Measuring & Evaluating A Competitive & Smart Border

Village In West Kalimantan Indonesia

Syaiful Muazir,[+] Lestari,[++] & Nurhamsyah Muhammad[3] & Riha Alhamdani Muhammad[4] (Indonesia)

Abstract

Today, most of the border areas include categories of lagging areas with limited infrastructure and less competitiveness. To accelerate border village development, one of the concepts used is a smart village. The smart village concept and its application may increase regional competition. This paper aims to identify the conditions and indications of village competitiveness and the readiness to apply the smart concept. The research activities include the following: (1) scoring the village competitiveness (2) scoring the Information and Communication Technology - ICT literacy (3) exploration of trends in the use of technology, (4) proposed a strategy, and (5) simulate the results. From the findings, Aruk village has a "sufficient" score in the level of village competitiveness and village officer's competence in using ICT. However, the readiness of the community in ICT literacy to support the smart village application is still a low score. The development of Aruk village can then be carried out by focusing on the aspect of social, economic, and health sectors as well as the readiness of the community in using ICT. Some strategies can be applied such as to encourage community facilitation and initiate a smart system. In the future, Aruk village is projected to have an increased level of competitiveness if the strategies have been applied.

Keywords: *Competitive, Smart Village, Aruk Village, West Kalimantan, Indonesia*

[+] Syaiful Muazir, Asst. Professor, Department of Architecture, Faculty of Engineering, Universitas Tanjungpura, Pontianak, Indonesia. email: syaifulmuazir@teknik.untan.ac.id.

[++] Lestari, Asst. Professor, Department of Architecture, Faculty of Engineering, Universitas Tanjungpura, Pontianak, Indonesia. email: lestari@teknik.untan.ac.id.

[3] Nurhamsyah Muhammad, Asst. Professor, Department of Architecture, Faculty of Engineering, Universitas Tanjungpura, Pontianak, Indonesia. email: nurhamsyah@teknik.untan.ac.id.

[4] Riha Alhamdani Muhammad, Asst. Professor, Department of Architecture, Faculty of Engineering, Universitas Tanjungpura, Pontianak, Indonesia. email: Mridhaalhamdani@teknik.untan.ac.id.

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Introduction

Based on the spatial planning law, a strategic area is determined based on the national interests spread across Indonesia. In a national urban system, it is known as a national strategic activity center (PKSN), which is an urban area that has been set up to encourage development in national border areas. Currently, there are 26 national strategic activity centers throughout Indonesia, and five of them are in West Kalimantan, distributed in Paloh-Aruk (Sambas), Jagoibabang (Bengkayang), Entikong (Sanggau), Jasa (Sintang), and Nangabadau (Kapuas Hulu). The conditions of border areas in West Kalimantan are generally still lagging behind, and most of them are included in “the lagging area” category based on the definition issued by the Ministry of Villages, Development of Lagging Areas, and Transmigration (Kemendes). This condition has developed due to limited infrastructure and other life-supporting facilities. For this reason, villages in border areas find it difficult to be compete in terms of relevant supporting sectors of growth such as economic growth rates, human development index, etc. (Kemendes, accessed August 2018).

Previous research (Muazir, 2016) has been found that the tendency of orientation and interaction between the capital city of the regency (developed city) and the border area tends to not be optimal due to several factors including distance, limited regional finances, and the extent of development. As for the lack of optimal relations, it creates limitations in the "transfer" of development results from developed areas to lagging areas (in this case, border areas). An interesting thing that is also found in the relationship or interaction between areas, is the use of technology/information media that tend to have no obstacles in communicating and interacting between areas. Through information technology media (digital), people in border areas can access and interact with communities in other advanced areas without significant obstacles, even though in certain conditions, they are constrained by the availability of telecommunications infrastructure.

This opportunity is in line with the issues of smart city development that utilize digital data compilation to provide information for efficient asset and resource management. In Indonesia, the concept of smart cities and their application has been initiated. Additionally, at the end of 2017, cities that implemented "smart" governance were awarded, which certainly has an impact on the efficiency in governance and the management of the city. Furthermore, in the face of the Industrial Revolution 4.0, there needs to be a "cyber-physical" approach that integrates digital and autonomous systems with connectivity. In their development, smart cities sometimes "hypothesize" to correlate with the increasing competitiveness of a region. Nick's research (2016) has proved that the development of smart cities has a strong positive impact on ranking from a region. In his research, “smartness” in terms of economics, innovation, education and population flexibility became the main clusters driving the competitiveness ranking.

The Industrial Revolution 4.0 is believed to have influenced the future development of the city or region. The development of smart cities in Indonesia is being increasingly undertaken. Along with the problem of border areas, the aforementioned "smart" concept can be the hypothesis in developing village competitiveness on the border through a "smart village" development approach. This ap-

proach may maximize digital data compilation devices according to regional characteristics to make management more efficient in relation to the limitations of distance and area, which ultimately correlate with increasing competitiveness.

According to Ramachandra et al. (2015) the framework for smart village should be adjusted to the availability of resources, both natural and labor, as well as social acceptance from the local community. They continued, the main stage in the development of a smart village is to knowing the existing resources in the village which is then implemented with technological interventions that can support agricultural, plantation and livestock activities. As stated by Ahlawat (2017), the concept of a smart village should be based on conditions or geographic location which can provide an overview of the availability of infrastructure and the effect of technology use on it. According to Shukla (2016) smart village will be interactive and multi-functional which combines many people and activities through the media. One of the most important things is the internet network. With the availability of the internet, it will connect agricultural/plantation business networks between farmers and other parties. Developed by PWC (2017) there are 4 pillars of development issues/problems that can be considered, which are issues regarding physical infrastructure, social issues, environmental issues, and governance. Each pillar of the issues can be "intervened" through technology that can be developed in several forms such as smart building, e-government, e-health, smart school, and others. These forms of intervention are then applied through the latest state-of-the-art technologies such as the Internet of Things (IoT) and Information and Communication Technology (ICT) which provide solutions to problems in the village.

The relationship between a smart (city) approach and the increased regional competition is strong (Garggiulo, C and Tremiteera, 2015). In their research, increased competitiveness can be achieved with “smart” applications that use an ICT approach, effective governance, and demographic strengthening. Also, summarized by them, that the use of ICT and increasing innovation and knowledge are the most important things in a region (city) to improve competitiveness from the aspect of regional "intelligence."

Competitiveness in a certain regional scale (regional) according to USCPC (OECD, 1997) is the ability of a region to produce goods and services that meet or are in accordance with national and even international markets. Besides, residents can also enjoy a sustainable standard of living. According to several sources summarized by Nikolic et al. (2016), regional competitiveness can be defined in several terms and indicators, including (1) the ability to increase the income and welfare of the local community, (2) ability to attract investment, and (3) productivity growth. Scoring or competitiveness measurement can use several variables (Ridwan et al., 2017) including labor productivity, gross regional domestic product per capita, employment rate, and per capita household expenditure. Furthermore, from each of these variables, a comparison can be made. Besides, according to Muta'ali (2015), indicators of village development can be assessed from several aspects such as road conditions, business fields, facilities and infrastructure, labor, and population density.

To strengthen the regional competitiveness, adapted from the ACI (Asian Competitive Institute), competitiveness simulation can be carried out with a "what-if-analysis" approach based on a simulation of increasing 20% of the weakest indicator which then recalculates all competitiveness scores (Tan and Rao, 2015). Regional competitiveness can be influenced by many factors (Bristow, 2010), including the level of technology and industrial development, feasibility of infrastructure, easy access to energy and telecommunications, skilled labor, good business atmosphere, good resource processing skills, education and innovation, strengthening demographics, health and culture, entrepreneurship, investment, and public services (Nikolic et al., 2016; Cuckovic et al., 2013; Tan and Rao, 2015). According to Porter (2013) a city or region can compete by considering several things, including providing a productive business and labor, creating clusters or business/industrial groups, considering strategic locations and networks close to national/international main nodes as well as developing regional policies that are effective and integrated with other vertical policies. Concerning small areas and outside the core of development, according to Thissen et al. (2013) strengthening competitiveness can be done by localizing economic activities with certain uniqueness or specialization in a limited distribution and utilizing local suppliers.

Based on the above considerations, the purpose of this paper is to identify the conditions and indications of border village competitiveness as well as the indication of the community's ability to use communication devices (ICT literacy) as one of the conditions for developing smart villages in the border area to support better competition. Afterwards, it will propose a strategy for smart village development within the framework of efforts to increase village competitiveness

Methods

This research was conducted in the border villages (Aruk Village) of Sambas Regency, West Kalimantan Province. In West Kalimantan, there are five regencies that are directly adjacent to Sarawak, Malaysia. This case study was based on Aruk village in the Sajingan Besar District (Figure 1), and data collection was carried out through field observation, interviews, and surveys.

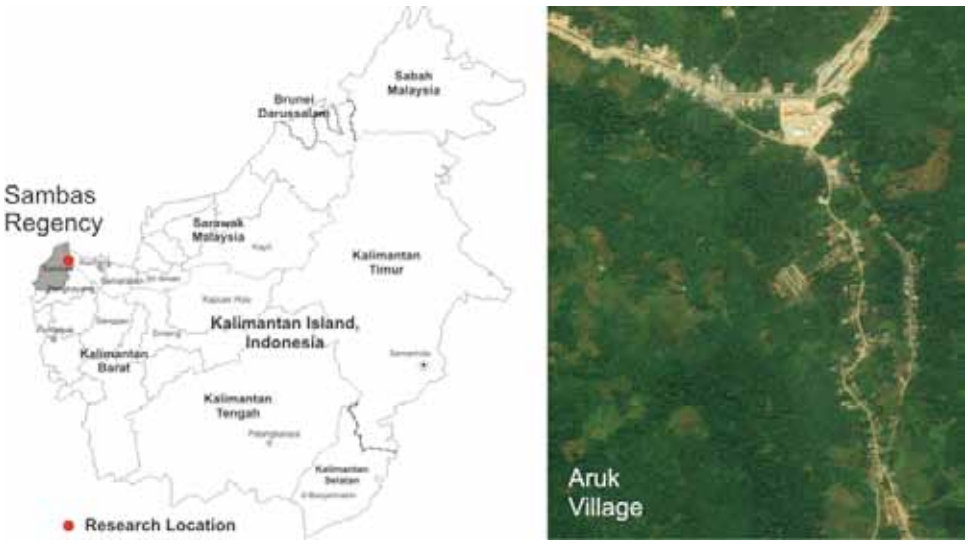

Figure 1. Research Location. Source: Authors, 2019.

There were several stages in the process of conducting the research:

1. Scoring the village competitiveness, including the condition of infrastructure, business fields, public facilities, facilities and infrastructure, labor, and population density.
2. Scoring the smart village indicators (community ICT literacy); scoring was done by dividing the weighting classification (value) starting from the best condition (high parameter) to the worst condition (low parameter).
3. Exploration of trends in the use of technology/development and smart village development study cases to construct discussion by taking into account the conditions of border villages (competitiveness and ICT literacy) and the possibilities of development based on the case study.
4. Proposed a strategy for smart village development in border area by creating the possible improvements or the solutions based on the issues/problems that will be resolved within the framework of competitiveness scoring and smart village pillars.
5. Simulate the results of smart village planning through the "what-if" analysis approach which is carried out by increasing the assumption of an increase in the "index" of competitiveness by a maximum of 20% from the weakest indicator, then recalculating the level of competitiveness and describing its trends.

Findings and Discussion

Aruk Village Profile

Aruk village is located directly close to Sarawak, Malaysia. In this village located a cross country post. The population of Aruk village is 1522, with 877 are above seventeen years old (productive age). The residents of Aruk village come from various ethnic groups including Malays, Chinese, Bugis, and Dayaks who are the most dominant. The residents of Aruk village also follow various religions including Islam, Protestant Christianity and Catholicism which is the most popular. The average person in Aruk village is married with a profession as civil servant, trader, honorarium teacher, village official, contract employee, student and farmer which is the most dominant.

The land in Aruk village is mainly used for plantations and agriculture. The plantations include that of rubber, pepper, and oil palms, while the agriculture is in the form of rice fields and some vegetables and fruits, such as corn, bananas, and cassava. The distribution of Aruk village settlements can be divided into three categories: (1) village settlements that are distributed on Kampung road, (2) pioneer settlements spread on Perintis road and (3) settlements on Border road, which are mostly populated by non-residents of Aruk. The average person's residence is private and built permanently. Aruk village houses generally have one floor with a gable roof that has wooden construction and a zinc covering. The walls are constructed using plastered brick and paint finishing, while the flooring has ceramic finishing.

In terms of infrastructure, Aruk village has two main transportation routes, the new road or Perintis road and Kampung road, both of which have predominately

concrete and asphalt pavement surfaces. Another available infrastructure is a drainage line, which is unevenly distributed only on the shoulder sides of Merdeka road, Border road, and partly on Kampung road. The source of clean water in Aruk village comes from mountain springs that are channeled using pipes to housing units. However, this mountain water piping system is not evenly distributed due to the capacity of mountain water flow. There is also communication as well as social and economic infrastructure: there are three telecommunications towers, two military posts, a credit union office, courier service, a non-permanent market and a post office. Furthermore, Aruk village has several public facilities including elementary school, junior high school, an early childhood program, village mess, village office, multipurpose building, health center, small market, security post, and house of worship (church and mosque). The Aruk village public facilities are distributed at the end of Jalan Perintis and Jalan Kampung. The following figure (Figure 2) can describe the situation of Aruk village.

Figure 2. Aruk Village Condition. Source: Author Observations, 2019.

In measuring the competitiveness of villages, in general, data collection was carried out in several ways, such as observation, interviews, and distribution of questionnaires to residents in Aruk village. The number of respondents is adjusted according to the literature (Krejcie and Morgan, 1970), which is adjusted to the willingness of respondents in the field. In measuring the competitiveness of village, the survey was conducted on 233 respondents (community/villagers), who willing to fill the questionnaires and to be interview. In the survey activities several indicators were used, such as infrastructure, socio-economic and health, and area (Nikolic et al., 2016; Ridwan et al., 2017; Muta'ali 2015, Ridwan et al., 2017; Sutikno & Maryunani, 2007; Suliswanto, 2017; Ministry of Finance, 2014; Huggins el at. 2013; Sinarti et al., 2018; Huovari et al. 2002).

No	Indicators	Classification	Percentage (%)
1	**Gender**	Male	49.24
		Female	50.76
2	**Age**	18-40	57.21
		41-65	34.93
		0-17	7.42
		Other	
3	**Education**	Elementary school	35%
		Senior high school	24%
		Junior high school	19%
		Other	
4	**Occupation**	Farmer	55%
		Student	23%
		Not working	5%
		Other	
5	**Marital status**	Married	63%
		Not married	35%
		Other	
6	**Ethnic**	Dayak	97%
		Malay	2%
		Batak	1%
		Other	
7	**Religion**	Catholic	90%
		Protestant Christianity	5%
		Islam	5%

Figure 3. Table of respondents (community) data.

Based on the below table, the measurement of the competitiveness level in Aruk villages is carried out by dividing 3 level of classifications, such as (1) high competitiveness, (2) medium competitiveness, and (3) low competitiveness. The calculation is carried out by multiplication between the highest (3) and lowest scores (1) of the indicators with the total number of the indicators (37) The highest score is 3 x 37 = 111, and the lowest score is 1 x 37 = 37. Based on the table above, the scoring results for the level of competitiveness is 69 and included in "Medium Competitiveness" category.

No	Indicators	Classification and Weight	Score			Justification of Score
			1	2	3	
	Infrastructure and Facilities					
1	Road material dominant	1. Asphalt (3) 2. Concrete (2) 3. Soil (1)	1	2	3	Concrete roads are more dominant and are located along village roads
2	Education facilities	1. Senior high school (3) 2. Junior high school (2) 3. Elementary school (1)	1	2	3	There is only one Elementary School and Junior high school
3	Public health facilities	1. There is a community health center (3) 2. There is a village health center (2) 3. There are no health facilities (1)	1	2	3	There is only a village health
4	Communication facilities	• There are Post Office and telephone line (3) • There is only public telephone (2) • No Post Office and telephone line (1)	1	2	3	There is a post office and courier office as well as two towers belonging to mobile phone provider
5	Fresh water sources	• Provide by local water company (3) • Local piping (2) • Other (1)	1	2	3	Use of drinking water from local piping 78%, local water company PDAM 21%, and another 1%
6	Domestic fuel sources	• Gas/Electricity (3) • Kerosene (2) • Firewood/Others (1)	1	2	3	Gas consumption 99%, firewood 1%
7	Households' percentage using electricity	• Above/equals to 80% (3) • Between 50% - 80% (2) • Below/equal to 50% (1)	1	2	3	All households are using electricity (100%)
8	Ease of reaching health facilities	• Very easy (3) • Quite easy (2) • Difficult (1)	1	2	3	The closest distance from the house is 16 m, and the farthest distance from the house is 2.67 km
9	Ease of reaching public market	• Very easy (3) • Quite easy (2) • Difficult (1)	1	2	3	The closest distance from the house is 22 m and the farthest distance from the house is 2.32 km
10	Ease of reaching shops	• Very easy (3) • Quite easy (2) • Difficult (1)	1	2	3	On the main road there are shops row and several small shops
11	Ease of reaching education facilities	• Very easy (3) • Quite easy (2) • Difficult (1)	1	2	3	The closest distance from the house is 10 m and the farthest distance from the house is 2.77 km

Figure 4. Table of village competitiveness indicators. Source: Data Collection & Analysis, 2019.

No	Indicators	Classification and Weight	Score 1	2	3	Justification of Score
	Infrastructure and Facilities					
12	Bank and credit facilities	• There are banks and credit/insurance facilities (3) • There is only banks or credit facilities (2) • No facilities (1)	1	2	3	There is a Credit Union Company
13	Public Market	• There is a permanent market and open every day (3) • There is a non-permanent market and open every day (2) • There is a non-permanent (1)	1	2	3	There is a non-permanent market, and open only in Saturday and Sunday
14	Houses percentage with good sanitation	• Above/equals to 80% (3) • Between 50% - 80% (2) • Below/equal to 50% (1)	1	2	3	99% of the houses have used a toilet/septic-tank
15	Telecommunication facilities	• Strong internet connection (3) • Delayed internet connection (2) • No connection/network (1)	1	2	3	There is an internet connection, but not to strong
16	Sport field/facilities	• There is more than 1 sports field (3) • There is 1 sports field (2) • No sports field (1)	1	2	3	There is no sports field
	Social, Economy, and Health					
17	Employment/business field dominant	• Entrepreneur (3) • Public services (2) • Farming (1)	1	2	3	The majority of people work as farmers 55%, traders 1%, civil servants 3%, students 41%, not working 5% and others 13%
18	Medical workers	• There is a doctor (3) • There are Paramedics (2) • there is a midwife (1)	1	2	3	There are 1 nurse and 1 midwife
19	Population density (square kilometers)	• More than 950 people (3) • Between 500 to 950 people (2) • Less than 500 people (1)	1	2	3	Total population are 1522 people, total area is 117.42, population density around 13 people/km2
20	Farmers household percentage	• Below/equal to 50% (3) • Between 50% - 80% (2) • Above/equals to 80% (1)	1	2	3	Farmers households are 55%
21	Average income	• Middle to upper (3) • Fair and enough (2) • Low income (1)	1	2	3	Average income: 1 million/month (44.53%), 1.5 million (17.97%), 2 million (14.84), etc.
22	Percentage of productive age who are unemployed (15 - 64 years old)	• Below/equal to 50% (3) • Between 50% - 80% (2) • Above/equals to 80% (1)	1	2	3	Percentage of not working is 5%
23	Percentage of productive age who are working (15 - 64 years old)	• Above/equals to 80% (3) • Between 50% - 80% (2) • Below/equal to 50% (1)	1	2	3	Total population of productive age is 877 people or 57.6%
24	Average education level at age of 15 and over	• Up to senior high school/college (3) • Up to junior high school (2) • Up to elementary school (1)	1	2	3	The last dominant level of education is: elementary school SD 35%, junior high school 19%, vocational high school 13%, senior high school 24%, college 3%, no school 6%
25	Percentage of workers whose wages/income are above the Regency/ City/Province minimum wage	• Above/equals to 80% (3) • Between 50% - 80% (2) • Below/equal to 50% (1)	1	2	3	The minimum wage is 2.3 million. The percentage of income 2.3 million and above is 15.62%, below 2.3 million is 84.38%
26	Health (average length of life)	• Over/equal to 60 years (3) • Between 20 - 60 years (2) • Under/equal to 20 years (1)	1	2	3	Age above/equal to 60 years is 7.43%, between 20 - 60 years is 77.72%, and under/equal to 20 years is 14.85%
27	Completed education up to high school	• Above/equals to 80% (3) • Between 50% - 80% (2) • Below/equal to 50% (1)	1	2	3	The last dominant level of education is: elementary school SD 35%, junior high school 19%, vocational high school 13%, senior high school 24%, college 3%, no school 6%
28	Completed education until higher education (college)	• Above/equals to 80% (3) • Between 50% - 80% (2) • Below/equal to 50% (1)	1	2	3	The last dominant level of education is: elementary school SD 35%, junior high school 19%, vocational high school 13%, senior high school 24%, college 3%, no school 6%
29	Locally-generated revenue per month	• Above 40 million (3) • Between 20 million - 40 million (2) • Below 20 million (1)	1	2	3	Annual locally-generated revenue per month Rp. 458.0730615 = Rp. 38,172,801/month
30	Investment	• There are many (3) • There are few (2) • None (1)	1	2	3	There is no investment in the village
31	Number of tourist visits	• There are many (3) • There are few (2) • None (1)	1	2	3	No tourist visits
32	Village specific products that have been sold to other areas	• Industrial product (3) • Agriculture product (2) • None (1)	1	2	3	Selling products from the agricultural sector, which are pepper, rubber and oil palm

Figure 4. (Cont.) Table of village competitiveness indicators. Source: Data Collection & Analysis, 2019.

No	Indicators	Classification and Weight	Score 1	2	3	Justification of Score
	Social, Economy, and Health					
33	Home industry	• There are many (3) • There are few (2) • None (1)	1	2	3	There is no home industry
34	Teacher ratio to number of student (for elementary and junior high school students (max 1:20)	• The ratio is in accordance with standards (3) • Only one is in accordance with the standard (2) • The ratio is not accordance with the standard (1) •	1	2	3	For elementary school: The number of teachers is 7 people and students are 198 Ratio = 1: 28 For junior high school: The number of teachers is 13 people and students are 136 Ratio = 1: 10.5
35	Vocational/engineering graduates (high school/college)	• Above/equals to 80% (3) • Between 50% - 80% (2) • Below/equal to 50% (1)	1	2	3	The last dominant level of education is: elementary school SD 35%, junior high school 19%, vocational high school 13%, senior high school 24%, college 3%, no school 6%
	Territorial	•				
36	Percentage of areas prone to disasters (earthquakes, landslides, floods)	• None (3) • Below 50% of the area (2) • Above or equal to 50% (1)	1	2	3	Floods often occur in Perintis road
37	Percentage of area in protected areas	• Below/equal to 50% (3) • Between 50% - 80% (2) • Above/equals to 80% (1)	1	2	3	There are no protected areas
	Total Score	•		**69**		

Figure 4. (Cont.) Table of village competitiveness indicators. Source: Data Collection & Analysis, 2019.

Based on the above table, the measurement of the competitiveness level in Aruk villages is carried out by dividing 3 level of classifications, such as (1) high competitiveness, (2) medium competitiveness, and (3) low competitiveness. The calculation is carried out by multiplication between the highest (3) and lowest scores (1) of the indicators with the total number of the indicators (37) The highest score is 3 x 37 = 111, and the lowest score is 1 x 37 = 37. Based on the table above, the scoring results for the level of competitiveness is 69 and included in "Medium Competitiveness" category.

High Competitiveness	Medium Competitiveness	Low Competitiveness
Score: 86.6 - 111	**Score: 61.6 – 86.5**	Score: 37 – 61.5
Aruk Village Competitiveness Total Score = **69**		

Figure 5. Table of village competitiveness indication. Source: Analysis, 2019.

ICT Literacy Readiness Measurement

In measuring the community ICT literacy/readiness it is related to the use of technology and media, where one of the most important elements is the existence of an internet network and its use (Ahlawat, 2017; Shukla, 2016). To measure readiness to apply the smart village, it is necessary to first measure the literacy or ICT readiness in the community, so that how prepared the village community is in terms of applying the smart village concept is understood. Some indicators were developed based on several studies (Burhan, 2015; Covello, 2010; Johnson, 2007; Catts el al, 2008; Wahyono et al, 2010). In the survey activities, there are 233 residents (community/villagers) respondents were willing to provide information related to research indicators. From the measurements that were made, the indications of ICT readiness in Aruk village can be described as follows:

No	Indicators	Classification and Weight	Score			Justification of Score
			1	2	3	
1	Percentage of households mastering PC/Laptop	Above/equal to 80% (3) Between 50% - 80% (2) Below/equal to 50% (1)	1	2	3	Having a computer = 13%, none = 87%
2	Percentage of households with internet access	Above/equal to 80% (3) Between 50% - 80% (2) Below/equal to 50% (1)	1	2	3	Frequent internet access = 27%, not often 15%, and never 59%
3	Percentage of population listening to TV broadcasts	Above/equal to 80% (3) Between 50% - 80% (2) Below/equal to 50% (1)	1	2	3	Frequently watching TV broadcasts = 92%, rarely watch = 5%, and no TV = 4%
4	Percentage of population listening to radio broadcasts	Above/equal to 80% (3) Between 50% - 80% (2) Below/equal to 50% (1)	1	2	3	Frequently listening to radio broadcasts = 0%, rarely listening to radio = 1%, and no radio = 99%
5	Percentage of population reading newspapers	Above/equal to 80% (3) Between 50% - 80% (2) Below/equal to 50% (1)	1	2	3	Subscribing to newspaper = 1%, not subscribing, but read newspaper = 2%, not subscribing = 97%
6	Percentage of households owning a line-phone	Above/equal to 80% (3) Between 50% - 80% (2) Below/equal to 50% (1)	1	2	3	Yes = 0%, None = 100%
7	Percentage of households owning mobile phone	Above/equal to 80% (3) Between 50% - 80% (2) Below/equal to 50% (1)	1	2	3	Using mobile phone = 74%, no mobile phone 26%
8	Percentage of book (references) ownership	Above/equal to 80% (3) Between 50% - 80% (2) Below/equal to 50% (1)	1	2	3	Owning books = 3%, No books = 97%
9	Percentage of mobile phone application availability	Above/equal to 80% (3) Between 50% - 80% (2) Below/equal to 50% (1)	1	2	3	phones with applications, 51%, no applications 49%
10	Percentage of computer and internet use	Above/equal to 80% (3) Between 50% - 80% (2) Below/equal to 50% (1)	1	2	3	Can use internet = 27%, Not often = 15%, never 59%
11	Percentage of knowledge about the consequences and impacts of ICT use	Above/equal to 80% (3) Between 50% - 80% (2) Below/equal to 50% (1)	1	2	3	Knowing the impact of ICT = 74%, not knowing = 26%
	Total Score			**16**		

Figure 6. Table of community ICT literacy/Readiness Indication. Source: Data Collection & Analysis, 2019.

Based on the above table, the measurement of the ICT literacy/readiness in Aruk villages is carried out by dividing 3 level of classifications, such as (1) very ready, (2) quite ready and (3) not ready. The calculation is carried out by multiplication between the highest (3) and lowest scores (1) of the indicators with the total number of the indicators (11) The highest score is 3 x 11 = 33, and the lowest score is 1 x 11 = 11. Based on the table above, the scoring results for the level of competitiveness is 16 and included in "not ready" category.

Very Ready	Quite Ready	Not Ready
Score: 25.1 - 33	Score: 18.1 - 25	**Score: 11 - 18**
Aruk Village ICT literacy/Readiness Total Score = **16**		

Figure 7. Table of community ICT literacy/Readiness Indication. Source: Analysis, 2019.

After understanding the conditions of ICT literacy/readiness in Aruk village, Based on several studies (Somwanshi et al, 2016; Fannel et al, 2018; PWC, 2017; Ramachandra et al, 2015; Shukla, P Y. 2016), it is generally found that there are 4 village pillars then classified in seven measurement indicator categories that consist of the following: (1) physical infrastructure, (2) energy, (3) sanitation and drainage, (4) socio-economic factors, (5) the environment, (6) community and government, and (7) ICT competencies of the village officer. From the measurements that were made, most of the indicators may include in the Village Competitiveness measure-

ment (figure 3). Based on the smart village pillars, one of the main indictors is an ICT competency of the village officers. To measure this competence, the survey was conducted on 21 respondents as village officials (not included in community/ villagers' respondents), who willing to filled the questionnaires and to be interview. Form the survey that have been made, the measurement of the village officers ICT competencies was found as follows:

No	Indicators	Classification and Weight	Score			Justification of Score
			1	2	**3**	
1	Internet access	• Frequently use (3) • Not often (2) • Never (1)	1	2	3	Often use the internet = 85%, not often = 15%, never = 0%
2	Computer ownership	• Above / equal to 80% (3) • Between 50% - 80% (2) • Below / equal to 50% (1)	1	2	3	Having a computer = 67%, none = 33%
3	Ability to do website search	• Above/equal to 80% (3) • Between 50% - 80% (2) • Below/equal to 50% (1)	1	2	3	Can do a website search = 83%, Cannot do a website search = 17%
4	Ability to use internet services	• Above/equal to 80% (3) • Between 50% - 80% (2) • Below/equal to 50% (1)	1	2	3	Can use internet services = 83%, Cannot use Internet services = 17%
5	Ability to create and manage a blog	• Above/equal to 80% (3) • Between 50% - 80% (2) • Below/equal to 50% (1)	1	2	3	Unable to create and manage a blog
6	Ability to change the computer appearance	• Above/equal to 80% (3) • Between 50% - 80% (2) • Below / equal to 50% (1)	1	2	3	Able to change the computer appearance = 71%, Unable to change the computer appearance = 29%
7	Internet uses	• Use the internet frequently (3) • Use internet, but rarely (2) • Not yet using (1)	1	2	3	Often use the internet = 57%, rarely use = 43%
8	Knowing the positive impact of the internet	• Above/equal to 80% (3) • Between 50% - 80% (2) • Below/equal to 50% (1)	1	2	3	Knowing the positive impact of the internet = 70%, not knowing it = 30%
9	Knowing the negative impacts of the internet	• Above/equal to 80% (3) • Between 50% - 80% (2) • Below/equal to 50% (1)	1	2	3	Knowing the negative impact of the internet = 74%, not knowing it = 26%
10	Cell phone ownership	• Above/equal to 80% (3) • Between 50% - 80% (2) • Below/equal to 50% (1)	1	2	3	Everyone owns a Mobile Phone
11	Ownership of social media applications on mobile phone	• Above/equal to 80% (3) • Between 50% - 80% (2) • Below/equal to 50% (1)	1	2	3	Everyone has social media accounts
12	The most dominant Cell phone Use	• Internet access (3) • Calling and sending messages (2) • Others (games) (1)	1	2	3	Calling = 48%, sending messages = 4%, and internet = 48%
	Total Score			**32**		

Figure 8. Table of village officers ICT competencies indications. Source: Data Collection & Analysis, 2019.

Based on the above table, the measurement of village officer's ICT competencies in Aruk villages is carried out by dividing 3 level of classifications, such as (1) high competence, (2) medium competence and (3) low competence. The calculation is carried out by multiplication between the highest (3) and lowest scores (1) of the indicators with the total number of the indicators (11) The highest score is 3 x 12 = 36, and the lowest score is 1 x 12 = 12. Based on the table above, the scoring results for the level of competitiveness is 32 and included in high competence category.

High Competence	Medium Competence	Low Competence
Score: 28.1 - 36	Score: 20.1 - 28	Score: 12 - 20
Village Officer's ICT Competencies Total Score = **32**		

Figure 9. Table of village officers ICT competencies indication. Source: Analysis, 2019.

Towards A Competitive & Smart Village

From several findings mentioned above, it can be seen that the border village has been "built" through a physical infrastructure developmental approach. This can be seen from the average score of the physical infrastructure in each indicator's categories of measurement in village competitiveness indication. Most of the indication are in the moderate score (score 2). However, when the readiness of the community to support the application of communication technology (ICT literacy/readiness) was considered, it was found that the community is still not ready as can be seen from the low score. In terms of ICT readiness, the public was found to be familiar with the use of televisions as sources of information. Furthermore, the use of and access to the internet is still relatively low, and the use of mobile phones as a communication medium is only for two-way communication (call) and not for the utilization of other technologies such as the internet. However, viewed from the readiness or competence of village officers in Aruk village, it can be seen that in general, village officers have been able to use devices or applications from ICT. These capabilities can be the important thing in helping the community in terms of ICT-based public services.

As per the measurement that has been done, it can be seen that Aruk village as a border village has the potential for physical development/existing infrastructure and the readiness village officers to operate the application of ICT. This needs to be undertaken with the development of non-physical elements so that the quality of human resources also increases. From the perspective of the development of smart villages, the quality of ICT literacy/readiness in the community also needs to be a serious concern. In terms of physical development, the acceleration of society following technological developments, especially ICT – which has become a part of everyday life – to support communication and searching for information needs to be considered.

From the discussion above, it underlined that the community's literacy is still low so that the correlation will be influential in line with the application of smart village concept and the efforts to increase the village competitiveness. In several discussions, it was discussed how the preparedness of implementing smart villages is related to the readiness of the village communities, especially the implementation of technology. According to Natarajan & Kumar (2017) the common lacks of infrastructure in villages are such as the inadequacy of irrigation, electricity, and clean water systems. For this reason, strategies that can be carried out are to provide an appropriate education for rural communities, increase awareness of the importance of using technology (ICT), and improve the skills needed by the market. Andari & Ella (2019) said that the development of rural areas had not been carried out well due to internal factors such as the lack of initiative and community knowledge, especially for technology. They continued, the application of smart

villages did not necessarily have to use the ICT approach, but the emphasis was on the appropriate technology to support the potential of communities, particularly in increasing agricultural and livestock production. Besides, in developing the smart village concept, a participatory approach also needs to be carried out to involve all parties, especially the village community, in determining the technology model that can be applied and learned by the communities.

According to Pwc (2017), one of the challenges in implementing smart villages is how to make "technology" accessible and used by the community. The issue of ease of application of technology is also a significant consideration in the research of Razak et al. (2013). In several studies, it was found that the ability of technology adaptation, including the inability of communities to use technology, was the primary evaluation of a smart village program succeeding or not. In supporting the application of smart villages in village communities, according to Shukla (2016) education for young people in villages is needed to prepare for the application of smart village concepts. For this reason, improvements in the quality of education and ICT literacy are required and are the main starting point for starting the idea of smart villages.

According to Vasisenaho & Sutinen (2010) one of the challenges in the application of ICT technology is its integration in the local culture, which is sometimes different from the technology or culture of the country of manufacture. Usually, people in developing countries do not have enough experience in utilizing technology to support their lives. The social activities of rural communities are often indirect with others and tend to be passive in the use of technology that supports their activities. For this reason, the application of smart villages must at least consider local cultural conditions and local needs. According to Zavratnik, Kos & Duh (2018) To develop smart villages can be done by looking at the potential, assets, and new opportunities that can be developed. From that perspective, the development of smart villages can involve traditional methods that are applied with digital media and telecommunications that aim to support the activities and businesses. The main thing is to ensure that all applications of the technology are in accordance with the capabilities of the community, desires, and cultural environment. These things can be done with a bottom-up planning approach that is integrated with a partnership with other parties involved. Ahlawat (2017) said that the development of smart villages could be done with the Information and Communication Technology (ICT) approach that is under with the existing geographical conditions and existing infrastructure and is supported by the possibilities of interaction between the surrounding areas to create trade and business. Like smart city, smart village concept is to have the same goal, which is to provide solutions to rural problems, such as poverty, health, education, technological backwardness, lack of information, and territorial issues (Subekti & Damayanti, 2019). At current conditions, the use of mobile phones (cell phones) has become common in the community, even in the rural area. So that in applying the concept of "smart village" the use of mobile phones can be crucial in implementing smart village applications because it is easy to use by the village community.

In supporting the development of smart villages, continuous and sustainable efforts need to be made with an emphasis on village potential and bottom-up planning. Also, the synergy between stakeholders needs to be elevated by strengthening each role (Subekti, Damayanti, 2019). Synergy includes efforts by the village government to use technological advances, the role of the community to continue to innovate and participate in encouraging the initiation of technology-based economic development. Concerning to Aruk village, the village officers has been working with residents to make a good impact on village development. In that case, the development of smart villages needs to have leaders who have good vision and strategy, as well as transparency in the village budget (Syaodih, 2018). The village officers then organize the villagers to work together with related parties to develop a smart village. Because one of the principles of smart villages is the synergy between elements based on the use of technology (Herdiana, 2019). In studies conducted in the Aruk village, the development of smart villages can be done continuously, especially on emphasis to increase the "knowledge" or human resources in the village for technology application (Sutriadi, 2018). Currently, Aruk village had strength in adequate infrastructure, since the implementation of priority development policies in the border and outer regions in Indonesia. On that basis, the development of smart villages in Aruk village can be initiated to improve the quality of public services and support the potential of the village.

In terms of its development, a smart village concept and its application that has been developed and discussed previously can be used as a case study. The development of smart village may increase the regional competition (Garggiulo, C dan Tremiteera, 2015). Some smart village case studies were taken through references (literature) from countries such as Indonesia, Malaysia and India. In Indonesia, there are several villages with different approaches, such as Hargotirto Village which implements smart tourism, Kulonprogo Regency which implements smart economy, smart governance, and smart living, based on study carried by Purwanto et al. (2019). In Malaysia there is one, Ks Besting. From the study of Razak et al. (2013), it generates a recommendation for smart village implementation plan. Also, in India there is one village namely Ragihalli panchayat based on the study of Ramachandra et al (2015). Some of the strategies that can be developed are as follows:

1. Develop or initiate a smart system with integrated management through conventional and digital systems, applied in marketing, financial management, and social media.
2. Develop local products for self-consumption or sale which are supported by an online marketplace system.
3. Develop smart governance by using information technology and telecommunications for public services.
4. Develop data and information for local products and tourism potential.
5. Develop smart living that aims to open information and access information in daily life, such as health, security, and public services.
6. Developing sustainable agriculture/plantation systems that lead to water and plant management, information systems, and training for agriculture.

The initiation of smart village development to increase the competitiveness may done through several stages such as (1) community empowerment through literacy, recognition of potential, building technological expertise and promotion, (2) developing smart village systems through increased knowledge and ongoing collaboration and participation of other parties, and (3) develop sustainable information systems that help to solve villagers' problems and support community empowerment through information systems that have been formed through community participation in its development. Based on the result of ICT literacy assessment, the existing conditions, and the case study above, an indication of the initial strategy can be developed. In developing smart villages at the border area, several plans can be initiated through several steps as follows:

No	Aruk Village Condition	Strategy Indication
1	Community ICT literacy is still low	Community empowerment through literacy, recognition of potential, building technological expertise and promotion
2	Adequate infrastructure development	Start to develop or initiate a smart system with integrated management through conventional and digital networks, starting from public services to everyday living (smart living)
4	The competence of the Government Employee (civil servant) that has well managed to delivered public services at the village	Started to develop or initiate a smart system in public services with integrated management through conventional and digital systems
5	The local village product (outcome) from agriculture and natural condition are still not fully utilized	Develop local products for self-consumption or sale which are supported by an online marketplace system. Besides, online (tourism) promotion should be promoting as well
6	Low human resource competitiveness and socio-economic facilities	Developing community empowerment through information systems that have been formed through community participation in its development. Also, it can also be improved facilitation of technology literacy (ICT)
7	Less health workers	Developing e-health ICT based, which developed through online media to support active medical personnel at the village
8	Low level of education	Develop smart living that aims to open information and access information in daily life in order to provide information and education service to community. This strategy is a supporter of the main primary education service policy provide by the government

Figure 10. Table of strategy indications of border smart village (in Aruk Village) development. Source: Analysis, 2019.

Judging from the assessment of the level of village competitiveness in Aruk, the competitiveness has reached a fair category (medium competitiveness) with the strength in the facilities and infrastructure that the government has built in recent years. However, if a detailed look at each category, it can be seen that the social, economic, and health categories have quite a lot of minimum average score (score 1). This is also relevant to the readiness of ICT literacy in the community, the assessment has a low score. In this study, the development of a smart village would be one of the strategies to increase the competitiveness of villages that are relevant to the welfare of rural communities. If a "what-if-analysis" is carried out with the assumption of an increase in the score of 20% (maximum) from the current condition by carrying out development strategies on ICT literacy readiness in the community, the number of increased scores obtained is 20/100 x 16 (current score) = 3.2., so that the projected total score obtained in ICT literacy readiness category is 16 + 3.2 = 19.2. In this analysis and projection, the score can increase into the "quite ready" category.

Conclusion

In the development of border smart villages, Aruk village generally has a "sufficient" score in the level of village competitiveness. The sufficient average score is on the assessment of the availability of facilities and infrastructure that have been built in recent years. However, if seen specifically regarding the readiness of the community in ICT literacy to support the smart village application, the assessment has a low score. On the other hand, from the assessment of the ability or competence of village officers in ICT, the assessment is quite promising with a high score and includes the category of "ready" to apply the smart village concept, especially in the use of ICT. Aruk village can be said to already have strong "assets" in the form of adequate infrastructure and ICT competence for village officers or leaders. The development of Aruk village can then be carried out in the aspect of social, economic, and health sectors as well as the readiness of the community in using technology, especially the literacy/readiness in the use of ICT. Furthermore, it is necessary to encourage community facilitation to prepare the community in using and manage existing infrastructure and prepare to use technology in particular to support the application of the smart village concept, which in turn can help increase the village competitiveness and community welfare. If development plans are carried out in the future, Aruk village is projected to have a high level of competitiveness, especially in the use of ICT "tools" towards a smart and competitive village.

Another contribution of this research is to provide an overview of the indicators in assessing and evaluating a smart village competitiveness in a lagging area or border area. From the summary of several previous studies as well as the indications that have been compiled beforehand, it is found that assessment and evaluation indicators in developing smart villages, including (1) infrastructure and facilities, (2) social, economic conditions and health, and (3) territory. Apart from that, the village can also be assessed for its technology use and media in the network system.

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