The Smart Village Model for Rural Area (Case Study: Banyuwangi Regency)

A A Aziiza 1,2 and T D Susanto 1,2

1 Information System Department
2 Institut Teknologi Sepuluh Nopember, Surabaya, Indonesia, 60111

E-mail: icha.rizia@gmail.com

Abstract Smart Village refers to a concept developed in rural area that provides solutions to problems occurred and improves the quality of life. The main problems faced by rural areas are poverty, low level of education, and limited access to technology. Smart village concept emerged due to some different characteristics between rural and urban areas. Banyuwangi Regency is one of regions that created smart concept starting from rural area, called smart kampung. So far, smart kampung only focused on public services, which included only a small part of smart city concept. Hence, this research was intended to propose the model of smart village examined through initial interview in village sample of Banyuwangi, literature reviews related to smart city, smart village, and smart rural. Then, the results were confirmed and adjusted to support local regulations. This research created a smart village model that was capable to be a guide for each village to develop towards better future. The proposed smart village model was categorized into 6 dimensions including (1) Governance, (2) Technology, (3) Resources, (4) Village Service, (5) Living, and (6) Tourism. This research is expected to be applied to villages in other Regencies by adjusting the characteristics of each region.

1. Introduction
Smart City-based development has become a trend of city development around the world. The development of Smart City is not just to improve the efficiency of the bureaucracy by utilizing information and communication technology (ICT), but also how to develop the community by making ICT infrastructure and facility as supporting factors or enablers [1]. Smart city is defined as an innovative city on the use of Information and Communication Technology (ICT) and other means to improve its quality of life, efficiency of urban services, and competitiveness, as well as sustainability [2].

As a form of government support on Smart City development in Indonesia, Ministry of Communications and Informatics of Republic of Indonesia in collaboration with Ministry of Home Affairs, Ministry of Administrative and Bureaucratic Reform, Indonesia Ministry of National Development Planning/BAPENNAS, Ministry of Public Works and Human Settlement, Presidential Staff Office initiated the idea of 100 Smart City Movement of “Gerakan menuju 100 smart city”. In 2017, 25 cities/regencies were chosen to be accompanied and mentored by the experts in implementing Smart City concept. In 2019, this program targets as many as 100 cities/regencies in Indonesia that have implemented Smart City development and become models for other regions in Indonesia.
Indonesia is a country with large area, consisting of cities and regencies, urban and rural areas. The need for smart city in urban and rural areas was different, but there were some standards that must be met [3]. The development of the village area was realized through smart village concept [4]. Smart city and smart village are two different cases where the level of the broad are different regional size and problems, so that not all elements in Smart City were able to be applied to all regions in Indonesia [5]. Based on law number 6 of 2014 about the village, the total of the villages is around 73,000 villages in regencies and around 8,000 villages in cities [6]. Villagers were empowered to realize their unique ambitions by picking and choosing the aspects of modernity they wished to incorporate to their communities [7].

Villages were more than cities, so they must take smart way for the improvement and development of the country as a whole [8]. Smart Village was a new concept developed by the researchers from India, N. Viswanadham, and Sowmya Vedula. This concept was developed in 2010, by describing the ecosystem for a village and mapping the procedures of integrated design to build a smart village [9]. The concept of smart village became an alternative for the development of rural areas in the current global era [10]. "Smart village" was a solution to improve people’s quality of life in rural areas [11]. In developing a smart village, the village government must set a goal, what must be developed first and what will become the supporter. The motivation behind "smart village" was technology must act as the development, bring through the education, local business opportunities, improve health and welfare, increase democratic involvement, and improve the villager’s quality of life [12]. This concept can be used as a basis for rural development in Indonesia.

The regency in Indonesia that has begun to innovate in the development of rural area is Banyuwangi Regency. In 2016, the District Government of Banyuwangi launched "Smart Kampung" program which was established through Regent Regulation Number 18 of 2016 concerning the Integration of Village/Urban-Based Work Programs Through Smart Kampung of Banyuwangi. This program designed a village to have an integrated program framework combining the use of optical fiber-based ICT, productive economic activities, creative economic activities, health-education improvement, and poverty alleviation efforts. The governance scope of "smart kampung" program was the implementation of public services for the community.

In 2017, the enactment of Regent Regulation Number 60 of 2017 concerning the Implementation of Smart City Master Plan through Banyuwangi Smart Kampung was done. This regulation was attached to Banyuwangi Smart City Master Plan discussing the reference to short-term, medium-term and long-term development programs. This Master Plan adopted the smart city model developed by Ministry of Communications and Informatics covering 6 dimensions. However, Master Plan had not provided detailed explanation related to the application of "smart kampung" in each village in Banyuwangi Regency.

Some legal products related to the development of "smart kampung" on http://jdih.banyuwangikab.go.id/ have not shown any models related to how "smart kampung" concept can be implemented. One legal product found was only Public Service Standard (SPM) from several villages, precisely there were 7 out of 189 villages whose SPM were on the page, including Ketapang, Cluring, Wringinrejo, Sumbersari, Plampangrejo, and Sempu Villages. Ketapang Village was the fastest growing village compared to other villages, with 35 services in 5 minutes as average standard of service. There were some differences in the number of services provided by each village, and the speed of service also varied. It showed that there were no standards used by all villages in the provision of services. In 2018, "smart kampung" program brought Banyuwangi Regency to the third place among 25 cities/regencies in the evaluation of phase 1 on "Gerakan menuju 100 smart city". It became the reason behind the selection of Banyuwangi Regency as the object of research. The concept of "smart kampung" have same subject with smart village concept. It has an innovation focusing on rural areas.

This research was intended to propose the model of smart village for villages in Banyuwangi Regency. The arrangement of this model was adjusted with the problems and characteristics of the research object, Banyuwangi Regency. The model developed was certainly supported by policies and
regulations existed in order to be implemented optimally and brought positive impacts for the development of villages in Banyuwangi Regency.

2. Methodology

The methods used to arrange a model in this research were done through preliminary interview, literature review of previous studies, books and analysis of supporting regulations. Literature review was taken by selecting journals according to the definition of the model used and the examples of its applications. Then it was continued by an analysis of local regulations dealing with the research object, Banyuwangi Regency. The research methodology can be seen on the figure 1

![Research Methodology](image)

**Figure 1. Research Methodology**

This research carried out the preliminary interview to obtain information related to the general overview of smart kampung implementation in Banyuwangi Regency. The criteria of the informants were Head of Village, TI Staff or service staff and head of department or staff at related department in Banyuwangi Regency. Literature review was done afterwards to find out the definition, model and implementation of smart kampung.

Literature review of this research was taken from the database of electronic journals such as Scopus, IEEE, Emerald Insight, Springer, Science Direct and Google Scholar. The keywords used to find the literature were ‘smart village’ and ‘smart rural’. The keywords used were not specified by the year. The “smart village” keyword shows that there were 78 research documents of Science direct database, 87 research documents of IEEE, 1680 research documents of Google Scholar, 84 research documents of Springer database and 36 research documents of Emerald insight database. Another keyword, “smart rural”; showed that there were 23 research documents of Science direct database, 10 research documents of IEEE, 578 research documents of Google Scholar, 127 research documents of Springer database and 8 research documents of Emerald insight database. In a total, there were 2711 research document search on “smart village” and “smart rural” around the world.

Based on these results, not every document was analyzed. The researcher verified the redundant documents and filtered based on its titles. The selection results collected 138 journal documents referring “smart village” and “smart rural”. These documents then were read and analyzed based on definition, model and examples of application. There were 25 journal documents selected in the final analysis. These documents were then analyzed by using mapping method concerning the objective,
model and examples of its application. The results were confirmed by related regulations to produce smart village model of this research

3. Literature Review

This literature review was taken from books, journals, previous studies related to the smart city and smart village or smart rural.

3.1. Smart City

Smart city was an adaptive city, possessing high capacity to react; the key was on the adaptation and learning capacity, in which the citizens as the main roles in reacting, listening and receiving learning itself, this learning must be done within groups [13]. Smart city concept was operated in complex urban area, combined several complex infrastructures, human behavior, technology, social structure and politic as well as economy [14]. Smart city was more than digital city as it was able to connect the capital city physically with its social and develop the services and infrastructures of a better city by combining IT and politic vision to clear program for the city improvement and its services [15].

Smart city had various models developed by the researchers around the world. The models developed were diverse, adjusted to the needs in certain areas. Smart city firstly was introduced by IBM in 2009 on a journal entitled “A vision of smarter city: How city can lead the way into a prosperous and sustainable future” [16]. Hongkong Smart City Blue Print (2017) states that there were 6 areas of smart cities covering “Smart Mobility”, “Smart Living”, “Smart Environment”, “Smart People”, “Smart Government” and “Smart Economy”. Besides, there were other models mentioned by the researcher, according to Giffinger, there were 6 characteristics of smart city covered smart people, smart environment, smart living, smart mobility, smart governance and smart economy [17].

In addition, smart city model developed in cities of overseas, Ministry of Communications and Informatics launched a model which was contained in the book of smart city guidance. This smart city model had a slight difference from the other model which lied on smart branding dimension to make a city able to display the face of each city through the tourism they had. There were 6 dimensions including: 1) smart government 2) smart economy 3) smart environment 4) smart living 5) smart society and 6) smart branding [1].

3.2. Smart Village

Smart Village was one of concepts for the developed villages in India. This concept was developed by Viswanadham and Vedula in their book entitled “Design of Smart Village” [9]. A smart village model followed a model from smart city as an effect of integrated technology changes to be implemented in the remote areas [18]. The aim of smart village was to help it solve all problems through the implementation of ICT (Information and Communications Technology) and GIS (Geographic Information System) [11].

Nowadays, Indonesia has implemented the concept of “nawacita” for regional development, this program prioritized the development in rural area [10]. Smart village concept focused on the role of technology in building governance and public services. Technology used by Muke and Nilesh in their research was able to be used by people lived in rural area in order to improve their quality of life [12]. The use of technology utilized by villagers was able to make them become more responsive [11]. Smart village model based on the concept of “Access to Information for Everybody” in which ICT (Information and Communications Technology) service was reached easily by villagers through IIIC program [19].

Smart village model developed by N. Viswanadham and S. Vedula was called as smart village ecosystem covering 4 aspects; 1) Institution, 2) Resources, 2) Service Chain and 4) Service delivery technologies & mechanism [9]. Besides, there were 7 focus areas in smart village including economy, ICT, people, governance, environment, living and energy [20]. Smart village existed because of ICT awareness that was able to be utilized as the instrument as the efforts of local economic development [21]. The use of technology became a main factor in creating smart village [22]. Based on Guzaral-Dec,
technology in smart village had important roles such as investing in the infrastructures, business development, human resources, potential and community building [23].

4. Result and Discussion

This section discussed about the preliminary interview, supporting regulation, and the proposed smart village model. Below is the description about the results.

4.1. Preliminary Interview

The preliminary data collection was carried out by the unstructured interviews with 3 respondents consisting of Chief of village, village operator, and government staff in Banyuwangi Regency. Chief of village and IT staff were selected from village that had implemented "smart kampung". According to the Chief of village, "Smart kampung" related to online services, for example, the management of birth and death certificates. The form of smart kampung was a system. An indicator of smart kampung was the existence of a Wi-Fi network at the village office, which could be accessed freely by the villagers. Meanwhile, IT staff explained that "Smart Kampung" program was a program that helped to accelerate and facilitate services to the community like services that was accessed both online and offline. So that people did not need to go to Regency office which made the community easier in assessing the online and offline public services. The next respondent was the government staff, who explained that "Smart kampung" was a regency program that directed villages to be IT literate. Each village had its own autonomy, so that the regency government only provided infrastructure and direction for improving IT, as if the village did not have IT staff, it was permitted to carry out special recruitment of IT staff.

Based on the results of the preliminary interview, it was found that Smart kampung was a Banyuwangi government program for villages that already had supporting regulations. Smart kampung program was under the authority of Community Empowerment Service and Banyuwangi Regency Village. Smart kampung program was closely related to online services to the community. This program accelerated and facilitated services to the community. Banyuwangi Regency Government acted as a provider in supporting infrastructure, while smart kampung program was developed adjusted with the creativity and ability of each village.

4.2. The Regulation about Smart Village

The development of the smart village model was not only compiled from the literature review in previous studies, but there was a need for regulations supporting the implementation of smart kampung. Banyuwangi regency government issued the Regent Regulation No.18 of 2016 concerning the Integration of Village-Based Work Program Through Smart Kampung. Smart kampung was the concept of community development within the community itself to do something smart/wise in overcoming various problems through the availability of resources efficiently in the area inhabited by people who formed their own community associated with local custom and the norm being applied. This regulation states that the scope of work program in Banyuwangi Regency had seven criteria covering (1) public services, (2) economic empowerment, (3) health, (4) education, arts, and culture, (5) improvement human resource capacity, (6) poverty, and (7) legal information [24]. These aspects were taken as guidelines in developing the proposed smart village model.

4.3. Proposed Smart Village Model

The proposed smart village model was analyzed based on 30 selected journals and village regulations. The smart village model consisted of six dimensions: 1) Governance, 2) Technology, 3) Resources, 4) Village Service, 5) Living, and 6) Tourism. The proposed model can be seen on Figure 2.
Figure 2. Proposed Smart Village Model

The model proposed on Figure 2 was analyzed based on six Smart City missions of Banyuwangi Regency as stipulated in the Regent Regulation Number 60 of 2017 concerning the Implementation of Smart City Master Plan through Banyuwangi Smart Kampung. The first dimension was governance. This dimension referred to Mission 1, which was to realize the effective, efficient, communicative, and innovative governance of Banyuwangi Regency government [25]. This dimension focused on developing good governance in internal and inter-village governance. Government played an important role in this dimension because he had a duty to provide good public services [20]. Governance was related to electronic services and social media in order to increase the empowerment and involvement of citizens in public management and transparency of the decision-making process [21]. The implementation of smart village for village development in Indonesia was depend on governance models that were able to implement planned strategies [26]. The governance dimension had three (3) aspects, covering public service, transparency, and policy.

Public services involved the use of ICT to provide services to the public [21]. One of the utilizations of information technology in government was e-government, which aimed to improve the quality and quantity of public services provided to the public, so that the services provided were faster [27]. In addition to public services, the governance dimension must be transparent. Public transparency refers to the openness of information accessed by the public. All information related to the village, resources, potential, budget, agenda, production results, tourism, etc [21]. Public transparency included openness of information and financial transparency. In village governance, an important role of the village head was needed as a decision maker. Leadership, chief of village played a role in encouraging community interaction and coordinating with various institutions. Community interaction was manifested in public participation in policy decision making at the village level [21].

In addition to the government, technology also played an important role in the smart village [22]. The Regent Regulation No. 60 of 2017 considers that smart cities are a concept of city management by utilizing information and communication technology effectively and efficiently to maximize services to the community [25]. Therefore, technology in smart village had important roles such as investing in infrastructure, business development, human resources, potential and building communities [23]. The existence of smart villages was due to the awareness of ICT that could be used as instruments for local economic development efforts [21]. In determining technology for smart villages, technology must
have efficient, durable, inexpensive, easy to use and easy to maintain. Therefore, the use of technology was not only for optimal utilization of resources, but for carrying out sustainable village development [26]. The technologi dimension was divided into two aspects, namely ICT (Information and Communications Technology) and technology that was suitable for rural areas. The technology implemented in a smart village must be in accordance with the needs and abilities of the village itself. ICT was closely related to the concept of "smart". ICT was the core of various smart city and smart village concepts. While the technology used must be suitable to the needs of each village [26].

Besides the quantity of the implementation with technology as the vehicle, status or quality of the resource was the important factor that should be considered in building smart village [28]. According to Regulations no.6 of 2014 article 8 about Village, Village formation should have potential that covers natural resources, human resources, and economic supporting resources [6]. Resources were the village’s resources consisting natural, water and energy, human, economic, as well as infrastructure resources [9] [26]. The quality of human resources in the city influenced the quality of the city [21]. In the proposed model, resource dimension was divided into three aspects that were natural, human and economic resources. The important thing that became the main focus of the village resources was the quality of sand, water, energy, and human resources [28]. Human was the essential part of smart village since they planned the social view in the village through personality, skill, creativity, and social relationship with others [29]. According to research carried out by Rachmawati, there should be a community empowerment activity in the village development [30]. In the aspect of human resource, there were some important things that should be given attention like the education which was expected to be the encouragement of smart village [26]. In addition, the openness of information helped the village become more open to the outside world [29].

The potential of the village resources could be converted into economy involving capital, economic organization, added value, and prosperity in term of economy [31]. Whereas, the focus area in economical services should be developed under the objective to earn village income [20]. In the context of the implementation of village regulation for example, BUMDes (village-owned business entity) would be strong if it was build and managed by village community who had been tested in term of value and moral, and had strong social capital, was able to develop creativity and power to reach capital, network and information [31]. Besides economic services or local economic potential-based services, a series of services were provided in smart village, that were, the basic service aspect [26]. The village basic service was the main service provided to the village community such as education and health services [26] [32].

Smart living was related to the quality of life such as health condition, housing quality, education facilities, social cohesion. Quality Smart living supported civil community and social inclusion in the village [17] [21]. The dimension of living explained about the aspect of life that could be developed in smart village. Living was related to each individual life, this dimension focused on how someone lived their daily-life [20]. In accordance with mission 4 that was actualizing a decent, comfortable, and efficient neighborhood [25], living dimension was divided into two aspects attempting to create safety and comfort, as well as easiness to access public facility.

Smart city of Banyuwangi regency has the 3rd mission of improving regional competitiveness by structuring the face of the city and regional tourism marketing in national and international scopes [25]. Based on that mission, tourism is proposed as one of the dimensions discussed in the proposed smart village model. Tourism was the development of tourism and village promotion. The development of tourism brought a new chance of job, infrastructure, and social connection that more alive into the area [20]. If a village had potential in tourism, smart village should provide service in tourism object, accommodation, and supporting facilities to develop the tourist village [26]. The dimension of tourism was divided into two aspects that were village potential and village branding. The village identity was able to be actualized through the development of the resources starting from food production or even craft [21]. Ministry of Communications and Informatics suggested developing platform and promoting conducive and comfortable trading ecosystem as well as building and promoting the product and service of regional creative industry in marketing the face of the city [1].
Based on the explanation above, there were some indicators that should be fulfilled in developing smart village model. The dimensions, aspects, and indicators, from the proposed smart village model for Banyuwangi regency can be seen on Table 1

**Table 1. The Dimension, Aspect, and Indicators of Smart Village Model**

| No | Dimensions | Aspects | Indicators |
|----|------------|---------|------------|
| 1  | Governance | Public Services | Administration services |
|    |            |         | Utilization of ICTs to provide services to the community |
|    |            |         | Complaint Service |
|    |            | Transparency | Government Information transparency |
|    |            |         | Financial transparency |
|    |            | Policy   | Leadership |
|    |            |         | Public participation |
| 2  | Technology | ICT      | Internet availability |
|    |            |         | IT infrastructure |
|    |            | Appropriate rural technologies | Sensor |
|    |            |         | Cloud Computing |
| 3  | Resources  | Natural resources | Land condition |
|    |            |         | Water availability |
|    |            |         | Energy uses |
|    |            | Financial resources | Agriculture |
|    |            |         | Fishing |
|    |            |         | Livestock |
|    |            | Human resources | Rural community |
|    |            |         | Level of education |
|    |            |         | Openness |
| 4  | Village Services | Essential Services | Health services |
|    |            |         | Education services |
|    |            | Economic Services | Entrepreneurship |
|    |            |         | Job availability |
|    |            |         | Economic Institutions |
|    |            |         | Distribution/Logistic facilities |
|    |            | Security and Convenience | Waste management |
|    |            |         | Environmental protection |
| 5  | Living     | Public Facility | Public Safety |
|    |            |         | Disaster management |
|    |            | Access   | Green space facilities |
|    |            |         | Sport area facilities |
|    |            |         | Banking facilities |
|    |            |         | Road and bridge facilities |
| 6  | Tourism    | Village Potency | Village identity |
|    |            |         | Tourist destinations |
|    |            | Village Branding | Village branding platform |
|    |            |         | Culture and traditions |

**5. Conclusion and Future Work**

Based on the analyzed literature above, it can be concluded that Smart Village was the concept of village development that provided solution of village problems by utilizing technology to provide
services, ease information access and provide energy access effectively and efficiently which was based on the regulation and village regulation to make the community life easier and improve its economy. In conducting the smart village model, there was a need for supporting the regulation to create solid foundation and to be implemented for the entire villages in Banyuwangi. The analysis was also conducted by doing related study to Masterplan Smart City of Banyuwangi Regency. The development of smart village should have specific models that were classified into dimensions, aspects, and indicators to reach the success of the implementation. The detail of the proposed model is on Table 1. The proposed smart village model consisted of 6 dimensions; 1) Governance, 2) Technology, 3) Resources, 4) Village Service, 5) Living, and 6) Tourism. The Banyuwangi District Government as a decision-maker can use this proposed model to develop the entire village so that it will have the same progress. Every village had its own characteristics, so its development model could not be linked to each other. Deep analysis is required toward the needs and problems within the area. Therefore, the model that was developed solved the existing problem and improved the quality of life. This proposed model is expected to be a reference for smart city developers specifically to develop a smart village model in a village that is certainly adapted to the needs of the rural area.

References
[1] Ministry of Communications and Informatics 2017 Buku Panduan Penyusunan Masterplan Smart City 2017 (Jakarta: Organisasi)
[2] S. P. Mohanty 2017 Everything You Wanted to Know About Smart Cities (USA)
[3] Fajrillah, Z. Mohamad, and W. Novarika 2018 Smart city vs smart village (Jurnal Manik Penusa vol 22) no. 1 pp. 1–6
[4] R. Novi and S. Ella 2019 Pengembangan Model Smart Rural Untuk Pembangunan Kawasan Perdesaan di Indonesia (Jurnal Borneo Adm. vol. 15) no. 1, pp. 41–58
[5] R. Rachmawati 2018 Pengembangan Smart Village Untuk Penguatan Smart City Dan Smart Regency (Jurnal Sistem Cerdas vol 01) no. 02 pp. 12–18
[6] Republic of Indonesia 2014 Law Number 6 of 2014 about Village pp. 1–103.
[7] J. Holmes and M. Thomas 2015 Introducing the Smart Villages Concept (International Journal on Green Growth and Development vol. 1) no. 2 pp. 151–154
[8] G. Natarajan and D. L. A. Kumar 2017 Implementation of IoT based Smart Village for the Rural Development (International Journal of Mechanical Engineering and Technology vol 8) no. 8, pp. 1212–1222
[9] N. Viswanadham and S. Vedula 2010 Design of Smart Villages (ISB: The Centre for Global Logistics and Manufacturing Strategies)
[10] E. Syaodih 2018 Smart Village Development (The 9th International Conference of Rural Research and Planning Group) pp. 22–33.
[11] J. Ahlawat 2017 Smart Villages , Information Communication Technology and Geographical Information System (International Journal of Current Trends in Science and Technology vol. 7) no. 8, pp. 20232–20238
[12] A. M. Muke and U. Nilesh S 2017 Use of Advanced Technology in Developing Smart Villages (International Journal of Research in Engineering Science and Technology vol 03) no. 04, pp. 1–6
[13] A. Bozzon, J. Houtkamp, F. Kresin, N. De Sena, and M. de Weerdt 2015 From Needs to Knowledge. A reference framework for smart citizens initiatives (Amsterdam Institute for Advanced Metropolitan Solutions)
[14] A. Gaur, B. Scotney, G. Parr, and S. McClean 2015 Smart city architecture and its applications based on IoT (Procedia Computer Science vol. 52) no. 1, pp. 1089–1094
[15] K. A.-L. Correia, Luis M., Wünstel 2011 Smart Cities Applications and Requirements (Net/Works European Technology Platform)
[16] S. Dirks and M. Keeling 2009 A vision of smarter cities: How cities can lead the way into a prosperous and sustainable future (New York)
[17] R. Giffinger 2007 Smart cities Ranking of European medium-sized cities (Center of Regional Science, Vienna University of Technology vol. 16) pp. 13–18
[18] P. Abinash and J. Josephine 2018 Internet of Things (IoT) for Smart Village (International Conference on Advancements in Engineering, Technology and Sciences (ICAETS)) pp. 813–819.
[19] T. Kamal, F. J. Tuli, M. Hassan, T. H. Rupam, and B. W. Habib 2018 Information, Innovation and Implementation Center (IIIC): Concept towards Smart Village (Researchgate)
[20] M. Mishbah, B. Purwandri, and D. I. Sensuse 2018 Systematic Review and Meta-Analysis of Proposed Smart Village Conceptual Model: Objectives, Strategies, Dimensions, and Foundation (2018 International Conference on Information Technology Systems and Innovation (ICITSI)) pp. 127–133.
[21] A. D. Santoso et al., 2019 Desa Cerdas: Transformasi Kebijakan dan Pembangunan Desa Merespon Era Revolusi Industri 4.0. (Yogyakarta: Center for Digital Society UGM)
[22] A. Singh and M. Patel 2018 Achieving Inclusive Development Through Smart Village (PDPU Journal of Energy and Management vol. 3) no. 1, pp. 37–43
[23] D. Guzal-Dec 2018 Intelligent Development Of The Countryside – The Concept Of Smart Villages: Assumptions, Possibilities And Implementation Limitations (Economic And Regional Studies (Sciendo) vol. 11) no. 3, pp. 32–49, 2018.
[24] Banyuwangi District Government 2016 Local Government Regulation Number 18 of 2016 about the Integration of Village/Urban-Based Work Programs Through Smart Kampung, pp. 1–13.
[25] Banyuwangi District Government 2017 Local Government Regulation Number 60 of 2017 about the Implementation of Smart City Master Plan through Banyuwangi Smart Kampung, pp. 1–5.
[26] S. Ella and R. N. Andari 2018 Developing a Smart Village Model for Village Development in Indonesia (International Conference on ICT for Smart Society (ICISS)), pp. 1–6.
[27] A. B. Marlinthia 2017 Design And Implementation Of Smart Village Mapping Geographic Information System Based Web In The Cinunuk Village (The 2017 IEEE Asia Pacific Conference on Wireless and Mobile (APWiMob)), pp. 66–71
[28] Ramachandra, G. Hegde, S. C. M. D. T. A. Kumar, and V. Swamiji 2015 SMART Ragihalli: Effort towards Self-reliant & Self-sufficient system empowering Man power (rural youth) with Appropriate Rural Technologies (Bangalore: ETR 90, Energy & Wetlands Research Group, CES)
[29] R. Santhiyakumari, N., Shenbagapriya, M., Hemalatha 2016 A Novel Approach in Information and Communication Villages (Humanitarian Technology Conference (R10-HTC), 2016 IEEE Region 10)
[30] D. Rahmawati, H. Sulistyarso, P. G. Ariastita, M. Yusuf, and D. A. Paramasatya 2018 Smart kampung for Surabaya smart city: Criteria redefined (IOP Conf. Series: Earth and Environmental Science 202) pp. 1–7.
[31] Ministry of Village, Developoment of Disadvantaged Regions, and Transmigration, Republic of Indonesia 2015 Indeks Desa Membangun
[32] N. Viswanadham and S. Kameshwaran 2013 Smart Villages and Cities (Ecosystem-Aware Global Supply Chain Management) (Bangalore, India: World Scientific Publishing) pp. 175–192.