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Economic Value of Equalization of Access and ICT Infrastructure for Rural Communities

Manfaat Ekonomis Pemerataan Akses dan Infrastruktur TIK Bagi Masyarakat Perdesaan

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Abstract

The government has initiated access and telecommunication infrastructure equalization program in Indonesia by deploying BTS to provide signals in the frontier, outermost, and least developed (3T) regions and providing rural internet access services. Government investment through the provision of telecommunications and internet access in rural areas is expected to be able to provide economic benefits for improving the people's welfare. This study aims to identify the economic benefits of equitable access and infrastructure in rural areas (mainly 3T villages) with the Ranti Generic IS/IT Business Value Table. Based on the study results, it can be concluded that in ideal conditions, equitable access to the internet and telecommunications infrastructure can contribute directly to cost efficiency for rural communities by reducing distribution costs and telecommunications costs. Also, the use of telecommunications and internet access can improve the people's welfare by increasing business capacity and expanding market segmentation.

Keywords: *Generic IS/IT Business Value, acces and infrastructure, internet.*

INTRODUCTION

Geographically, Indonesia is an archipelagic nation which consists of 16,056 islands (Statistics Indonesia, 2019) with 5 major islands and other smaller group islands which are stretched from Sabang to Merauke islands. Such archipelagic characteristics have resulted in an imbalance of development between regions, leading to gaps, both between urban and rural areas, as well as in the western and eastern regions of Indonesia. 2020 recorded a percentage of 56.7% of the nation's total population live in urban areas, and it is estimated that by 2025, more than 60% of the Indonesian population will live in urban areas (Statistics Indonesia, 2020b). Despite the fact, poverty rate in rural areas is higher, with a percentage of 12.82% compared to urban areas of only 7.38% in March 2020. (Statistics Indonesia, 2020a)

Urban areas are characterised by a specific requirements in terms of population density, percentage of agricultural households, and presence/access to certain facilities. In general, rural areas have limited facilities and infrastructure, those geographically difficult to access. Gaps generally occur in terms of development and availability of infrastructure access between urban rural areas, especially in suburban and remote areas.

The government has launched a strategy to develop Indonesia from the periphery by strengthening regions and villages within the framework of a unitary state, to prioritize development in the 3T (frontier, outermost, and least developed) areas. One of the focuses of Indonesia's development is equitable distribution of infrastructure and access to information and telecommunications.

Farmers and fishermen, the majority of whom live in rural areas, have very limited access to information, especially that from digital media (Masyhur, 2016). Lack of access and supporting infrastructure in rural areas is a major problem. Masyhur (2016) in his study stated that apart from access and infrastructure, promotion of ICT literacy to open access to information is also needed by farmers and fishermen. Literacy promotion is expected to be able to accelerate transfer of technology which will lead to rural business productivity increase. An empirical evidence shows that the increase in internet infrastructure density has a positive impact on household monthly income (Ariansyah, 2018). Therefore, an inclusive infrastructure development program, including access to and infrastructure of ICT in 3T areas, can serve as an accelerator for household economic growth to increase rural communities' welfare.

The government, through the Ministry of Communication and Informatics, has implemented a program to accelerate inclusive ICT development in the 3T regions through Universal Service Obligation (USO) funding. Regulation of Minister of Communication and Informatics No.10 of 2018 on the Implementation of Telecommunication and Informatics Universal Obligation serves as the legal umbrella for the implementation of the Telecommunication and Informatics USO which includes programs of the provisions of ICT infrastructure, ICT ecosystems, and digital economy ecosystems. (Regulation of Minister of Communications and Informatics, 2018)

The universal service obligation funding program in Indonesia is in line with the following success factors ((Digital Regulation Platform, 2020):

- a. Capacity building, sustainability and complementary services: Local content development is classified as one of the priorities for funding.
- b. Flexibility in universal service deployment: The structure and design of the fund is flexible enough to allow the addition of the next new technology as a universal service category (e.g. addition of broadband)

Several USO programs are implemented through the Indonesian Telecommunication and Information Accessibility Body (BAKTI) for equitable access to telecommunications and the internet. Equity programs that directly touch the community include the construction of 3T Signal BTS to ensure blankspot-free areas, and the provision of internet access services through integrated broadband villages. The integrated broadband village is a village equipped with internet access facilities, user devices, content and applications that are in accordance with the characteristics of the local village community (Usman, 2016).

Equitable access and ICT infrastructure programs, especially telecommunications and the internet, have been widely implemented in various countries with the telecentre concept. Telecentres were established to spread knowledge from basic to advanced levels and stimulate the socio-economic status of underprivileged communities (Tabassum & Yeo, 2015).

In Iran, the development of a Rural ICT Center in the form of a public space where people can use computers, the internet and other media, receive training and other communication-related services shows that such ICT center has a slight

impact on increasing household income, e-commerce and access to information related to agricultural input and output prices (Alibaygi et al., 2011)

The Malaysian government program to build telecentres to bridge the digital divide between urban and rural areas has been initiated since 2000. Telecentres are ICT-related service centers, especially for people who do not have the facilities or who do not have the skills to exploit ICT. Telecentre initiatives are based on the hope that rural communities who are competent in ICT skills will be able to improve their economic status, thereby reducing gaps in opportunities between well-informed and uninformed people (Tahir et al., 2016).

Based on these countries' best practices, the program for equitable access to telecommunications and internet in rural areas is expected to be able to provide economic benefits and become a catalyst for improving the people's welfare.

Economic Value of Information System/Information Technology

Several researchers have made efforts to identify and classify the IS/IT business benefits that an organization can gain. Parker in Ranti (2008) divides benefits into three parts, namely: tangible (real/direct and easy to measure benefits), intangible (benefits that can not be touched/indirect and difficult to measure), and quasitangible (benefits that are real but difficult to measure or vice versa).

Ranti Generic Table or Ranti Generic IS/IT Business Benefit table (Ranti, 2008) is a framework that can be used to identify and classify business benefits in Indonesia. Research to determine the economic benefits of IS/IT implementation by using

the Generic Ranti IS/IT Business Benefit Table has been widely carried out. One of them is research to identify the benefits of IS/IT investment based on Ranti's Generic IS/IT Business Value to determine the maturity of IS/IT investment management in the case of a retail company in Indonesia (Made et al., 2017).

Another study related to the economic benefits of IT was conducted to discuss the measurement of benefit quantification of IS/IT implementation in small and medium-sized companies by combining the Val-IT Framework and Ranti Generic IS/IT Business Value (Basuki et al., 2017)

Analysis to see the economic benefits of government program initiatives has been carried out. A study on the benefits of IS/IT in the government was conducted by Wowor dan Karouw (2013) to assess the economic benefits of the North Sulawesi Provincial Government's (Pemda) IT strategic plan as a guideline for IT investment and to quantify the business benefits of IT investment made by the Regional Government. Several other studies have analyzed the economic benefits of government programs, including Bahar (2020) who identified and quantified the benefits of IS/IT in Talaud Regency, and Utomo (2018) who analyzed the economic benefits of investing in the Treasury Dealing Room (TDR) system.

Another study on the government's initiatives related to technology investment was conducted by AS, et.al., (2018) which investigated the economic benefits of IT in the implementation of Warehouse Receipt System and the Commodity Auction market in the agricultural sector. The study employed the Ranti Generic IS/IT Business Benefit Table as a framework for assessing the economic

benefits of implementing Warehouse Receipt System and Commodity Auction market in the agricultural sector. The results of this study indicate that the Ranti Generic IS/IT Business Benefit Table is suitable to be used as a framework to determine the economic benefits of government programs.

METHODOLOGY

This study aims to map the economic benefits of rural infrastructure and internet access equalization program, especially programs initiated by the Ministry of Communication and Informatics. Based on these objectives, the flow of stages in this study is formulated as follows.

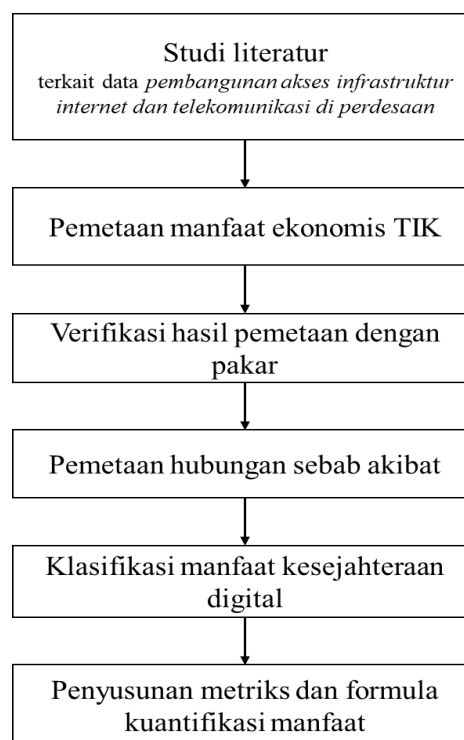


Figure 1. research flowchart

The literature study is conducted to obtain data and information related to the development program for equal distribution of internet and telecommunication access as well as related research. The results of the ICT Empowerment survey for Farmers and

Fishermen (Anandhita et al., 2015) serves as the initial reference data for the use of ICT in this study. Based on the results of a literature study and supported by survey data, the economic benefits are mapped into the Ranti Generic IS/IT Business Benefit Table.

The Ranti Generic IS/IT Business Benefits Table consists of 13 categories (and 74 sub-categories) as follows:

1. Reducing Costs (travel costs, staff/operator/employee costs, meeting costs, service failure fees, application development costs, shipping costs, training costs per employee, return costs for incorrect shipments, money costs, office supplies and printing costs, subscription fees for certain reading materials, or subscription fees per employee, space rental fees, device rental fees, inventory costs, research failure fees).
2. Increasing productivity through job functions restructuring, product knowledge mastery acceleration, ease of analysis, employee satisfaction increase.
3. Accelerating Process (production process, stock procurement process, report preparation process, data preparation process, order inspection process, debt payment process, transaction process, decision making process).
4. Reducing Risks (miscalculated prices, unrecoverable claims, lost inventory, rejected goods, lost data, incorrect data, penalties, loss of potential employees, counterfeiting, administrative fraud, incorrect payments, asset mismanagement).
5. Increasing Revenues led by (increased business capacity, improved report quality, increased customer confidence, expanded market segments, increased other revenue).
6. Improving Accuracy (billing, analysis, data, planning, decisions).
7. Accelerating cash-in led by accelerated delivery of billing.
8. Improving External Service (reduced order cancellations, identified customer problems, added service points, personal service, customer satisfaction).
9. Improving Image led by (improved quality service, large discount offer, complying with regulations, branded system in place).
10. Improving Quality (better supplier/vendor management, work results, services, products).
11. Improving Internal Services (shared services, in accordance with employee rights and responsibilities, employee services, appropriate schedules and training materials).
12. Increasing Competitive Advantage led by formation of business alliances, acceleration of new business opportunities execution, increase of switching costs).
13. Avoiding costs (reserve funds, maintenance costs, loss and late fees).

The results of the mapping are then validated by experts, and then an analysis of the causal relationship is carried out. Based on the analysis of the causal relationship mapping, quantifiable economic benefits are obtained. The results of the mapping are also identified and classified in the Digital Wellbeing framework to show how equitable access to internet and telecommunications infrastructure is beneficial for improving welfare. Furthermore, the economic benefit quantification

matrix is determined as a reference for calculating the benefits from equitable development of internet and telecommunication access and infrastructure in Indonesia.

RESULTS AND DISCUSSION

In order to identify which benefits are obtained from the access and ICT infrastructure equalization program, benefit identification and classification is carried out using the Generic IS/IT Business Benefit Table (Ranti, 2008). The mapping of benefits is based on literature studies, with verification of interviews with experts, and results of survey on the use of ICT and empowerment of farmers and fishermen through ICT use (Anandhita et al., 2015).

The evaluation of the implementation of the Universal Telecommunications and Informatics Obligations program shows that the program is

effective in providing equal distribution of internet access, but has not been effective in internet access use (Nugroho & Nafi'ah, 2019). The success of equitable provision of ICT access must be supported by community empowerment. This is because ICT empowerment does not immediately follow the technology application, rather, the success of technology and its access depend on relationships in the community (Ullah, 2017).

Therefore, the mapping of the economic benefits of access and ICT infrastructure equalization program is assumed to occur under ideal conditions. Ideal conditions are conditions in which external factors do not interfere or hinder the program, and program implementation is supported by the success of the community empowerment ecosystem. Inhibiting factors such as socio-cultural society, weak coordination between institutions, and other risk factors are ignored in this study.

Table 1 Identification of access and ICT infrastructure equalization program

| Category and sub-category | | Code | Rel | Sig. | Description |
|---------------------------|--|--------|-----|------|--|
| Cost reduction | | | | | |
| 1. | Telecommunication costs | RCO-01 | Yes | Yes | Relevant: The 3T BTS signal and internet access programs are held in 3T villages that are not covered by cellular signals by providing equipment and a communal internet connection Significant: will reduce villagers' telecommunication and internet access costs. |
| 2 | Travel costs | RCO-02 | Yes | Yes | Reducing travel costs to obtain information and shortening travel costs in purchasing capital materials such as seeds, fertilizers etc. |
| 3 | Distribution costs | RCO-06 | Yes | Yes | Relevant: With the rural internet program, distribution costs can be reduced and crops can be sold quickly. Supply chain distribution information is one of the information accessed by farmers. Significant: shorter and more flexible crops sale distribution chain |
| Productivity increase | | | | | |
| 4 | Restructuring of Work functions division | IPR-01 | Yes | No | The rural internet access program provides the potential for changes in the structure of work where the community can directly play a role |

| Category and sub-category | | Code | Rel | Sig. | Description |
|---------------------------|-----------------------------------|--------|-----|------|--|
| | | | | | in marketing their products via the internet. |
| Process acceleration | | | | | |
| 5 | Production process | APR-01 | Yes | No | From the survey results (Center for Research and Development of Posts and Informatics, 2015), internet access is generally used by farmers to search information about agriculture (72.4%). Agricultural information can speed up the production process, for example speeding up the purchase of raw materials, seeds, fertilizers, equipment, etc. |
| 6 | Transaction process | APR-07 | Yes | No | The Integrated Broadband Village Program accelerates transaction process between farmers and buyers, because of shorter distribution chain of agricultural products |
| 7 | Decision making process | APR-08 | Yes | No | Provision of information on prices, weather, etc. can support the acceleration of the decision-making process to start agricultural/livestock/fishery production |
| Income increase | | | | | |
| 8 | Business capacity increase bisnis | IRE-01 | Yes | Yes | Relevant: The communal internet can increase business capacity for farmers, this is supported by survey data on the ICT Use and Empowerment for Farmers and fishermen (2015), of which 7.2% of farmers access the internet, 62.1% of whom use it for business development efforts. Significant: Optimizing the livelihood productivity of farmers and fishermen through the use of ICT and the internet |
| 9 | Market segment expansion | IRE-05 | Yes | Yes | Relevant: The Village Broadband program in 3T areas will expand market segmentation through the sale of agricultural/processed products via the internet Significant: Optimizing community products selling price through the use of ICT and the internet |
| Quality improvement | | | | | |
| 10 | Product quality improvement | IQU-04 | Yes | No | Farmers' information needs based on the survey (Research and Development Center for Post and Informatics, 2015) are information on pests and diseases, prices, and information on cultivation techniques. The availability of such information will help farmers improve the quality of their agricultural products. |

The results of the benefit mapping has revealed the importance of the availability of telecommunication and internet access especially to bridge asymmetric information for rural communities. Ullah (2017) stated in the results of his study that access and use of relevant information is a

key component of empowerment. The availability of information from prices of seeds, prices of fertilizers, how to deal with pests to how to open new markets has a direct impact on increasing productivity and people's income. Tabassum et al. (2017) in their study on the benefits of telecentres concluded that

better communication with internet connectivity has enabled people to strengthen social ties between family, friends and business networks, increase finances and increase empowerment.

Benefit relationship analysis is conducted to

determine the causal relationship of the benefits that have been identified. Mapping of cause and effect relationships in infrastructure and ICT access equalization program in rural areas can be seen in the image below:

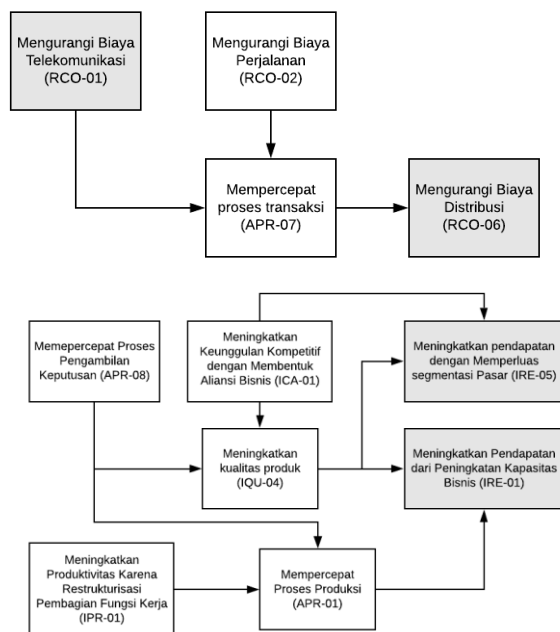


Figure 2. benefit causal relationship mapping

Benefit Identification and Classification Based on a Digital Wellbeing Framework

Information technology (IT) development and growth in the current era of globalization has a significant impact on society. IT does not only improve the quality of life for a person, but also increase economic growth and also the level of people's welfare (Atkinson & McKay, 2011). The program for equitable distribution of infrastructure and access to ICT in the 3T areas can indirectly provide benefits on a macro scale for Indonesia's economic growth.

For the community, this program can increase farmers' business capacity and quality of production or community crops by utilizing internet technology as a source of information and superior agricultural

methods. With internet access in 3T (frontier, outermost, and least developed) villages, people working as farmers has easier access to information to support their farming process such as: superior types of agricultural products, effective agricultural methods, and information about fertilizers and pests that can improve the quality of agricultural products. With the increasing business capacity and quality of agricultural products, agricultural production growth can be accelerated and farmers' income can be increased from agricultural products sale.

The infrastructure and ICT access equalization program in 3T areas can also expand market segments from online marketing (e-commerce). With the wider market segment, the 3T people's income will also increase.

Table 2. benefits of telecommunication and internet access equalization in rural areas based on digital wellbeing framework

| Benefits of access and infrastructure equalization program for 3T villagers | Benefits of IT on digital wellbeing (Atkinson & McKay, 2007) |
|---|--|
| - | Flexible supply chain |
| - | Easily accessible and flexible employment |
| Reducing telecommunication and distribution costs from reduced costs to obtain access to telecommunications and information, reduced costs of transportation and delivery of crops/products by directly connecting with customers | Efficiency enhancement |
| Increasing business capacity for the community as well as the quality of production or yields by utilizing internet technology as a source of information & production methods. | Increased quality of products and services |
| - | Better decision-making process |
| Expanding farmers' market segmentation by online sale of agricultural/SMEs products | Larger and more efficient market |
| - | New research tools |

The increasing income of people in rural areas, especially in 3T areas, will contribute to the increase of national per capita income, because 27.33% of Indonesia's population makes a living in agriculture, plantation and fisheries (Statistics Indonesia, 2019). With the increasing per capita income, the state tax revenue will increase. This increased state tax revenue can be used by the government to improve the quality of government services and to further develop disadvantaged villages. Additional tax revenue can also be used by the government to

promote small and medium industries' growth. The development of small and medium industries will help reduce unemployment in Indonesia, so that people's welfare will increase.

Benefit quantification metrics and formulas

To be able to quantify the value of economic benefits, a metric and formula is needed as a calculation guide. The determination of benefit metric and quantization calculation formula are as follows:

Table 3. metrics and formula of the benefits of telecommunication and internet equalization access project in rural areas

| Benefit | Metrics | Formula Perhitungan |
|---|--|---|
| Increase of revenue due to increased business capacity (IRE-01) | Increase of business production volumes due to easy access to information | Increase in profits obtained by the community from the increase in business production |
| Increase of income from market segment expansion (IRE-05) | Increase in income due to being connected to a wider market (via internet or telephone access) | Increase in income due to increased business turnover with access to telecommunications |
| Reducing distribution costs (RCO-06) | Reducing the cost of distribution of business products | Reduced costs due to shortened distribution chain |
| Reducing telecommunication costs (RCO-1) | Reducing telecommunication costs with internet and 3T BTS | Reduced telecommunication costs (support jobs/income) |

These metrics and formulas can be used to quantify the economic benefits of rural ICT infrastructure and access equalization program initiatives. Calculation of quantification requires further detailed and in-depth research, so that the results of the calculation can provide an overview of the benefits (in rupiah) of the program on improving village community welfare.

CONCLUSION

Based on the results of the study, it can be concluded that development and equalization of ICT in rural areas, especially 3T villages, have a positive impact on the people's economy in terms of increased income and reduced costs. To achieve these economic benefits, it is important that the implementation of the program to equalize telecommunications access be balanced with the development of an ideal community empowerment ecosystem. The potential economic benefits from equitable access to telecommunications and the internet can be achieved by overcoming socio-cultural problems, such as eliminating dependence on middlemen or *pengijon*, so that the program can have a direct impact on rural communities.

In order to further study the benefits of the USO program to the community, a further detailed study is needed to observe the quantification of economic benefits, the success of community ICT empowerment and an ecosystem development model to achieve ideal conditions.

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