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The Role of the Digital Healthcare Platform Ecosystem in Economic, Social and Health Resilience during the COVID-19 Pandemic

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Abstract:

Almost all countries have made various efforts, including using digital technology to mitigate the impact of the COVID-19 pandemic on health, economy, and society that has hit the whole world. This research aims to explore the role of the healthcare digital platform ecosystem in economic, social, and public health resilience. The research employed a qualitative method with content analysis to describe the balance of illustrative extraction and analytical narrative based on primary and secondary data. An online semi-structured open statement questionnaire was distributed through WhatsApp Group (WAG), and 111 respondents' replies were primary data. Secondary data were collected from reviews and ratings of the five most used Indonesian digital healthcare platforms on the Google Play Store. The research findings show that the digital healthcare platform ecosystem plays a role in shaping the economic, social, and health resilience of the community through (a) serving public goods, (b) creating meta-platforms, and (c) optimizing service operations. The platform owner plays a role in standardizing and aggregating the information on healthcare services. Healthcare access becomes affordable and more widely accessible without harming the economic goal of the autonomous complements. The utilization of the healthcare ecosystem complements such as hospitals, doctors, and pharmacies was increased during pandemic COVID-19. This research novelty contribution is on the digital platform ecosystem approach for further development of the healthcare services, especially in the use of big data from the meta-platform of the healthcare ecosystem. Further research is recommended to build a comprehensive ecosystem optimization model so that the dominant platform owner does not hinder the platform's autonomous ecosystem complements in creating community resilience in the post-pandemic era.

Keywords: digital platform ecosystem, community resilience, healthcare, COVID-19.

新冠肺炎大流行期间数字医疗平台生态系统在经济、社会和健康复原力中的作用

摘要:

几乎所有国家都做出了各种努力, 包括使用数字技术来减轻新冠肺炎大流行对全球健康、经济和社会的影响。本研究旨在探索医疗数字平台生态系统在经济、社会和公共卫生弹性中的作用。该研究采用带有内容分析的定性方法来描述基于主要和次要数据的说明性提取和分析性叙述之间的平衡。通过微信群(摇摆)分发了在线半结构化开放式问卷调查, 111名受访者的回复是原始数据。二手数据是从谷歌播放商店中五个最常用的印度尼西亚数字医疗平台的评论和评级中收集的。研究结果表明, 数字医疗平台生态系统通过(a)服务公共产品、(b)创建元平台和(c)优化服务运营, 在塑造社区的经济、社会和健康弹性方面发挥作用。平台所有者在标准化和汇总医疗服务信息方面发挥作用。在不损害自主补充的经济目标的情况下, 医疗保健变得负担得起且更广泛地获得。在新冠肺炎大流行期间, 医院、医生和药房等医疗保健生态系统的使用有所增加。这项研究的创新贡献是在数字平台生态系统方法上, 以进一步发展医疗保健服务, 特别是在使用来自医疗保健生态系统元平台的大数据方面。建议进一步研究建立一个全面的生态系统优化模型, 以便主导平台所有者不妨碍平台的自治生态系统补充在后大流行时代创建社区弹性。

关键词: 数字平台生态系统、社区弹性、医疗保健、新冠肺炎。

1. Introduction

The COVID-19 pandemic is a global disaster that has a multidimensional broadness impact on health, social and economic and lasts almost two years (Byrne et al., 2021; Hadi et al., 2020; Siriopoulos et al., 2021). In Indonesia, the COVID-19 pandemic was first identified in March 2020 until today has had an economic impact, such as a slowdown in the national economic growth of minus 5.5% % (Yudhistira & Jayani, 2020). About 56.8% of the 64.3 million small and medium enterprises with 117 million workers, contributing 57.2% of GDP, are in poor condition. More than 50.5% of them lose their jobs, which has economic and social impacts (Iswara, 2020). Furthermore, 142 thousand people died from 4.2 million COVID-19 cases, and 40 thousand of them were still hospitalized until September 2021 (Worldometer, 2021).

Various efforts have been made by the Indonesia government, such as economic policies by providing a social safety net program, pre-employment cards for 5.6 million workers, basic food cards for 20 million recipients, Program Keluarga Harapan (PKH) for 10 million recipients, rural cash labor-intensive with a budget of IDR 10 trillion (Jayani & Yudhistira, 2020). The government has also provided business incentive assistance for MSME bad debt loans restructuring at banks and other financial institutions, interest subsidies, working capital credit guarantees, final income tax (PPH) borne by the government, investment financing, and tax incentives with a total amount about IDR 244.1 trillion (Iswara, 2020). These government programs have been carried out to reduce the economic impact with large-scale social restrictions (PSBB), community activities restriction (PPKM), free treatment and vaccination programs carried out by the government (Satuan Tugas Penanganan COVID-19, 2021a) in accelerating recovery in the business world and other community activities. On the corporate level

environment, the company participates in overcoming economic and health problems for employees, customers, and the surrounding community through social responsibility (CSR), re-allocation of production capacity needed by the community to overcome the COVID-19 pandemic (Giacomini et al., 2021; Hadi et al., 2020; Sana & Usha, 2021).

The development of digital information technology is also widely used to monitor and control efforts for the COVID-19 pandemic at the national level by the central and regional governments (Satuan Tugas Penanganan COVID-19, 2021b; Jakarta Smart City, 2021). Likewise, the Ministry of Health collaborated with 11 startup companies engaged in health technology (health-tech). Some of them were founded before the COVID-19 pandemic to work together (Ministry of Health of Republic of Indonesia, 2021) to improve and adapt to the needs to obtain healthcare services, consultations, and purchase medicines without having to visit the hospital so that it is safer during the COVID-19 pandemic (Mulyana & Handoyo, 2021).

Several hospitals and health care centers have also used information technology to provide healthcare services to the community, either directly or in collaboration with the above health technology companies (Fajrian, 2020; Solangi et al., 2021). Meanwhile, at the community level, they formed a self-managed and independent task force through economic, health, and education programs based on social capital in the community utilizing information technology in realizing community resilience and helping and protecting local residents, including the SONJO initiative in Yogyakarta (Pradipto, 2021).

The government, companies, communities, and individuals have taken the above efforts and steps to create resilience in the face of the COVID-19 pandemic. Likewise, many academic studies have been carried out in creating community resilience. However,

there is still limited research on the role of digital healthcare platforms in building healthcare community resilience. With this background, this study aims to explore the role of the digital healthcare platform ecosystem in building community resilience in the health, economic and social during the COVID-19 pandemic.

Based on the literature review discussed below, this research will explore the role of the digital healthcare platform ecosystem in the community resilience, including the roles of platform owners, platform complements, such as hospital, doctors, pharmacy, insurance, and corporation, and the community and stakeholder value creation in the ecosystem. The multidimensional approach includes economic, social, and health aspects of utilizing digital platforms for health services during the COVID-19 pandemic.

2. Literature Review

2.1. Community Resilience

Resilience research has developed significantly, involving many scientific disciplines and dimensions covering the individual, family, organizational, community, and national levels in health, social, political, economic, cultural, and life security aspects with various definitions, theories, and multidisciplinary empirical research (Southwick et al., 2014). The previous literature review on community resilience was carried out not only for one dimension but also with multidimensionality, using different research methods. It still shows a lack of consistency in the key concepts used to measure community resilience (Saja et al., 2019). One of the most widely referenced definitions of resilience is suggested by Masten (2014), defining it as the ability of a dynamic system to adapt successfully to disturbances that threaten the system's survival, function, or development. Thus, community resilience is a form of a social system resulting from the dynamic continuous interaction of individuals with others, organizations, and the environment.

Furthermore, according to Panter-Brick & Leckman (2013), the process of resilience is carried out by utilizing resources to achieve prosperity in the community (Southwick et al., 2014). Meanwhile, Castleden et al. (2011) stated that community resilience related to the health protection system is a process that connects a series of adaptive capacities in a positive direction after a disturbance which is influenced by economic and social factors. Meanwhile, Norris et al. (2008) explained that community resilience has four main adaptive capacity dimensions: economic capital, social capital, information and communication, and community competence. To build collective resilience, communities must reduce risks and resource inequalities, involve themselves in mitigation, create organizational relationships, enhance and maintain social support, flexible planning, decision-making

skills, and reliable sources of information functioning in the face of the unknown (Norris et al., 2008).

In summary, community resilience is defined as the community system's capacity to absorb disturbances and rearrange the system when changing to maintain or create functions, structures, identities in new conditions by utilizing economic and social capital through a feedback process within the community with appropriate information and communication. Therefore, digital platforms for the healthcare ecosystem are an interesting subject for further exploration of the community resilience system.

2.2. Digital Platform Ecosystem

Digital platforms, in principle, orchestrate supply and demand through the flow of information, goods, and economic values. The digital platform has entered almost all life activities in the last ten years, including digital trading platforms (e-commerce), ride-hailing (location-based sharing economy), financial technology (FinTech), education technology (EduTech), etc., which brought changes in economic transactions, delivering goods and social behavior in society (Isbah & Wibawanto, 2021; Liu et al., 2021; van Dijck, 2020). Furthermore, Hein et al. (2020) on their study proposed that the digital platform ecosystem consists of three core main roles, namely platform ownership, value creation mechanisms, complementary autonomy that co-creates value within the ecosystem beyond the boundaries of one particular organization. The platform owner can be an organization, a consortium with a complement, or peer to peer from the community who has a dominant role in designing and regulating a platform's value creation and transaction mechanisms. In the platforms mentioned earlier, the economic factor is the principal value and goal of the platform owner. However, it also indirectly solves social problems and provides a social impact on the ecosystem (Liu et al., 2021). However, it is different from the digital platform for health services (health-tech). According to Wu et al. (2019), platform owners must consider more complex ecosystem stakeholders, namely the need to position and align the interests of each stakeholder in the health ecosystem as health services are public sector services and essential in people's lives.

In terms of community resilience and digital ecosystem platforms, research conducted by Floetgen et al. (2021) on 577 mobility platforms (ride-hailing), which connects the resilience of economic profit-oriented organizations and the community, is an example of the role of an organization's digital platform in shaping economic resilience in society. This digital platform role can be seen through five digital archetypes: resilience through diversification, the adaptation of business models, serving the public good, creating a meta-platform, and optimizing service operations that interact with social systems (non-digital) socio-technically. Previous research on community resilience uses pre-crisis conditions as a reference for resilience; the research by Floetgen et al. (2021) on the

digital platform ecosystem resilience shows it can form new community resilience different from that before the crisis. However, Floetgen et al. (2021) also show that there is frugality in exploiting limited resources for the benefit of the platform organization, which can also reduce the potential of the ecosystem as a whole to build resilience or the influence of the dominant platform owner.

3. Research Method

The research was conducted using a qualitative descriptive method that describes the use of a digital healthcare platform in creating community resilience using content analysis from primary and secondary data (Creswell, 2019). Primary data was obtained through a survey of 11 digital healthcare platforms' users. Secondary data sources were obtained from reviews and ratings by the digital health service platform users.

The survey was conducted by purposive sampling through an online questionnaire (Microsoft Form) from the researcher's social network (WA Group) during the third week of September 2021. In this survey, the researchers asked semi-structural questions:

- What digital platforms have been used by the respondents?
- How many respondents have been using them?
- How long is the digital health service platform used?
- What features, respondents' suggestions and recommendations to stakeholders are used in the digital health service platform ecosystem?

This survey is then supplemented with secondary form reviews and ratings of the digital health service platforms on the Google Play Store of the five platforms most widely used in the survey. The review and rating data for January 2019 – September 2021 (from before the pandemic until today) were downloaded using the AppFollow application (Figure 1) to see the platform use development before and during the COVID-19 pandemic.

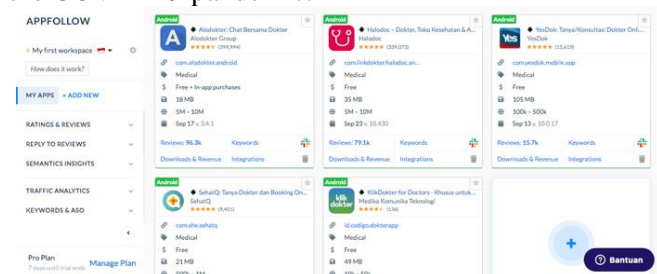


Figure 1. Google Play Store monitoring application (<https://watch.appfollow.io/apps>)

Content analysis used cyberethnography on the community of users of digital health services applications with computer-assisted qualitative data analysis (CAQDA) tools Quirkos cloud (Quirkos, 2021) for coding, categorizing, examining relationships, displaying data and data concluding (Schutt & Chambliss, 2013). With qualitative primary and secondary data, qualitative relationship analysis was

then carried out to explain the economic, social, and health factors of using digital health service platforms in building community resilience during the COVID-19 pandemic.

4. Finding and Discussion

A semi-structured survey and open-ended questions were conducted to determine the role of the health service digital platform ecosystem on economic, social, and public health resilience. One hundred eleven respondents filled out a questionnaire through a Microsoft Form. The respondents' demographics is as follows: people below 35 years old (60%), 36-55 years old (29%), and above 55 years old (11%). By gender, there were 55% of women and 45% of men, among whom there were 53 government officials, state-owned enterprise and private sector employees, 43 students, eight businessmen, and seven unemployed and retired people. The domicile of the respondents is 44 people in Jabodetabek and 67 people outside Jabodetabek. With this composition, more than 57 people (50%) use more than one digital platform, such as digital e-commerce platforms, online motorcycle taxis, digital banking, travel and hotel bookings whose main purpose is economic transactions. Meanwhile, 86% of the respondents said they had used a digital health service platform, 57% of them had used it before the COVID-19 pandemic, and this number increased by 29% during the Covid-19 pandemic.

From the survey conducted by users through a questionnaire with open questions, followed by coding, 307 quotes were coded and grouped into the categories of platform owner (41 quotes), healthcare system (53 quotes), technical systems (38 quotes), social and community systems (23 quotes), and complement platforms such as hospitals (33 quotes), doctors (18 quotes), medical administration (8 quotes), pharmacies (21 quotes), companies, insurance (26 quotes), government, media and other institutions (15 quotes). The coding result analysis using the community resilience model adapted from Floetgen et al. (2021) and the core role of the digital platform ecosystem from Hein et al. (2020) is presented in Table 1.

Table 1. Role of the digital healthcare platform ecosystem (The framework is adapted from Floetgen et al. (2021) and Hein et al. (2020))

The role on Community Resilience	Platform Ownership	Value Creation Mechanism	Complements Autonomy
Serving Publics Goods	Healthcare system with an increase in health service standards, transparency, accessibility for the community, and a complementary platform	Capacity building for health services, economically affordable, equitable distribution of health services	Hospitals, doctors, pharmacies, companies jointly contribute according to service standards, easy access, availability of supplies, and increase in complement utilization

Creating a meta platform	Utilization of Big Data Health, Security and Privacy of Customer Data for continuous improvement of Healthcare Ecosystem	Aggregating and collaborating health information and services to form a more resilient public health preventive system	Contribute to data disclosure for health ecosystem service innovation
Optimizing service operation	Lowering the cost of health ecosystem services while maintaining the quality of health service standards remains excellent	Technical system platform cost efficiency and operational linkage of complements services with the community in the health ecosystem	Ease of joining the platform, efficient service delivery without queuing, easy administration, timely availability of drugs and medical devices as needed, claim processing, and proper insurance allocation.

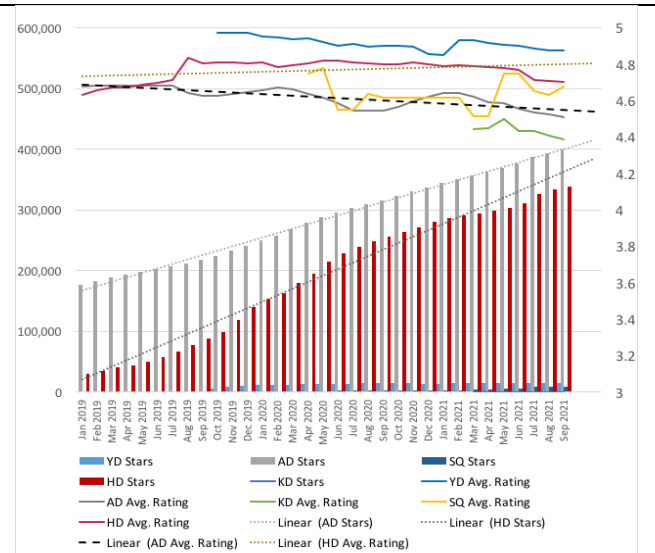


Figure 2. Digital Healthcare Platform Service Rating for Jan. 2019 – Sep. 2021 (Collected from Ratings on the Google Play Store)

Based on the analysis, there are positive factors in the digital healthcare service platform ecosystem, where the platform owner can optimize and collaborate with complementary resources that result in community economic, health, and social resilience. Health services become more affordable and accessible more widely without compromising the economic objectives of the complements by increasing the utilization of existing capacities. This finding supported previous research by Floetgen et al. (2021) on the economic resilience of the digital platform ecosystem community.

Furthermore, the finding also showed that health resilience with the aggregation of public information that is more aware with prevention and a more resilient community. The digital healthcare platform ecosystem is also reshaping social resilience with the contribution of platforms and complements to help people who cannot afford health costs and have difficulty accessing the healthcare system because the healthcare infrastructure (hospital, doctors, and pharmacy) is fully utilized to take care of people hospitalized during the COVID-19 pandemic. This supports previous research that the digital platform ecosystem has a positive influence on community resilience (Floetgen et al., 2021; Hein et al., 2020)

Moreover, an analysis was carried out using secondary data from ratings and reviews of the five most widely used digital platforms in the primary data survey. It aims to find out the negative impact of the dominance of the platform owner. The rating of the platform is presented in Figure 2.

Based on Figure 2, the five digital healthcare platforms most used by the public were Halodoc (HD) and Alodokter (AD). Since the COVID-19 pandemic, the number of users' reviews and ratings on the two applications has grown quite significantly. Halodoc increased from 50 thousand reviews and ratings in early January 2019 to above 300,000 reviews and ratings in September 2021. Likewise, the average rating also increased by around 4.8, which shows increased user satisfaction with the service. However, as indicated by the research of Floetgen et al. (2021), the dominance of the platform owner can result in reduced complementarity to produce optimal community resilience. For observing this impact, as shown in previous research, coding and analysis were carried out on the ratings of the two dominant platforms from users who were dissatisfied or gave negative sentiments with rating scores of 1 and 2 on a scale of 5 during the period January 2019 – September 2021, which are summarized in Table 2.

Table 2. Dominance effect of the digital healthcare platform (Processed from the Google Play Store Reviews and Ratings for Jan. 2019 – Sept. 2021)

Digital Platform	Total Rating	Number of Rating 1 & 2	Percentage of Negative Sentiment
Halodoc	338.707	17.911	5.3%
Alodokter	399.597	36.529	9.1%
Yesdok	15.618	397	2.5%
KlikDokter	136	17	12.5%
SehatQ	9.429	397	4.2%
Total	763.477	55.251	7.2%

Negative Sentiment (368 Quotes):

Platform Owner (103 Quotes): poor service standards, the mechanism that changes unilaterally (from free to paid), old fee refunds, data usage by complements without user consent, vulnerability to user data leakage.

Doctor (72 Quotes): unfriendly service, rushed, inactive, unsatisfactory consultation, unilateral schedule cancellation, busy, long response.

Pharmacy & Healthcare Store (40 Quotes): Unavailable stock, the remote location from the user, long delivery, expired medicine, inappropriate prescription, unilateral cancellation.

Insurance (25 Quotes): forcing insurance sales, using data from the platform owner without the user's permission, canceling insurance is not easy.

Technical Systems (84 Quotes): customer experience in using the application, operation optimization algorithms that are not yet running (location, information, doctor's schedule)

Healthcare System (33 Quotes): a mechanism for regulating business and social services, affordability of services (price, doctors, drugs)

The analysis of the negative sentiment quotes showed a dominance of the platform owner in the platform ecosystem mechanism. It can be changed unilaterally by the platform owner. There was also potential use of private user data by the platform owner for business purposes but ignoring customer privacy data. The example is the use of user data by insurance companies that impose inappropriate products on the customer. In addition, complements (doctors, pharmacies, insurance), which provide bad services and impact the digital service standards of the health ecosystem, also need to be addressed. The healthcare system mechanism also does not guarantee affordability, especially for economically disadvantaged communities and the outermost regions to receive health services. These negative sentiments showed that the digital healthcare platform ecosystem should consider non-economic goals to maximize community resilience.

Thus, although the digital health service platform has been able to build community resilience, especially during the COVID-19 pandemic, the regulation of the role of the platform owner and the orchestration of the autonomous complements ecosystem still needs to be improved. This is consistent with the concerns in previous studies about the dominant role of the platform owner and the role of autonomous complements (Wu et al., 2019; Floetgen et al., 2021; Hein et al., 2020).

5. Conclusion

This research showed that the digital healthcare platform ecosystem plays a role in building and shaping the economic, social, and health resilience of the community through services for the public interest, meta-platform creation, optimization of platform owners' service operations, value creation mechanisms, and autonomous platform complements within the ecosystem. The platform owner role in the healthcare ecosystem has increased healthcare service standards, transparency, accessibility for the community and enhanced the complementary platform, lowering the cost of health ecosystem services while maintaining the excellent quality of health service standards.

Easiness of joining the platform has opened the ecosystem complements such as hospitals, doctors, pharmacies, and companies jointly contributing according to service standards, easy access, availability of supplies and increased complement's capacity utilization, efficiency in service delivery without queuing, allowed easy administration, timely availability of drugs and medical devices as needed, claim processing, and proper insurance allocation. As a result, health services have become more affordable and can be accessed more widely without compromising the economic objectives of the complements by increasing the utilization of existing capacities.

Furthermore, the utilization of big healthcare data, customer security and privacy data has also benefited continuous improvement of the healthcare ecosystem, health resilience with the aggregation of information on the public that is more aware of the prevention and a more resilient community, and social resilience with the contribution of platforms and complements to help people who cannot afford health costs.

On the other hand, there were some challenges still being faced by the digital healthcare platform ecosystem, such as poor service standards of ecosystem complements, the mechanism changing unilaterally (from free to paid), longer time to get fee refunds, data usage by complements without the user consent, and vulnerability to user data leakage. Using the application, the customers experienced such problems, as operation optimization algorithms that were not yet running well (location, information, doctor's schedule), lacking a mechanism for regulating business and social services, and unaffordability of health services (price, doctors, drugs) for remote areas, disadvantaged communities, and the outermost regions.

This study contributes to explaining the role of digital ecosystem platforms in community resilience by using a qualitative analysis method using primary and secondary data obtained from users of digital healthcare platforms through surveys and qualitative cyberethnography by cloud-based computer analysis (CAQDA) from reviews and ratings in the Google Play Store, which can be further developed, especially for digital ecosystem analysis and social behavior. Compared to previous digital platform ecosystem research, this research has described the wider role of the digital platform ecosystem for the economic, health, and social resilience of the community during the COVID-19 pandemic.

This research is limited to a qualitative descriptive analysis that aims to describe the role of digital healthcare platforms on community resilience using content analysis from primary and secondary data, so further research is needed with a quantitative approach. It is recommended to find a comprehensive ecosystem optimization model so that the owner of the dominant platform does not hinder the platform's autonomous complements in creating value for community resilience.

Author's Contribution

Agus F. Abdillah is a Ph.D. (Candidate) in Social Science, Faculty of Social and Political Science, Universitas Diponegoro, Semarang, Indonesia. His contribution to this research was collecting primary data from his social network, collecting secondary data from the Google Play Store using Appfollow, coding and analyzing data using CAQDA Quirkos, and reviewing this research.

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