The Utilization of 'Jogja Pass' Mobile Application as an Effort to Prevent the Spread of COVID-19 in Special Region of Yogyakarta

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Abstract. In order to respond to the increasing number of COVID-19 cases, the government created the Jogja Pass mobile application for screening and tracing as well as supporting the implementation of smart city in Special Region of Yogyakarta. This study aims to identify the utilization of the Jogja Pass, analyze the impact of the Jogja Pass in handling COVID-19, and identify obstacles in the utilization of the Jogja Pass for the application development purposes. This study employed quantitative descriptive and qualitative descriptive methods. The primary data were obtained from in-depth interviews with relevant institutions and through questionnaires to the public. The secondary data were obtained through recapitulation of application data. The results indicated that the users of the Jogja Pass are spread throughout the region of Yogyakarta and it is used at 113 public area points. The Jogja Pass has positive impact on the users and becomes one of the SOPs for health protocols in several public areas. The obstacles in the development of the Jogja Pass include limited human resources and funds, dishonesty of users in filling out the screening test, and the Jogja Pass has been taken down from the Android Play Store.

1. Introduction

Coronavirus belongs to the family of viruses that can be found in animals and humans. This virus can infect human beings and cause various diseases, such as flu to more serious diseases, namely Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS) [1]. It did not take long for this virus to spread to a hundred countries in the world [2]. The COVID-19 virus began to enter Indonesia from March 2020 and the cases continue to grow. COVID-19 cases in Special Region of Yogyakarta might continue to grow if the chain of local transmission continues.

COVID-19 can be spread through droplets. Therefore, people who are in close contact can be transmitted by people who are infected with the virus. People who are close to these infected people have the potential to expand the chain of transmission because most people are not aware of the existence of the virus in their bodies. This indicates that contact tracing is quite important and makes it possible to track the movements of people who have the potential to be infected with the virus [3].

The massive spread of COVID-19 cases in urban areas triggers the technological updates that are needed to minimize population mobility, one of which is health checks, such as self-detection to symptoms [4]. Responding to the increasing number of COVID-19 cases, Special Region of Yogyakarta Province launched the Jogja Pass Mobile Application. This application can be used as an early detection based on a self-assessment that is filled out by the users. The Jogja Pass Mobile Application, which can be downloaded on Android-based smartphones, has been downloaded more than 10,000 times as of November 3, 2020. When compared with the population of Special Region of Yogyakarta, that is, 3,842,932 people [5], the users of the Jogja Pass Mobile Application are only around 0.2% of the total...
population. The reviews given by the users still amount to 78 reviews. This application that was created for the prevention of COVID-19 has screening and contact tracing features that can be utilized by the users.

The COVID-19 pandemic has forced many Indonesians to experience digitalization due to a sudden change from conventional to modern habits by utilizing information and communication technology (ICT) [6]. In facing the COVID-19 pandemic in Indonesia, based on the previous result of study, the implementation of smart city shows the increased use from the side of smart governance through ICT-based services and strengthening public information [7]. In implementing a smart city, one of the important steps is to identify the needs and priorities of the city problems [8]. Smart cities do not only deal with the use and development of technology, but they also deal with how the people in a city manage, their environment in a smarter way [9]. The Jogja Pass Mobile Application is one of the implementations of ICT and smart city in handling COVID-19 in Special Region of Yogyakarta because the current problem being faced is the COVID-19 pandemic.

One of the components that can support the implementation of a smart city is e-Government because it is one of the pillars that must be included in the master plan towards a smart city [10]. One example of e-Government is the development of public service applications. Electronic public service systems can be made by the government together with the private sector. The service can be accessed by the public easily through laptops and mobile communication devices (smartphones, tablets). Electronic public services are created to increase the efficiency and transparency of activities carried out by government institutions. Therefore, works and services to the community become faster and more effective. As one of the public service applications, the Jogja Pass Mobile Application is expected to be a tool for contact tracing for COVID-19 confirmation cases. Therefore, the objectives of this study are (1) to identify the utilization of the Jogja Pass Mobile Application, (2) to analyze the impact of the utilization of the Jogja Pass Mobile Application in handling COVID-19, and (3) to identify obstacles in the utilization of the Jogja Pass Mobile Application for the purpose of application development.

The results of this study are expected to provide both theoretical and practical benefits. The theoretical benefit of this research is to add knowledge in the field of smart cities and can be a reference source for future studies. This research is expected to provide information to the public about Jogja Pass mobile applications and be an input in the evaluation of information and communication technology development in the application of smart cities. In addition, this research can be developed through similar research in the future.

2. Methods
This study employed qualitative descriptive and quantitative descriptive methods. Quantitative descriptive research is employed to describe, explain, or summarize various conditions, situations, phenomena, or various research variables according to events as they are photographed, interviewed, and which can be expressed through documentaries [11]. Meanwhile, qualitative descriptive research is a research that analyzes, describes, and summarizes various conditions and situations from various data in the form of interviews or observations regarding the problems studied in the field [12].

Research with quantitative descriptive method use questionnaires and data documentation from relevant agencies. This study employed open and closed questionnaires, that is, a questionnaire that enables the respondents to fill out answers and questions whose answers have been provided by the researcher. Questionnaires in this study were conducted online through google form. Determination of primary data sources using questionnaires is using purposive sampling with considerations or characteristics used including (1) aged 15-54 years, (2) domiciled in Special Region of Yogyakarta, and (3) using social media. The qualitative descriptive researches are carried out by in-depth interviews with key informants. The determination of the sample is done using purposive sampling because considering
The data analysis technique performed in this study is descriptive analysis. Quantitative descriptive research methods are used to answer the first aims of this study, which is to analyze the impact of the utilization of Jogja Pass Application in handling COVID-19 in Special Region of Yogyakarta. The data processing technique used is editing, which checks the data again and then inputs questionnaire data into the table to convert the data into a number/number form. In addition, another method is the scoring technique. Scoring is the process of determining the score of respondents' answers that is done by making classifications and categories that are suitable depending on the respondent's assumptions or opinions. Furthermore, the processes carried out to process qualitative data include data reduction, data presentation, and conclusion.

3. Results and Discussion

Based on the research questions, there were three things to examine, namely (1) the utilization of the Jogja Pass Mobile Application, (2) the impact of the utilization of the Jogja Pass Mobile Application in handling COVID-19, and (3) obstacles in the utilization of the Jogja Pass Mobile Application. The results of the study are further described in more detail as follows.

3.1. The Utilization of the Jogja Pass Mobile Application

The Jogja Pass Mobile Application was officially launched on August 27, 2020. The Jogja Pass Mobile Application is a breakthrough from the Regional Government of Special Region of Yogyakarta which was initiated in June 2020 to prevent the spread of COVID-19 in Special Region of Yogyakarta. The total downloads from the beginning of its launch, that is, from August 1, 2021 to June 17, 2021, amounted to 26,339 downloads. Figure 1 demonstrates that the download fluctuates, which indicates that the condition is not fixed or changing. It can be seen in Figure 1 that the Jogja Pass Mobile Application was effectively downloaded until January 2021. One of the highest daily downloads is in August 2020, more precisely on August 27, 2020, which was the launch date of this application, and September 2020.

Figure 1. Jogja Pass Mobile Application Download Performance Chart August 2020–June 2021
(Source: Communication and Informatics Office of Special Region of Yogyakarta, 2021)

Figure 2. The Classification Map of User Distribution of the Jogja Pass Mobile Application shows that Special Region of Yogyakarta is dominated by subdistricts with the number of users in the 'medium' category. The subdistricts that have the number of users in the 'high' category are located in Sleman Regency, Yogyakarta, Bantul Regency, and Kulonprogo Regency. Meanwhile, the subdistricts that have
the number of users in the 'low' category is dominated by Gunungkidul Regency. Technology is the most important dimension in breaking the physical geographic limit [13]. The reception of mobile phone internet signals in Gunungkidul Regency is the lowest among other regencies/cities, which is only around 64% [14]. Meanwhile, all subdistricts in Yogyakarta City have received internet signals. Thus, the percentage of the internet signal reception is 100%. The affordability of the internet remains an obstacle in implementing smart city because there are still many people who cannot access the internet or other media so that information and promotions regarding the Jogja Pass Mobile Application cannot be provided evenly.

![Figure 2](image)

Figure 2. Classification Map of User Distribution of the Jogja Pass Mobile Application
According to Figure 3. Graph of Knowledge on and Participation of the Public in the Jogja Pass Mobile Application, there are 54% of respondents who do not know and do not use the Jogja Pass Mobile Application. Subsequently, 23% know but do not use the Jogja Pass Mobile Application, and 23% of the total respondents know and use the Jogja Pass Mobile Application. Thus, it can be said that as many as 46% of the total respondents are aware of the Jogja Pass Mobile Application.
Figure 3. Graph of Knowledge on and Participation of the Public in the Jogja Pass Mobile Application

As many as 24% of respondents stated that they knew about the Jogja Pass Mobile Application through the regional library, namely Grhatama Pustaka Library. Grhatama Pustaka Library is indeed registered on the Jogja Pass Mobile Application to control visitors during the COVID-19 pandemic. In addition to Grhatama Pustaka Library, there are 120 institutions and public areas registered in the Jogja Pass Mobile Application, but not all of them are still active. Only 113 points are still registered as active, whereas 7 other points are considered inactive. The institution points registered in the Jogja Pass Mobile Application are shown in Figure 4. Map of Total Scan of Jogja Pass Mobile Application Users in Public Areas. The map demonstrates that the public areas registered in the Jogja Pass Mobile Application are in Yogyakarta City and several public areas have scanned a lot of visitors’ QR, namely Grhatama Pustaka Regional Library with a total of 25,148 scans. Meanwhile, there are 48 public areas that are only registered but do not apply the mandatory use of the Jogja Pass Mobile Application to their visitors.
Figure 4. Map of Total Scan of Jogja Pass Mobile Application Users in Public Areas

Institutions/locations registered in the Jogja Pass Mobile Application can get the following benefits:

- Automatic scan QR.
- Maximum addition of 1 QR for 5 visitors.
- Information on the current number of visitors (real time).
- Notification if visitors have exceeded the specified capacity.
- Warning if the scanned QR has expired or is invalid.
- Information on statistics of total visitors as well as incoming and outgoing visitors.
- Offline mode.

Institutions/locations registered in the Jogja Pass Mobile Application can monitor the number of visitors so that they do not exceed the specified capacity. This can certainly prevent crowds in an area. In addition, visitors who enter an institution/area are expected to have filled out a screening test which subsequently results in the status of symptoms and exposure to COVID-19. If the results of the screening test show that the user has no symptoms and the risk of exposure is low, the visitors can enter the area/location as shown in Figure 5. The Flow of the Use of the Jogja Pass Mobile Application in Public Areas.
Broadly speaking, the users of the Jogja Pass Mobile Application use the application as needed because this application is not mandatory and is used regularly among the people. According to Figure 6. Graph of the Frequency of the Use of the Jogja Pass Mobile Application, it is found that 16 people stated that they do not necessarily open the Jogja Pass Mobile Application within 1 (one) month. Therefore, it can be said that the majority of respondents rarely use the Jogja Pass Mobile Application. Only 5 respondents stated that they use the Jogja Pass Mobile Application and only 2 respondents stated that they often open the Jogja Pass Mobile Application.
According to Atnan and Imran (2018), one of the factors that influence public participation in the use of Media Lapor Bandung is its ease of use [15]. This section evaluates the level of ease of use of a program for the community. Analysis of the level of ease of use for the Jogja Pass Mobile Application involved 23 respondents who use the application. Table 1 below shows the results of the analysis of the level of ease of use of the Jogja Pass Mobile Application as measured using four statements. Each statement was measured by five levels of agreement with a scale of 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree.

| Ease of use                                           | Approval Rate | Total Score | Average |
|-------------------------------------------------------|---------------|-------------|---------|
| The Jogja Pass Mobile Application is easy to use     | 0 1 4 14 4    | 90          | 3.9     |
| Instructions to use the Jogja Pass Mobile Application is easy to follow | 0 1 4 12 6    | 92          | 4.0     |
| I have not encountered any significant difficulties while using the Jogja Pass Mobile Application | 0 3 5 10 5    | 86          | 3.7     |
| I will continue to use the Jogja Pass Mobile Application in the future | 0 4 9 7 3    | 78          | 3.4     |
| Overall                                               |               | 346         | 3.8     |

The results of the analysis indicate that the users of the Jogja Pass Mobile Application have positive responses to the ease of use of this application. The statement "Jogja Pass Mobile Application is easy to use" got an average of 3.9 according to the responses from the users. Furthermore, the statement "Instructions to use the Jogja Pass Mobile Application is easy to follow" obtained an average of 4.0, which means that the users agree with the statement. The third statement “I have not encountered any significant difficulties while using the Jogja Pass Mobile Application” received an average of 3.7. The lowest average of 3.4 was obtained by the statement "I will continue to use the Jogja Pass Mobile Application in the future". Overall, the users of the Jogja Pass Mobile Application 'agree' that this application is easy to use with an overall average of 3.8. The ease of use of a program which was also examined by Atnan and Imran (2018), namely Media Lapor Bandung, also produced an average score of 3.43, which indicates that the program is easy to use.

3.2. The Impact of the Utilization of the Jogja Pass Mobile Application in Handling COVID-19
The Jogja Pass Mobile Application is considered useful and supports the handling of COVID-19 in Yogyakarta. As many as 4% of respondents stated that the Jogja Pass Mobile Application is not important and less useful for handling COVID-19. On the contrary, 96% of respondents stated that this application is important and useful to support the handling of COVID-19 in Yogyakarta. Furthermore, Figure 6. Graph of the Benefits Felt by the Users of the Jogja Pass Mobile Application is demonstrated as follows.
Based on Figure 7. Graph of the Benefits Felt by the Users of the Jogja Pass Mobile Application, 65% of respondents felt the psychological impact of using the application, namely increasing self-awareness of the spread of the COVID-19 virus. As many as 30% of respondents stated that the Jogja Pass Mobile Application can make the users feel safe from COVID-19 because they can detect themselves as early as possible using the features in this application. Furthermore, as many as 17% of respondents did not feel any benefit from using the Jogja Pass Mobile Application. The COVID-19 pandemic has created new habits for the community, such as to always maintain cleanliness, use masks, and maintain distance. Everyone has a different level of alertness, so the sense of security for each person is also different. This application can increase the sense of security against COVID-19 exposure because the features in it can detect symptoms for each user. The use of smart city applications can increase the effectiveness of providing government services to the public, which is then encouraged to perform these activities, raising their overall levels of productivity, safety, and well-being [16].

After identifying the psychological impact of the utilization of the Jogja Pass Mobile Application for the users, the impact of the utilization of this application in handling COVID-19 in Special Region of Yogyakarta can be further identified on the COVID-19 Handling Task Force Team (Tim Gugus Tugas Penanganan COVID-19) in Special Region of Yogyakarta. The Task Force Team is a team aimed at dealing with COVID-19 and its impacts in Special Region of Yogyakarta through a synergy among institutions established through the Decree of the Governor of Special Region of Yogyakarta No. 64/KEP/2020. According to the personnel structure in the same decree, the Task Force Team consists of directors and executors consisting of several related institutions.

"Yes, it has only a little impact, because there are very few users and there is a tracing function so that it can be tracked if something happens. If there are many users or this application is mandatory to have and use, then it is possible to use tracing results from the application. But the problem is that not everyone is honest in filling out a self-assessment to detect symptoms or exposure, so it is not accurate enough to use. Yes, maybe this application is a complement to the requirements for entering a location/institution in addition to temperature checking and washing hands." (COVID-19 Handling Task Force of Special Region of Yogyakarta, 2021)

Based on the quote above, the Jogja Pass Mobile Application has little impact on handling COVID-19 because it can be used as a complement to health protocols for entering an institution. The Jogja Pass Mobile Application was launched in August 2020 when tourist sites and public areas had begun to reopen. In addition, the factor that causes the government not to use the database of the Jogja Pass Mobile Application is due to the few application users, not all of whom are honest in filling out the application screening test in the application so that it cannot be used as an accurate basis for tracing in handling COVID-19.
3.3. Obstacles in the Utilization of the Jogja Pass Mobile Application

The maintenance of the Jogja Pass Mobile Application is carried out by the Communication and Informatics Office of Special Region of Yogyakarta. The maintenance was done by developing the performance based on reviews and complaints from the users. According to the reviews given by 70 users on the Android Play Store, the Jogja Pass Mobile Application has a rating of 4.8 out of 5. The reviews are reviews from the users from August 2020 to January 2021 because after January 2021, this application is no longer available on the Android Play Store.

The Jogja Pass Mobile Application has been taken down from the Android Play Store because the Jogja Pass Mobile Application gathers users’ personal data. In this case, the Android Play Store is very strict on user privacy policies, coupled with the proliferation of applications related to COVID-19 that are currently widely used. The unavailability of the Jogja Pass Mobile Application on Play Store hinders its development because it causes a decrease in the number of downloaders. However, the Jogja Pass Mobile Application can still be downloaded on the official page of the Jogja Pass Mobile Application, namely https://cared-diy.jogjaprov.go.id/.

The development of the Jogja Pass Mobile Application was hampered due to internal factors, namely the human resources within the management, that is, the Communication and Informatics Office of Special Region of Yogyakarta, which is already busy with other tasks. The management and maintenance are still carried out by the manager, but cannot be maximized as before. The development of human resources in smart city can lead to smart people and smart community [17]. Smart people are citizens who are actively involved in managing and jointly developing the city [18]. Therefore, the manager of the Jogja Pass Mobile Application, which is part of the government, can also determine the success of smart city in Special Region of Yogyakarta.

Another internal factor that hinders the development of the Jogja Pass Mobile Application is limited funds for further development. The problem that is often faced by cities in Indonesia in implementing smart city is budgeting because smart city programs have only recently been popularly developed, whereas the Medium-Term Development Plan (Rencana Pembangunan Jangka Menengah/RPJM) and Long-Term Development Plan (Rencana Pembangunan Jangka Panjang/RPJP) documents have been agreed beforehand [19]. The Jogja Pass Mobile Application was created to handle COVID-19. However, COVID-19 pandemic is an unexpected condition, so the development funds are limited.

The user aspect can also be one of the factors that hinder the development of the Jogja Pass Mobile Application, that is, the dishonesty of users in filling out the screening test. Community participation is indeed the key in the development of public service applications. One of the most highlighted discussions in the smart city concept is the development of information and communication technology. Smart city is a city that has good performance in six characteristics, namely smart people, smart living, smart economy, smart environment, smart governance, and smart mobility [20]. The characteristics of smart people are not only related to the education level of the community, but are also seen from the quality of community social interaction, the quality of public life, and openness to the outside world. Jogja Pass Mobile Application users who are not honest in filling out the screening test certainly affect its management and development because the user participation is considered less serious and of less quality. Therefore, the data from the community screening test results are not used in the tracing carried out by the COVID-19 Handling Task Force of Special Region of Yogyakarta because they are not accurate.

In addition, smart city development in an area is supported by three main related components, namely technological factors, human factors, and institutional factors [21]. These three synergistic factors can lead to smart city programs that run well. The quality of each factor also affects the achievement of smart city programs so that the development of smart city programs in an area may be hampered. However, the Jogja Pass Mobile Application, which was initiated by the Regional Government of Special Region of Yogyakarta, can still run well even though it is hampered by some of the aforementioned factors. The
public can also still make good use of the Jogja Pass Mobile Application as a way to feel safe and avoid COVID-19.

4. Conclusion
The users of the Jogja Pass Mobile Application are spread throughout the region ranging from Special Region of Yogyakarta to outside of the province. In addition to being used by the public, 113 points of public area. The Jogja Pass Mobile Application has positive impact, namely feeling safe because of the screening test feature as an early detection of symptoms and exposure to COVID-19. The Jogja Pass Mobile Application still has a positive impact because it can be one of the SOPs for health protocols in several public areas. Some of the obstacles in the development of the Jogja Pass Mobile Application include (1) that the Jogja Pass Mobile Application has been taken down from the Play Store, (2) that the manager's internal human resources have been busy with other tasks, (3) that there are limited funds for further application development, and (4) that the users do not honestly fill out the screening test.

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References
[1] WHO. (2020). Pertanyaan dan Jawaban Terkait Coronavirus. https://www.who.int/indonesia/news/novel-coronavirus/qa-for-public (Accessed on 10 October 2020)
[2] Khan, S., Shereen, Kazmi, A. (2020). COVID-19 Infection: Origin, Transmission and Characteristics of Human Coronaviruses. Journal of Advanced Research: Elsevier
[3] WHO. (2020). Pertanyaan dan Jawaban: Pelacakan Kontak untuk COVID-19. https://www.who.int/indonesia/news/novel-coronavirus/qa-contact-tracing (Accessed on 10 October 2020)
[4] Rachmawati, R., Pradipta, A.W., dan Choirunnisa, U., (2020). Pemanfaatan Virtual Space pada Masa Pandemi COVID-19 di Perkotaan. Dalam: Rijanta, R. dan Baiquni, M. (editor). Rembug Pageplug: Dampak, Respons, dan Konsekuensi Pandemi COVID-19 dalam Dinamika Wilayah. Badan Penerbit Fakultas Geografi UGM. Yogyakarta.
[5] Badan Pusat Statistik Daerah Istimewa Yogyakarta. (2019). Jumlah Penduduk menurut Kabupaten/Kota di D.I Yogyakarta (Jiwa). 2010-2019. https://yogyakarta.bps.go.id/dynamictable/2017/08/02/32/jumlahpenduduk-menurut-kabupaten-kota-di-d-i-yogyakarta-jiwa-.html (Accessed on 10 October 2020)
[6] Rachmawati, R., Choirunnisa, U., Pambagyo, Z.A., Syarafina, Y.A., Ghiffari, R.A. (2021). Work from Home and the Use of ICT during the COVID-19 Pandemic in Indonesia and Its Impact on Cities in the Future. Sustainability 2021, 13, 6760
[7] Rachmawati, R., Mei, E.T.W., Nurani, I.W., Ghiffari, R.A., Rohmah, A.A., Sejati, M.A. (2021) Innovation in Coping with the COVID-19 Pandemic: The Best Practices from Five Smart Cities in Indonesia. Sustainability, 13, 12072
[8] Rachmawati, R. (2019). Toward better City Management through Smart City implementation.
[9] Rachmawati, R. (2019). ICT-Based Innovation in the Smart City Masterplan and Its Relation to Regional Planning. *IOP Conf. Series: Earth and Environmental Science Vol. 328*

[10] Zanda, N. (2019). *e-Government Dukung Penerapan Smart City di Kabupaten Tangerang*. https://aptika.kominfo.go.id/2019/07/e-government-dukung-penerapan-smart-city-di-kabupaten-tangerang/ (Accessed on 10 October 2020)

[11] Burhan, B. (2005). *Metodologi Penelitian Kuantitatif: Komunikasi, Ekonomi, dan Kebijakan Publik Serta Ilmu-Imu Sosial Lainnya*. Jakarta: Kencana

[12] Wirartha, I.M. (2006). *Metodologi Penelitian Sosial Ekonomi*. Yogyakarta: Andi

[13] Choirunnisa, U., Rijanta, R., Rachmawati. (2021). Digital transformation readiness: How 'Sonjo Pangan' movement assists SMEs' product distributions during COVID-19 Pandemic. *IOP Conference Series: Earth and Environmental Science, Vol 916*

[14] Badan Pusat Statistika D.I. Yogyakarta. (2021). *Provinsi Daerah Istimewa Yogyakarta dalam Angka 2021*. Yogyakarta: Badan Pusat Statistika D.I. Yogyakarta

[15] Atman, N. dan A.I. Imran. (2018). Tingkat Partisipasi Publik Melalui Pemanfaatan Media Lapor di Kota Bandung. *Jurnal Wacana Politik*, 3(2): 150-162

[16] Rachmawati, R., Sari, A.D., Sukawan, H.A.R., Widhyastana, I.M.A., Ghiffari, R.A. (2021) The Use of ICT-Based Applications to Support the Implementation of Smart Cities during the COVID-19 Pandemic in Indonesia. *Infrastructures*, 6, 119

[17] Jannah, H.N. (2018). “Pemanfaatan Aplikasi Gencil (*Government and Smart City Landmark*) dalam Implementasi Konsep Smart City di Kota Pontianak” Skripsi. Fakultas Geografi, Pembangunan Wilayah, Universitas Gadjah Mada, Yogyakarta

[18] Walravens, N. (2015). Qualitative indicators for smart city business models: The case of mobile services and applications, *Telecommunications Policy, Elsevier*, 39(3): 218-240.

[19] Graha, I.M.S. (2021). Proses Kota Denpasar Menuju Smart City. *Jurnal Litbang Sukowati*. 4 (2). 1-13

[20] Giffinger, R. dan H. Gudrun. (2010). Smart Cities Ranking: An Effective Instrument for the Positioning of the Cities? *ACE: Architecture, City and Environment*, 4, 7-26

[21] Nam, T. dan T.A. Pardo. (2011). Conceptualizing smart city with dimensions of technology, people, and institutions. Proceedings of the 12th Annual International Digital Government Research Conference: Digital Government Innovation in Challenging Times, June 2011 (pp: 282–291)