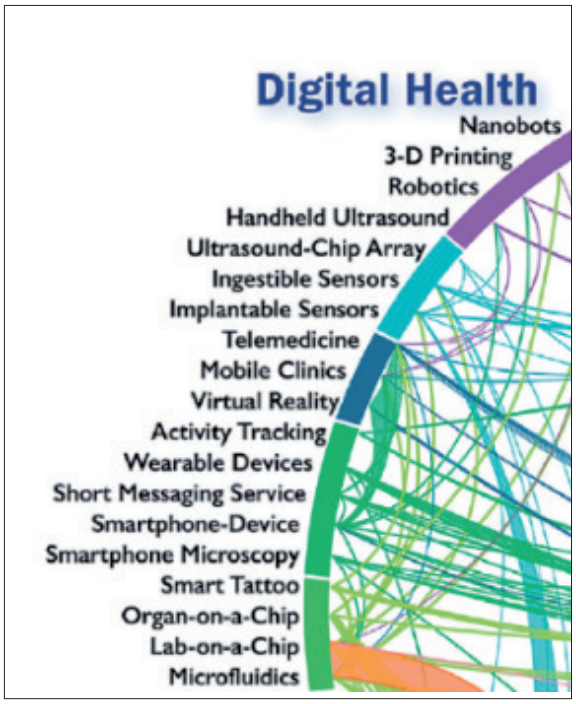


Source: (Vial, 2019)

Figure 1. Digital Transformation (DT) Process

technology (Tseng et al., 2018). Furthermore, there are several findings summarized about DT impacts on HC in a review of 45 years of literature, including (a) Integrated Management of Information Technology in Health; (b) Medical Images; (c) Electronic Medical Records; (d) Information Technology and Portable Devices in Health; (e) Access to E-Health; (f) Telemedicine; and (g) Privacy of Medical Data (Kraus et al. 2021; Marques & Ferreira, 2020).

Figure 2 shows new innovation from digital health. It is not only limited to HA but actually there is still a wide range of digital health coverage. However, what does interact directly in people's lives today is HA.



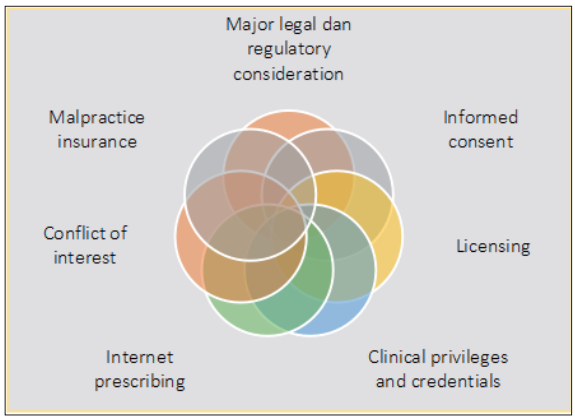
Source: (Bhavnani et al., 2017)

Figure 2. New Innovation in Digital Health

One of the products from DT in the health sector is HA. HA aims to improve public health through HC services to all people through DT (Kraus et al., 2021). HA is a professional health service that is able to reduce the space and time gap because it can be easily accessed anytime, and anywhere. (Beheshti-Atashgah et al., 2020). HA is a portable HC that provides portable health services using a smartphone. HA is a portable health device that follows the social trend of using digital platforms for various activities, which is a meeting of conventional health care methods with virtual technology to generate efficiency and strengthen real-time participatory services, empowering patients through smartphones (Bhavnani et al., 2017).

C. Social, Ethic and Legal Aspect

Following digital health care growth and trends, raises legal and ethical issues. Digitalization in health care implementation needs more attention in policy and legislation (Broens et al., 2007). Legislation plays an important role in the reason to manage doctor-patient relationship that mediated by technology (Raveesh & Munoli, 2020). Doctor-patient relation transformation needs a new tool to manage problems that raise, such as medical dispute or medical record management (Eaves et al., 2020). From an ethical perspective, there is a call for discussing privacy, confidentiality and liability, the 'autonomy' brought by telehealth to remote users (Kaplan, 2020).



source: (Fields, 2020)

Figure 3. Legal Issues in Telemedicine

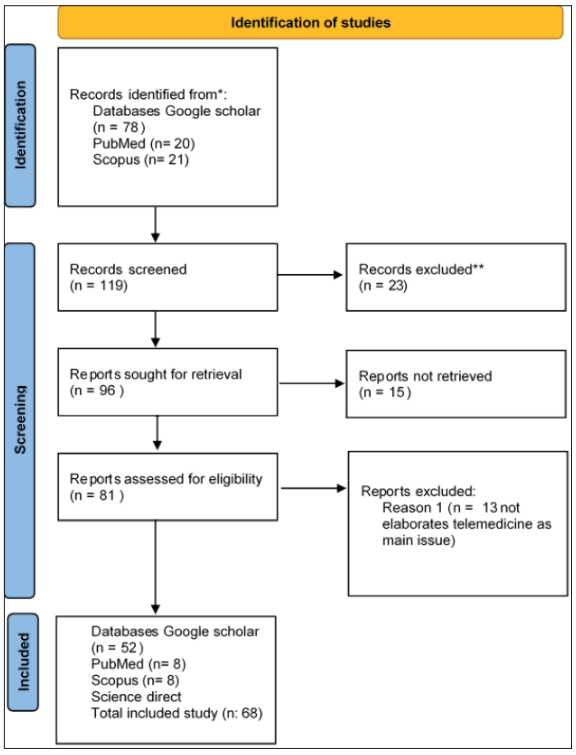
Without proper administrated digital health care, health disparities and poor quality of health care occurred (Stavroulaki, 2019). Further, legal and ethical management were needed for patients and healthcare professionals, and establish some limits to safeguard the quality of healthcare from the economic interests of private stakeholders (Botrugno, 2017). Therefore, ethical and legal aspect of telemedicine take significant part in shaping health care transformation.

Further, digitalized health puts society in potential risk (Mak, 2016). In every advantage on an advancement of digitalized, has embedded risk (Adams, 1995). Legal and ethical rules are intended to manage potential liability as digitalization in health grows and accessed by people (Gilmore & Ward-Ciesielski, 2017; Stanberry, 2001). Modernization causes people to be dependent on technology where the level of risk dependent on the level of the relationships that occur between society and digital technology (Beck, 1992)

III. METHODOLOGY

Using a PRISMA systematic review approach, the paper identified and elaborated the Indonesian context for both ethic and legal issues in experiencing digital health, based on Scopus, PubMed MEDLINE, and the Google Scholar data base. On 1 April 2021, using ("healthcare challenge") AND ("covid 19") AND ("Indonesia") was applied and found 68 articles. Inclusion criteria was focus elaboration in telemedicine as the main issue. As effort to ascertain the quality o an article to be included in the analysis, the non-peer review journal, non-original research articles and non-Indonesia research sites applied as exclusion criteria (Moher et al., 2009).

Each paper was then analyzed into social, ethical and legal context in digital health transformation. Its elaboration intended to provide explanation in diverse context implementation (Booth et al., 2019). As a consequence in using systematic literature the review approach only covered phenomena elaborated in previous studies and do not explain individual use experience context.



Source: Own Elaboration based on PRISMA Systematic Review Flow (Moher et al., 2009)

Figure 4. PRISMA Systematic Review Approach

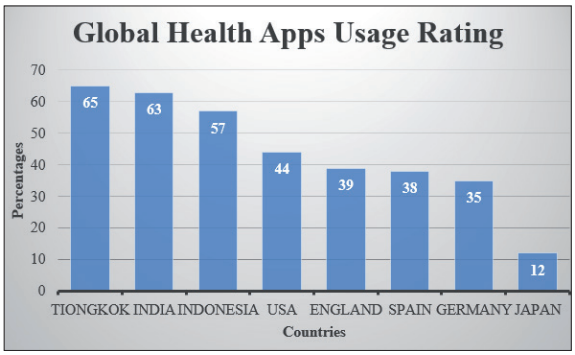
IV. RESULTS

A. Healthcare Transformation Issues Growth

The emergence of DT in the HC sector cannot be prevented parallel with the growth of the digital ecosystem in Indonesia. Recent study show that Indonesia is the third country with the largest number of users of HA (Statista,2020)

The diagram shows that Indonesian people as a user of HA services is quite high, even being ranked third over developed countries such as the US, Germany, and even Japan.

Meanwhile, through the keyword '*dokter*' on the Playstore searching page for android smartphones, what comes out is a few platforms that provide digital health services. Halodoc, Alodokter, KlikDokter, YesDok, SehatQ, and Good Doctor is in the top position of search engine results. Although in fact there are still a lot of HA being developed by Indonesian startups. Globally, there are over 318.000 HA, which is



Source: Statista, October 2020

Figure 5. Global HA Usage Rating

Tabel 1.
Top Six HA in Indonesia

No.	Platform	Ratings	Downloads
1.	Halodoc	4,8	5M+
2.	Alodokter	4.6	5M+
3.	KlikDokter	4,5	1M+
4.	YesDok	4.9	100K+
5.	SehatQ	4.8	100K+
6.	Good Doctor	4.2	500K+

Source: Own Elaboration based on Playstore, May 2021

200 HA added each day on Google Play and the Apple App Store.

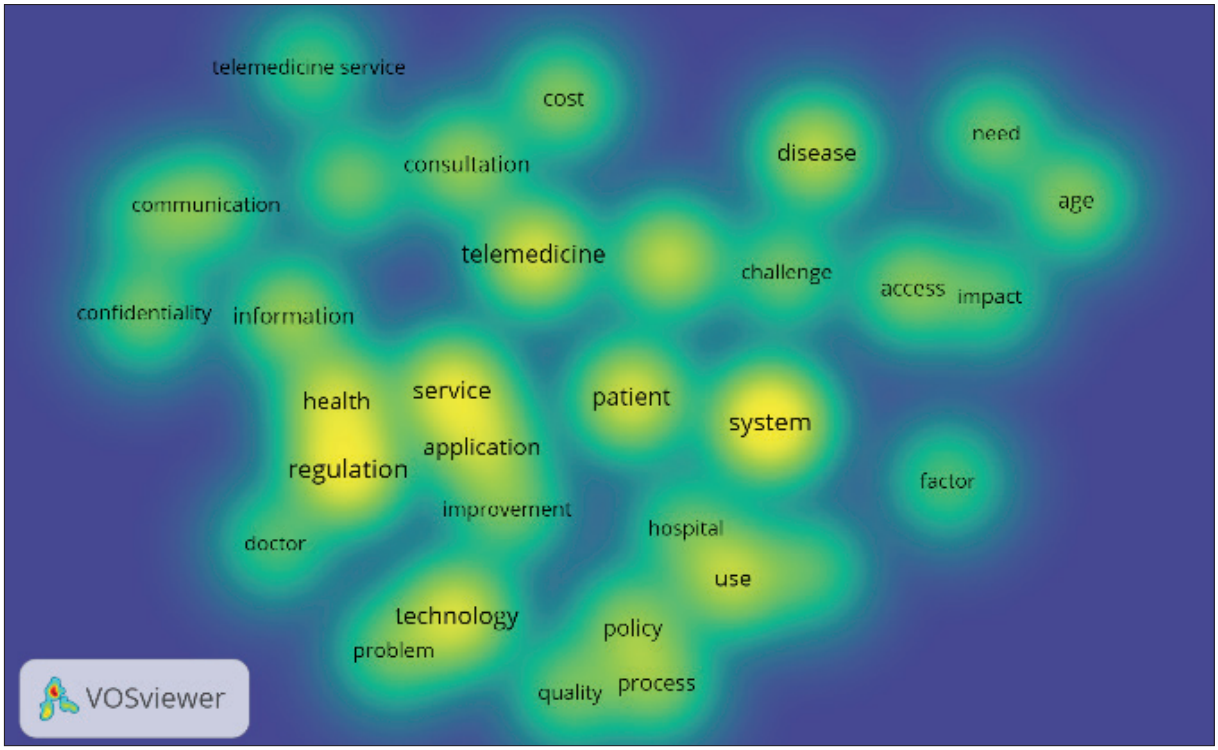
The six HA have similar features, including virtual consultations with doctors and pharmacies as main features, and some have collaborated with insurance and hospital. In addition, there are also additional features that complement each app, including features for making appointments for direct consultations with doctors in hospitals, medical tests in laboratories, health articles, promotions, self-health check-up, donations for people affected by medical calamities, and of course a special feature about test and vaccines for Covid-19 which are currently becoming a global trend.

In literature, HA is better known as telemedicine. The transformation of HC through telemedicine is a growing research topic in digital transformation studies. This figure number 4 shows an overview of the number of keywords (29 keywords) that appear in the abstract section of the reference.

Issues exposed to confidentiality, communication, cost, patient need, and quality are still marginalized. Few discussions about social interaction issues show that existing studies pay little attention to the interaction and social aspects of the HC challenge.

The study found there was trend in healthcare challenge discussions in the technical aspect. Elaboration about the system, regulation, application, telemedicine, technology, and its policy, dominate issues of elaboration about HC challenge. Especially regulation, technology and system are mainstream discussions about HC.

Rapid growth of HC services based on information technology was shown by a diverse



Source: Own Research Elaboration through VOS Viewer tool with data sources from Scopus, PubMed MEDLINE, and google scholar data base, May 2021 (Keyword: healthcare challenge, Covid-19, and Indonesia. Analysis based on 1512 terms, minimum occurrence 5 with subjective selection based on health apps issue correlation)

Figure 6. Landscape keyword density of healthcare transformation

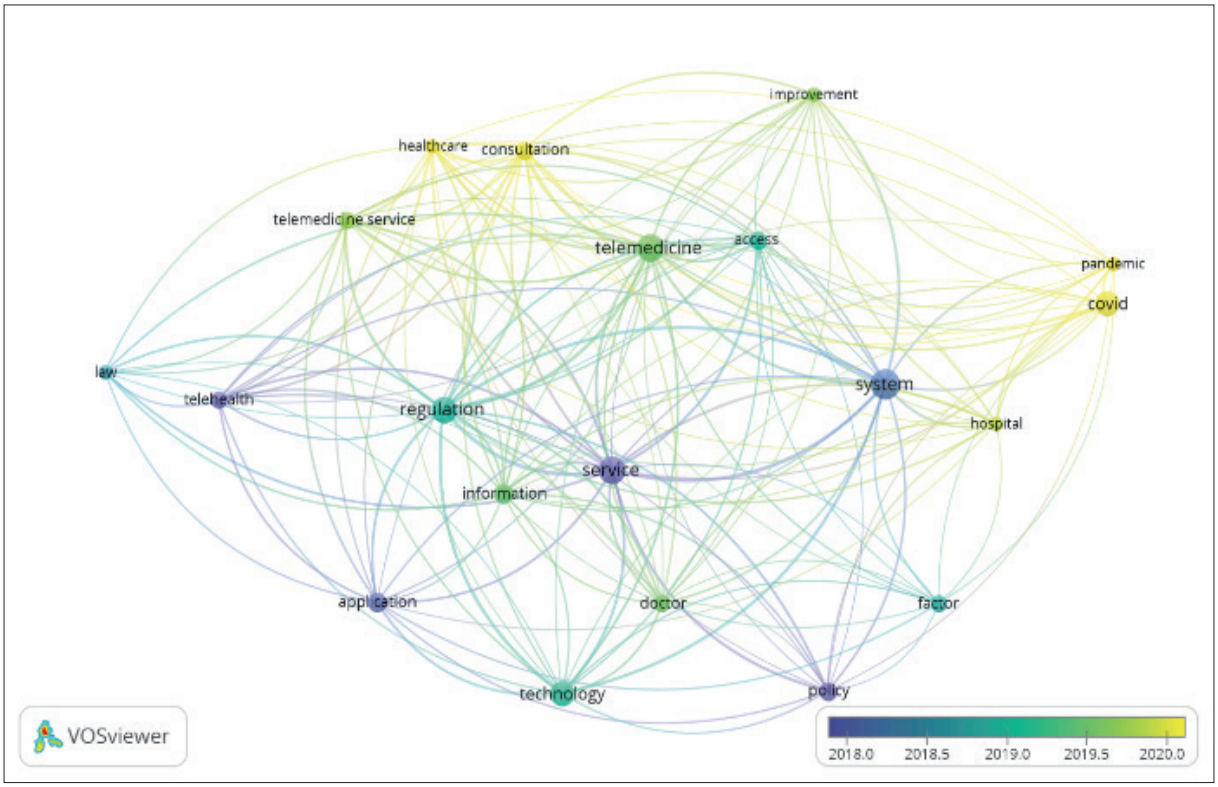
study. There were 3 big clustered issues founded. First, attention on regulation. Second, system issues in implementing information technology for healthcare. Third, the technology elaboration and application. The study related Covid-19 to digital health implementation, whichbecame the latest issue that the academic community had elaborated its function and effect to deal with the pandemic.

In the development of studies on HC, in the last two years there have been discussions regarding the pandemic. Trend discussions are no longer related technical aspects, formal legal and ethical such as regulation and application. However, discussions related to HC began to refer to the elaboration of improvement, telemedicine service and access.

The emergence of the keyword "consultation", and "improvement" showed new trends in looking at the challenges facing the health service. The aspects of the discussion showed the emergence of social factors that arise in the development of HC.

B. Indonesian Healthcare Application (HA) Services

According to the Indonesian Internet Providers Association (APJII), in 2020 some 74 percent of Indonesia's population had access to the internet. This percentage is higher than in 2018 of 65 percent. This means that 197 million people out of a total of 267 million Indonesians are facilitated by internet infrastructure (APJII, 2020). More specifically, based on the results of a more in-depth study, it shows that 6.3 percent of internet users visit health content, 1.4 percent of them buy health needs online, and 0.3 percent use HC services. This means that the presence of internet infrastructure encourages the growth of digital HC services. Although not yet a priority for internet users like social media, HA services have been present and growing in the community. This



Source: Own Research Elaboration through VOS Viewer tool with data sources from Scopus, PubMed MEDLINE, and google scholar data base, May 2021 (Keyword: healthcare challenge, Covid-19, and Indonesia. Analysis based on 1512 terms, minimum occurrence 5 with subjective selection based on health apps issue correlation)

Figure 7. Main trend and intertwined keywords of healthcare transformation

showed there is a social transformation where people were starting to consider digital services to meet their needs for HC services.

There are at least three things that arise when HA is used by the community when the challenges of social and physical restriction policies during a Covid-19 pandemic exist. Firstly, Digital HC services through HA can reduce conventional interaction with virtual interactions. There is an increase in access to HA services for the community. So that people who feel unwell, will take action to consult a doctor through HA without mobility. This means that the need for health services can be immediately reached. Secondly, reduced costs to conventional HC services (e.g., hospital or clinic) because many HA still offer free doctor consultation services. In addition, although there are fees for certain specialist doctors, the costs are still very affordable for the community compared to the costs and risks of going to the hospital. Moreover, collaboration with a logistics platform, patients or HA user do not have to queue at the pharmacy. Because the prescription will be sent directly from the nearest pharmacy in collaboration with HA to the patient's location. Then, fee transactions are also carried out via internet banking or other digital payment gateways.

However, based on research through using the top six HA, the HC platform faces social ethical-legal challenges.

Social challenge consists of several points. First, in the process of DT, there is a migration of social processes to become virtual. Consultation is carried out by conducting conversations by text messages and not by interactive voice messages. This means that there is a space or knowledge gap where multiple interpretations often occur. Second, patients have different abilities in describing symptoms in writing, thus affecting the results of the doctor's diagnosis. Third, the quality of photos and filter feature addition from smartphone cameras, makes the accuracy of the image result too far from the reality. Sometimes doctors ask patients to send photos such as consultations about body wounds or skin rashes. Of course, it also makes the low accuracy of the doctor's diagnosis. It is dangerous if the misdiagnosis, requires prescribing drugs. Fourth, each consultation sometimes has a certain lead time, and doctors also have limited consultation hours or schedules for virtual consultations. For different areas (e.g., rural area) whose internet infrastructure is still weak, it will certainly make interactive communication difficult. Fifth, the difficulty in reaching the correct diagnosis due to the lack of physical examination because occasionally there are physical signs that are checked as indicators to make a diagnosis. such as nerves, bones, baby growth and illness, etc. Sixth, normally, doctors treat more than one patient, read all their messages and respond to them as quickly as possible. But occasionally, the response becomes quite long for those who need a quick diagnosis in an emergency condition.

Ethical and legal issues challenges consist of data security and privacy protection. The same regulation applies between conventional HC center and users of HA. The HA user will be directed to the data upload page, and should fill in the same data as the hospital. It is mandatory to fill in private data, medical data and medical record history. The difference is, health apps do not make commitments with users regarding data protection and data management. When a patient comes to the hospital, the patient signs a statement that the data is confidential and protected by the hospital under state law, and only the patient and the patient's designated guardian can obtain this information.

The authority of data security is the HC institution (e.g., hospital or clinic). The confidentiality of any medical records is guaranteed. Some health apps only provide information that the data input page is encrypted and protected. But users do not get information about the management of their private data and security. There are technology providers, operators and maintainers in these services who have access to the medical record data set.

Moreover, based on tracing on Google by mentioning certain medical condition keyword, many conversations were found between patients and doctors through website from the HA, without closing patient identity. That means there are security risks that users must understand because

users never know the extent of use of their data and their dangers. Table number 2 below is an overview of the data requested by HA:

Based on Table 2, doctor consultations, pharmacy and payment transactions occur in one application, it means not only medical data is needed, but there is also payment account data i.e., bank account or digital payment gateway. Hence, even if digital technology continues to develop rapidly, but literacy on emerging risks must also be considered.

V. DISCUSSION

A. Digital Healthcare Transformation

Referring to the diagram about digital transformation, HA can be claimed as one of the products of the development of digital transformation in Indonesia. Starting from the presence of

Table 2.
Personal data requested by the HA Provider

Type of Data	Information Detail	Status of Data
Demography Data	Name Age Date of birth Gender Identity card number Address Phone number Marital status Family profile (Child, couple, parents, sibling, etc.) Office Address	Low level confidential data
Digital Identification Data	E-mail account (e.g., gmail or other) Social media account (e.g., facebook) Biometric ID IP address Geolocation	Intermediate level confidential data
Medical Information Data	Body height Body weight Medical record Allergy history History of disease History of hereditary diseases Blood type Regular drug consumption Consultation messaging history Doctor diagnosis Medicine	very high level confidential and sensitive data
payment account data	Credit/Debit card number Bank account number Transaction history Digital Payment Gateway (OVO, Gopay, Dana, LinkAja, etc)	high level confidential data
other data	Insurance affiliation data	

Source: Own Elaboration based on Top HA on Playstore, May 2021

Covid-19, HA has experienced an escalation in usage due to consumer behavior and expectations of health services from a safe home that are more friendly to those who are vulnerable to being exposed to Covid-19, especially pregnant women, elderly with comorbidities, infants and children, and other general public. At the same time as the pandemic, Indonesia has been disrupted by digital technology so that the digital ecosystem has been quite developed even though it is still hampered by infrastructure inequality. Relying on the existence of IoT, the existing HA platform itself, there has been a shift in utilization behavior from smartphones, triggering the strengthening of digital business in the health sector through the HA. With various features that have been continuously developed since the beginning of the pandemic, it was declared in Indonesia in March 2020, all of the HA began to prepare transforming strategies to meet the needs of users.

However, not all the HA platforms will automatically reach the digital HC market. There is also massive competition, which is about who is more accessible in terms of services and needs as well as the interface that is considered easier for users. In this case, there are enablers such as how HA continues to develop services according to community needs during the pandemic. It certainly can be read by looking at the algorithm of HA users. So that the sooner HA can read the needs of the market and of course get an injection of capital to innovate, it will have an impact on wider reach and number of users. meaning that there is more value for each HA even though they have the same basic purpose apps. It is acknowledged that this study has limitations: no in-depth study was carried out on every platform developer. So, from the internal developer, this study can't capture how the organizational structure and culture changes, their leadership, also the human resources skill composition and roles from the start-up company owned by the HA developer. However, this study looks more at the utility of HA by testing the use of all trending HA platforms in Indonesia.

In practice every new technology brings with it advantages and disadvantages, benefits and dangers (Halamka & Cerrato, 2020). After all factors that encourages the ecosystem of HA, there are always the advantages and disadvantages to the use of HA. *First*, it presents unique opportunity to improve health outcomes through reduced HC barriers thereby reducing mobility need. *Second*, it helps people who lack health insurance or have limited income because many HA are free (Halamka & Cerrato, 2020; Higgins et al., 2019). *Third*, it provides equal access for people and reduce services class (Halamka & Cerrato, 2020). *Fourth*, HA bridges the gap between patients from rural areas and medical professionals located in city centers. It is important because HA reduced geographical constraint and increased HC quality in rural and remote areas (Broens et al., 2007; Jennett et al., 2003; Sasikala et al., 2018). Digital technology provides opportunities for the improvement and convenience of HC services from all aspects. HA also provides hope of reducing blockages in access to HC services, especially in rural areas (Setiawan et al., 2018).

Based on the high level of HA use in Indonesia compared to other countries, it is necessary to think critically about what the high use of HA means during the Covid-19 pandemic. First, is the result that people have a high awareness of doing physical distancing? Second, is it due to the high susceptibility to being exposed to Covid-19 that people are reluctant to come to the HC center? Third, is it because the HC center infrastructure in Indonesia has not yet reached and accessed by everyone? Developed countries get a low value of HA users. It could be because the physical infrastructure of their HC center has reached the entire community and has high-quality facilities that are in accordance with health security standards in dealing with Covid-19. So that people are not afraid to come directly to the HC center. This requires an in-depth study with critical sociological analysis. But this study is justifying that Indonesia's digital ecosystem is growing well, so that HA is quite in demand by the public.

Summarized from the results of testing using HA there were three main points of disadvantages of HA. *First,* from a medical perspective, HA makes doctors vulnerable to misdiagnosis. *Second*, from the perspective of legal and ethical issues, users are vulnerable to data misuse or not getting guaranteed protection in terms of personal

data security. This creates a potential conflict between providers and recipients of health services.

Digital technology provides an ambiguous space between the strict medical domain and relatively lax market rules (Lucivero & Prainsack, 2015). The pattern of HC services through HA that were accessed directly by the public had a legal vacuum and the responsibilities of the parties involved in its implementation were not clear (Latifah et al., 2020). Especially when there was a context of increasing the use of HA, during the Covid-19 pandemic, it had several impacts that needed attention (Mawuntu & Limato, 2020). Potential conflicts over data management occurred when the management and control of data generated by HC services was unclear. So far, health data is quite sensitive and is held by HC service institutions. The use of information technology makes it possible for data to be managed not only by HC service institutions but also the emergence of stakeholders outside HC institutions made health data management possible to become an arena for contesting interests among them.

During consultation with doctor through digital platform, patients or users must enter all the medical symptoms they feel so that the doctor can diagnose the disease. On one hand, this opened new opportunities and innovative ways to improve health and healthcare delivery (Paglialonga, Lugo, & Santoro, 2018). But on the other hand, a user faced supplying individual personal health information; higher-level sensitive data than other types of data information (e.g., demographic) (Gao et al., 2015). A number of facilities from the HA can be used after the users provide privacy data to the application developer.

To provide personalized health care, the user is requested to fill in personal data page that's very private, such as personal identity, medical records and daily behaviors. Some of types of HA are designed to help users for recording their health-related behaviors, such as daily steps and distance, monthly weight change, diet control, heartbeat, blood sugar and pressure, etc. (Huang, et al., 2019). Based on record health data of users, system in the HA also provided users advice to improve their physical conditions and directly can be consulted with a doctor through the conversation menu. However, users never know the extent to which the protection and security of data privacy and security is in the hands of application developers. With this high-level sensitivity, perceived privacy risk, information sensitivity, importance of information transparency, and regulatory protection , so the information collection of this type may make users feel uncomfortable (Huang et al., 2019). Then, if one person used more than one HA platform, it means that public are massively connected to various HA during the Covid-19 pandemic, which means that millions of people's personal data are also scattered on many HA platforms.

Minister of Health Regulation No. 20/2019 concerning Telemedicine Services leaves unclear arrangement in health apps regulation. The law only concerned about telemedicine among health facilities. There is no legal legitimacy of the provision of health services via health application. In other words, there are legal vacuums that regulate health apps practice in Indonesia. The fact is health applications make unclear claims to be an official partner of the Ministry of Health of the Republic of Indonesia. This way is only to provide trust from users.

However, the government's efforts are currently issuing laws and regulations regarding the protection of personal data, deserve appreciation. This regulation is indeed able to complement the protection of data and information related to health services that already exist in the Health Law No. 36/2009, the Health Workers Law No. 36/2004 and the Medical Practice Law No. 29/2004. The government uses the concept of a personal data controller and a private processor in managing the protection of personal data. This concept when applied in the management of information and data on HC services has implications that require attention. DH services through HA are at risk and have undesirable consequences such as violations of privacy, so organizational governance is needed to align interests among stakeholders. (Bhavnani et al., 2017). Providing a sense of security to users of HA is a big challenge for a HA provider, because the security and privacy of health data records is the most important thing (Beheshti-Atashgah et al., 2020). The fact that health records data is sensitive data

has sparked debate in the public regarding the benefits and risks of using HA (Knoppers & Thorogood, 2017). Based on several studies over the last few years, there has not been much attention to privacy and security issues, so this is a major threat to health data (Beheshti-Atashgah et al., 2020). The displacement of their data and information to HA needs to be protected by the user and guaranteed by the HA provider, given that IoT and AI as HA bases have the potential to be developed for the provision of new HC services (Beheshti-Atashgah et al., 2020).

User trust is vital to build quality and continuity of service (Sims, 2018). Besides, user information and data generated from any interaction, requires guaranteed security and privacy (Kotz et al., 2016; Mooney & Pejaver, 2018; Olaronke & Oluwaseun, 2017). A precondition requires sufficient health literacy, which at least forestalls medical dispute potential among doctor-patient relationships (Dharma, 2020; Oliveira et al., 2018). There are several ways that are commonly used by HA provider to protect user data, including through authentication schemes, authentication via passwords and biometric IDs, Ethereum-cryptocurrency based block chains, data masking, and access control (Abouelmehdi et al., 2017; Beheshti-Atashgah et al., 2020).

Moreover, health data and information from medical records for surveillance are no longer in the realm of the health profession. Technology presents a new space where data and information related to health services become more inclusive. Changes in the management and control of health data and information require a system that can be trusted because trust is the most important component in HC services through digital platforms.

There needs to be a privacy policy and laws to regulate access to data such as personal data, media data, financial data or other highly confidential information. Data collection through the big data system by HA providers is not just a matter of risk and benefit, more than that, providers need to consider the ethical issue of data users (Knoppers & Thorogood, 2017). Indonesia DT in HC becomes more complicated than providing sufficient infrastructure. In its transformation process, Indonesian experiences show comprehensive policy and response needed to reduce many risks.

B. Digital Health Literacy for Risk Society

Through a sociological perspective, DH encourages society to face the risk society era. The risk society is a social transformation in society caused by modernization (digital technology) which is directly correlated with changes in the social system due to growing awareness of many risks (Beck, 1992). The risk is reproduced in an institution e.g., DH services, where the level of risk depends very much on the level of our dependence on DT and the quality of the relationships that occur between society and digital technology. Health literacy about is very important for society to reduce as much as possible the risks that will be faced, such as knowledge gaps, incorrect diagnosis, and data security and privacy, which means people drowning in risk.

Health literacy is a person's ability to access and seek information, process and understand it through critical thinking, all health information, so that person can make good decisions related to his health condition (Smith & Magnani, 2019). While digital health literacy is a person's ability to accumulate health information sourced from the utilization of technology-based digital tools and understand them critically in order to bring optimal benefits to their health (Smith & Magnani, 2019).

In Indonesia, health literacy needs more concern (Gallaway & Bernasek, 2004; Novianty & Rochman Hadjam, 2017; Rahardjo et al., 2015). The role of health literacy is quite important because it is often related to efforts to improve the quality of health services (DeWalt et al., 2004). Sufficient health literacy at least forestalls medical dispute potential among doctor-patient relationships (Dharma, 2020; Oliveira et al., 2018). Legal and ethical issues have not received enough attention from HA users. This condition occurs due to the lower level of literacy of Indonesian society towards data security on the internet and digital platform such as HA.

Health literacy is important to reduce the practices that have been going on for a long

time, including the superiority of HC centers because the workload of HC providers is high so that participatory relationships with patients are less than ideal (Claramita, et al., 2011). Study on patient-doctor interactions in Indonesia showed a paternalistic pattern developed by health care providers (Claramita, et al., 2011; Claramita et al., 2013).

With the existence of health literacy, patients have a bargaining position so that they are not submissive consumers. Therefore, digital health literacy must be an important concern for stakeholders to educate the public about this, including providing protection. The proper policy to set up the DH practice become important because it can be the code of conduct in transformation in HC and increasing DH literacy, whereas today people use HA without a qualified policy infrastructure and legal protection.

In Indonesia, insufficient health literacy especially in ethical issues, triggers some medical disputes that ended up in court (Sidharta, 2011). Besides that, health literacy makes an important role in heading disruption in HC service. The disruption that occurs potentially raising conflictual relations among stakeholders in HC services (Dharma, 2020). Moreover, some stakeholders take hesitant responses to DH transformation (Prawiroharjo et al., 2019). Sufficient health literacy at least forestalls potential medical dispute in doctor-patient relationships (Oliveira et al., 2018). In Indonesia, insufficient health literary especially in ethical issues trigger some medical disputes that ended up in court (Sidharta, 2011).

Consequently, it is important to put more attention on health literacy to deal with the disruption era of HC services. Another context Indonesia, HC service disruption not only meet literacy obstacle but also social and cultural challenge of the paternalistic relation in HC services (Claramita, et al., 2011). This pattern becomes more challenging to perform DT. Such social, political, and cultural aspects in HC digital transformation raises the risk potential. Moreover, there is some gap among DH practice and legal vacuum regulation in HA practice (Latifah et al., 2020). Conflict among stakeholders in digital health became unavoidable or at least in high-risk potential.

As a risk society, it is necessary to have a booster to increase literacy and education about digital health, so that people are not trapped in conflicts with providers due to lack of literacy. Boosters cannot be unilateral by the community, but the state needs to intervene to prepare learning materials and regulations for the community as mitigation and protection efforts.

VI. CONCLUSION

Based on what has been described above, it can be concluded that in Indonesia, the trend of digital transformation in the realm of health services continues to grow even though there is little literature that examines health service applications. This means that the study of application-based health services as one of the representations of the digital transformation trend is the novelty of this study and enriches the repertoire of similar studies.

Meanwhile, digital health apps present opportunities and challenges for the development of health services in Indonesia, including that HA is an emergency exit for health services during the Covid-19 pandemic and is an alternative for equitable distribution of health services. These digital health apps provide hope of reducing blockages in access to HC services, especially in rural areas while encouraging the government to equalize hard health infrastructure. Then, it must be supported by digital infrastructure such as internet access.

However, an important concern for state administrators, business actors, and the public, are improving public health literacy, solving the lack of awareness of sensitive data security issues, and the space for errors in medical practice. Because health services are directly related to human life.

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