

ICT FOR RURAL AREA DEVELOPMENT IN INDONESIA: A LITERATURE REVIEW

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Abstract-- This paper discusses ICTs for the development of rural areas of Indonesia that have been carried out. There were 37 papers related to ICT and rural area reviewed. The ICT model for development that is mostly carried out is telecenter models such as PLIK, MPLIK, Information Village and Integrated Broadband Village. The main problem faced by ICT for development is the problem of literacy, in addition to territorial problems. Both of these problems are challenges for ICTs for future development, especially in rural areas.

Keywords: e-literacy; ICT for Development; Mobile broadband; Rural area; Telecenter.

I. INTRODUCTION

The development of ICT has affected human life. Information becomes easier to obtain. Affordability of information become widespread increasingly. The volume of spread information getting bigger. The presence of the internet makes all sectors of life associated with information technology. The internet has penetrated all sectors of life, not only as a medium of information but also in the sectors of government, education, economy and trade, health, arts, culture and tourism management and also communication and information technology itself.

Compared to other countries, the development of ICT in Indonesia is far below Iceland and Korea which are in first and second. Indonesia ranks 111 in the 2017 ICT Development Index (IDI) ranking, up three ratings from the previous year with an IDI rating of 4.33 [1]. However, compared to other developed countries in Southeast Asia, Indonesia is still lagging behind. Singapore is ranked 18th, Malaysia (63), Philippines (101), Thailand (78), and Brunei Darussalam (53). Indonesia is above from Cambodia (128), Myanmar (135) and Timor Leste (122). The toughest challenge for Indonesia is the condition of the territory of Indonesia which consists of islands and various Indonesian cultural factors.

Indonesia is an archipelago, has many areas that are difficult to reach, especially the borders areas. In addition, the unequal distribution of population, different levels of life and economic levels make the development of ICT infrastructure throughout Indonesia uneven. Telecommunication and internet service providers cannot fulfill infrastructure needs in remote/border areas. Moreover, investment in remote areas is considered less benefits for them. Therefore, the Indonesian government always tries to drain the digital divide by running ICT service

provision programs, especially for left behind, isolated, and outermost area. In Indonesia, this area called 3T (*tertinggal, terpencil, terluar*) region.

This paper doing review how rural area development by ICT in Indonesia has done. The review include describe how ICT for rural area Development in Indonesia is running. How is ICT for Developmnet models, what are the problems and what is the chalanges to future. The reviewed literature is a paper published by the journal of the ministry of communication and informatics.

II. METHOD

The problem to be discussed in this paper is about ICT for development in rural areas. I used a literature review to see how ICT for Development running in Indonesia, especially in rural area. I collect literature from a number of papers published in the journals of the ministries of communication and informatics, Republic of Indonesia (www.jurnal.kominfo.go.id). I select some papers related to ICT in rural area and focus on the publishing period of 2015 - 2108. I found 37 papers related to ICT and rural area. I list journals name and the number of paper those were chosen in Table 1.

TABLE I
Number and Source of Literature

Source (Name of Journal)	e-ISSN	Number of Paper
Bulletin of Posts and Telecommunications	2443-1524	5
<i>Jurnal Penelitian Komunikasi</i>	2460-0172	3
<i>Jurnal Penelitian Pos dan Informatika</i>	2476-9266	6
Journal of Pekommas	2502-1907	8
<i>Jurnal IPTEK-KOM</i>	2527 - 4902	3
<i>Jurnal Studi Komunikasi dan Media</i>	2407-6015	6
<i>Jurnal Penelitian Komunikasi dan Opini Publik</i>	2527 - 4554	2
<i>Jurnal Penelitian Komunikasi dan Pembangunan</i>	2549-0176	4

I examined these papers and then, categorize it into four classes as shown in Table 2. Each literature could be categorized in two or more categories, but I only choose the best

categories that fit with each paper. After categorizing these paper, I conducted review on how ICT was used by people and then, I review the kind of ICT for development models, what problems are faced in developing through ICT, and finally, what the challenges are faced in the future regarding ICT for development, especially in rural areas.

TABLE II
Categorization of Reviewed Literature

Categories	Description	Number of Studies	Percentage
Evaluation	Doing evaluation of ICT Development programs for rural area	9	24,32%
Study	Describing the condition or impact of ICT in rural area	20	54,05%
Conceptual	Proposes a concept, model or solution in ICT for Development for rural area	7	18,92%
Action	Doing action research for develop with ICT	1	2,7%

III. RESULT AND DISCUSSION

A. ICT Utilization

Based on literature, many people in rural areas of Indonesia have used ICT. Many individual communities use the internet. Internet has been used by households and individuals, as well as in education sectors. However, in business sector, only few businesses make use of the Internet. Likewise, in government sector, Internet has not been fully utilized to provide public services through e-Government management [2].

Anton Susanto's research results mention that the Pasar VI Kualanamu village community uses the internet for several activities. However, the majority is only used for media/social networking purposes (35.5%) and playing online games (17.04%). While those who use the internet to study are only 13.3% and seeking information about goods/services is only 12.56% [7].

Muhammad Rustam found that the rural community in Takalar Regency had become familiar with the internet as a new media. it's just that, familiarity is limited to social media [3].

Rukman Pala found that very few respondents were aware of the benefits of accessing the internet. Respondents who felt the benefits of the internet felt the most benefits as material for additional insight or as documentation material [4].

Around 2014-2015, when the MPLIK program was still running, the society in Pinrang Regency generally used the internet through MPLIK services with the aim of visiting social

networking sites. This is related to the trend of internet users in Indonesia who generally use the internet for social activities on social networking sites. Social networking at the time, has touched all circles and many people who spend their time in MPLIK [5].

Internet also used by the village community to make news through the village portal. The news contained the local problems of the village. The Village Portal presents the viewpoint of 'ordinary people'. Villagers have got dominant position. It shows the strength of the village as community that intends to exist, that they are there, they are voiced, and they are empowered [6]. In Special Region of Yogyakarta, some community radios in the rural areas, utilize ICT in operation. Praworo FM, implements the use of computers and internet networks that are managed together with internet information systems in Gadingsari village. Streaming facilities have been operated, but due to technical damage the live streaming cannot be carried out. Trisna Alami FM uses computer devices and the internet as broadcast supporters, but has not been established with the village internet system [7].

ICTs have also been widely used by fishermen. Based on research conducted by Takariani, fishermen in Karawang, West Java, still rely on interpersonal media to access public information compared to the internet. The fishing community only has television and mobile phones to get entertainment and communication. Almost all fishing communities in Karawang have mobile phones. However, it was not conveyed in this study the type of HP that was owned, so it could not be known how much the community had a smartphone that should be used to access the internet [8]. In Bulukumba, South Sulawesi, Fisherman use fish finder (include GPS) to help them for fishing [11].

ICT also used by government. ICT has been utilized by the Talaud Islands government in the implementation of G2G e-government even though it still occupies the first stage, the level of preparation. Furthermore, the process in its implementation is still carried out partially or sectorally in each SKPD [9].

In Panjalu Village, ICT training to the village employees and cadres has held. The utilization of ICT related to the business sector is quite complete and informative. Village government use website to promote agricultural, tourist sites, and handicrafts from SME (Small Medium Enterprises). However, the use of ICTs is still largely at the information stage. only a few are at the interaction stage. so far, the use of ICT in Panjalu Village has been used to distribute or disseminate information about development activities [10].

In economic case, the existence of the internet as an online media is relatively quite popular among MSMEs. The results of Saleh and Hadiyat's research state that the majority (74.3%) of MSME players in Belu Regency already internet literate. Even more than a quarter of MSMEs in Belu District are quite intense or often access the internet [11]. Based on research by Harahap, the utilization of ICT in fulfilling information to household farming industry in Halongonan district are very rare because ICT access is still very low. Internet rarely used by farming community because there is no broadband connection [12].

However, Nugroho's research results mention that, although there is effect between patterns of use of ICTs with economic

improvement, number of people who use ICTs for economic activities just a little [13].

B. Models

Telecenters

Most of ICT for development models in Indonesia, especially in rural area are telecenter. Telecenters are generally defined as places that provide shared public access in the form of information and communication technology to meet educational, social, economic, personal and entertainment needs in society [14].

One of telecenter model in Indonesia is sub-district internet service center, called PLIK (*Pusat Layanan Internet Kecamatan*). References [15], [16], [17], [18] are several papers that discuss the PLIK program. All the literature states that this PLIK program was less successful. many things affect the program's not fully success. discussion of the problems and constraints of the PLIK program will be discussed in the next section.

The other model is mobile PLIK, called MPLIK. MPLIK is PLIK models in mobile version. All devices are placed in a mini bus, then moves to provide internet services in one sub-district area. References [5], [19], [20] are papers that discuss the MPLIK program. Reference [19] mention that MPLIK Programs in Langkat quite effective in providing internet access to rural communities. The success key of this programme are coordination and communication between local government and the vendor/provider, as well as great attention from the Langkat Regent to improve information access to public and also provides an operating budget for MPLIK at the local budget in 2013.

USO programs were developed. Telecenters, no longer centered in sub-districts, but have reached villages, especially border villages. This program is called "Information Village". The establishment of Information Villages aims to reduce the digital divide through equitable distribution of information and provision of access to information and communication technology to rural communities. The information village program has eight elements of activity, namely; (1) *Desa Berdering* (villages with telephone connections), (2) *Desa Pinter* (villages have internet), (3) radio community, (4) empowerment of Community Information Groups (borders) called KIM(s), (5) media centers, (6) TV subscribes, (7) folk media, and (8) M-CAP (Mobile-Community Access Point) or MPLIK. Reference [21] discusses about Information Village. This reference presents research findings that show the existence of media and Village Information activities in Kualanamu's Pasar VI Village. From 8 elements of Information Village, only four elements are still available, namely Media Center, Internet, Telephone and TV subscription. Even then, elements that are still available are no longer used, except TV subscription.

In 2015, the Ministry of Communication and Informatics took the initiative to hold a pilot project "Integrated Broadband Village" which encouraged the rural development model with minimal infrastructure investment, but was able to move the regional economy, at least at the village group level. The model is implemented by deploying infrastructure and broadband access facilities. The number is very limited, but complemented

by the preparation of its utilization, such as ICT volunteers training in rural areas. Its aim to mobilize the economic potential of the village. This program, called DBT (*Desa Broadband Terpadu*), is a new government program that replaces the previous program which was considered unsuccessful. Refferences [22], [23], [24] discusses the DBT program. Studies on six villages in Province of Riau about the beneficiaries of Integrated Broadband Village in border region show that the implementation of DBT is generally not run optimally [23]. While, Reference [24] states that the effectiveness of the device, including conditions, functions, and utilization has a non-significant correlation to connectivity. This research data shows that most DBT devices have been used optimally except in Papua. Refference [22] also states that out of 22 DBT locations in NTT and Papua provinces, only four DBTs have the lowest risk of failure, the rest have moderate and high risk.

Mobile Broadband

Another thing that can be done to develop rural areas through ICT is mobile broadband. Mobile broadband is a phrase that is typically used by a wireless carriers to describe its mobile Internet access service that uses the mobile phone infrastructure, or cellular network.

References [25], [26], [27] have discussed mobile broadband. Wahab's research results state that people are more likely use flexible access and devices such as mobile internet and smartphones to access broadband interners [27]. Another reference also states that in Mindiptana Village, Boven Digoel Regency, Papua, which includes the recipient of the DBT program, broadband internet services are actually available from one of the 2.5G telecommunication providers. In addition, there are also available BTS which are USO programs but are limited to voice services. some people have used the mobile broadband service, although the service is still limited both in terms of speed of access and time of use due to the limited electricity in the area [28].

For telecommunications operators, rural areas may not provide economic value. But, for the government, the availability of telecommunications services including the internet in rural areas is important to provide equal access to information. Actually, w can do something to increase the penetration of cellular customers in the countryside. The survey was conducted by Wahyuningsih and Kusumawati. Based on the results of the survey, each village has potential products that can be developed such as agriculture, plantations and tourism. Telecommunication infrastructure support can help promote village potential and increase product distribution from the village [25].

Technically, Refference [26] has compared the performance of future broadband network solutions with optimized LTE system and a new enhanced Mobile Broadband (eMBB) system, in which assumed to be prospective 5G network. this research have propose any solution and eMBB techniques are fulfilled the single carrier 15 GHz link network is the most efficient.

Application

References [29], [30], [31] provide examples of ICT for development in rural areas through the provision of applications. The role of the private sector in building

ecosystems is carried out by PT. XL Axiata through the mFish and Xmart Village programs that have begun to be realized in a number of regions with the aim of providing access to communication and information technology to areas that are still difficult to reach. With this program, it is expected that local people can develop [25].

References [30] propose a design social media application in agricultural in Indonesia called ASMI (Agricultural Social Media Indonesia). ASMI prototype can be used to supply the need of information and communication in agricultural sector. The prototype of ASMI can be utilised by public, farmers, government, agricultural observer, researcher, lecturer, and experts as communication media in agricultural field. References [31] propose an Administration Management System at rural level. With the existence of administration management system, rural agencies can easily manage and process population data. By implementing RESTful API-based

technology in rural administrative management systems, it can bridge a variety of information access that is connected to the population administration management system at the rural level, also provides data management with a simpler process.

C. Problems

Some ICT problems for development, especially in rural areas revealed in the literature are shown in Table III. I groups problems into four problems. The first is the problem of ICT programs for development which include problems with limited infrastructure, management and communication. Another problem is regarding territories, including the issue of location and culture. Furthermore, the problem of e-literacy includes the community, managers, and the government. As well as public awareness issues.

TABLE III
Problems of ICT for Development in Rural Area

Problems	Description
Programs (lack of infrastructure, management, communication)	Villagers have not used the internet service optimally yet. The reason is lack of infrastructure and public awareness relating to the usefulness of the internet [25].
	The obstacles in the implementation of DBT is a slow internet connection, location DBT less strategic, applications that have not been touched activities of the business community (less attractiveness), the limited availability of electricity, lack of a service, the lack of guidelines and operational guidelines for the implementation of DBT, lack of socialization of Government central or village about DBT program, the limitations in the management and utilization of human resources, low public's understanding of information technology (less awareness), the lack of structured and systematic program to support the use and limited government support village and district [23].
	... minimum access toward television, radio and internet. Broadcast quality from television and radio can not be accepted clearly. Radio ownership and utilization only used by some respondents and internet rarely used by respondents because there is no broadband connection. Information fulfilling to household farming industry are very rare because ICT access is still very low [12].
	Development PLIK Simeulue face obstacles that relates to the choice of location is less precise, mentoring poor, lack of computer knowledge society, and the lack of ICT training for communities as well as inadequate infrastructure [15].
	the management faced some barriers, primarily there were no coordination and control to elements involved in the operation of the information village [21].
Region/Territoriality (included culture)	the development in rural areas is also constrained by the bind rules of customary a village and traditional cultures that refuse acceptance of ideologies or new technologies result from globalization [32].
	Technical issues on the mobile phone's usage are related to organizational (government and private) and cultural ones. Because of the diversity of cultures in Indonesia, this study recommends to use a constructivism paradigm to study mobile phone penetration [33].
	location DBT less strategic,... [23] ... the choice of location is less precise [15].
ICT Literacy	The barriers is predominantly lack of knowledge in internet usage. This factor also causes community internet broadband literacy at level 0 [27].
	They do not have information communication technology gadgets. This findings explain that they are not literate since of precondition of PNPM itself, for example savings-and-loan program in village [13].
	Practically, empowerment efforts are needed in an effort to increase the level of knowledge of coastal villagers about computers,... [34]
	... lack of computer knowledge society, [15].
	Another obstacle is the lack of knowledge of members and the community (farmers) in using ICT [35].
Public Awareness	In general, farmers and fishermen do not have sufficient skills to access information through the internet, they only know the internet as a means of entertainment and social media. So far they have not use internet to help them improve the quality of work [36].
	most of PLIK Bembanglipuro visitors are students, productive age visitors are very few. Thus, the productive age community cannot use PLIK to improve their economic level [16].
	survei result: only 3,8% people use mobile phone for using internet. Villagers have not used the internet service optimally yet [25]. ... some of the obstacles that are quite dominant are feeling not yet needing the internet [37]

D. Challenges

The challenge of ICT for development especially in rural areas is literacy problems. All problems that arise are caused at least because of the problem of literacy. ICT literacy itself, public awareness, cultural issues and the problem of unsuccessful various ICT programs for development, one of the reasons is illiteracy. The limitations in the management and utilization of human resources [23], no coordination and control to elements involved in the operation of the information village [23] is about literacy. If the manager or local government has good e-literacy, management of various programs can be done at least better, as in the village of Panjalu [10]. The lack of productive people who use the internet [18], the use of the internet which is only limited to social media and entertainment [36], feel no needing the internet [38], are all issues of literacy.

Cultural diversity in Indonesia, which causes the development of ICTs is not easy to do, should be dealt with by providing insights through an e-literacy improvement program. Fear of the entry of western culture [38] because the internet can also be overcome by e-literacy programs so that people can understand the impact of good and bad internet, before they are exposed to the internet.

That is why, I capture a phenomenon where the challenge of ICT for development is e-literacy problems. The implementation of a telecenter program such as PLIK, MPLIK, Information Village and DBT, should be supported by e-literacy programs. An area that receives a telecenter program should have been e-literate. Before the telecenter program was held, the smallest local government should have been e-literate. Even after the program was held, there should always be an accompanying literacy development program. Many things can be done for literacy programs. As the ICT volunteers in West Java doing [35]. Activity model of ICT empowerment to a farmer by ICT community, specifically: (1) Meeting and assisting (workshop) about ICT to farmer/farmer group directly/particularly in the use of ICT among farmer. (2) Developing ICT-based service for agriculture. (3) Socialization the benefit of ICT in developing agriculture. (4) Encouraging productivity of agriculture product, and dissemination/promotion the village potency and agricultural product. (5) Cooperating with the village in assisting the use of ICT. References [36] also generate ICT literacy development model that can be adapted to the needs of the target/participants/farmers and fishermen. The proposed ICT literacy development model consists of 5 stages of the cycle. The first is the stage of identification of ICT skills needs and identification of device needs, design procedures for using ICT, training in the use of ICT devices and finally evaluating training and identifying new needs. One example that can be done to improve e-literacy is providing direct technical training regarding the use of ICT devices. As done by Intan in the process of helping teachers use multimedia devices in the teaching and learning process [39].

Besides the issue of literacy, the challenge in the future is the need for a better ICT for development model. The provision of mobile broadband services is the simplest and most preferred model for the community because of the ease of using a mobile device. But besides that, many remote areas do make telecenters a suitable model. It's just that, learning from experience that has

occurred, telecenter programs should be planned more carefully. Telecenter program implementation should be carried out jointly by various parties. Telecenter construction work should be divided to be lighter. There are parties who provide the infrastructure, there are parties who prepare the recipient's environment, there are parties who prepare services and applications that can be provided and there are parties who prepare their HR development programs. Besides, before the program was held on a large scale, prior research was carried out through several pilot projects.

IV. CONCLUSION

ICT has been widely used in rural areas. ICTs are used by individual and household communities, although they are mostly used only for social media and entertainment. In addition to individuals, in some regions, ICTs are also used to support journalism through village portals and community radio. ICT has also been used by farmers and fishermen. In addition, local governments have also used ICTs to promote their regions.

Most of ICT for development models in Indonesia, especially in rural area are the telecenter. The kind of telecenters has held in Indonesia such as PLIK, MPLIK, Information Village and DBT. Most of literatures states that this telecenter program was less successful.

Some ICT problems for development, especially in rural areas are revealed in the literature, such as problem of ICT programs for development (limited infrastructure, management and communication), territories problems (location, culture), e-literacy problems, and public awareness issues.

The challenge of ICT for development especially in rural areas is a literacy problems. ICT literacy itself, public awareness, cultural issues and the problem of unsuccessful various ICT programs for development, one of the reasons is illiteracy. In addition, Indonesia's territorial issues are quite difficult challenges, so an ICT model for development is really planned and mature. In addition, the important thing is that this work must be carried out together.

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