Cloud Computing and E-commerce Adoption in Indonesia: Mind the Gaps

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Abstract

This study examines the e-commerce road map of Indonesia with its implementation and project plan to promote national development in Indonesia. The objective is to compare the eight aspects of the road map to academic literature that focuses on rural development strategy from the perspective of cloud computing and e-commerce adoption. The paper identifies areas of similarity and gaps in the road map to enable future research to best promote rural area development in Indonesia and reduce the digital divide.

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Abstract— **This study examines the e-commerce road map of Indonesia with its implementation and project plan to promote national development in Indonesia. The objective is to compare the eight aspects of the road map to academic literature that focuses on rural development strategy from the perspective of cloud computing and e-commerce adoption. The paper identifies areas of similarity and gaps in the road map to enable future research to best promote rural area development in Indonesia and reduce the digital divide.**

Keywords— *e-commerce road map, cloud computing, e-commerce, adoption, rural area development, digital divide*

I. INTRODUCTION

Cloud computing has been reported as the technology solution for e-commerce to leverage business coverage [1, 2], particularly for developing countries to improve business integration with information and communication technology (ICT) and national economic development [3]. Cloud computing adoption for e-commerce provides benefits such as cost reduction, less reliance on equipment needs, faster service and customer tracking [4, 5]. However, there are challenges for cloud computing adoption for e-commerce in developing countries, these include lack of infrastructure, lack of regulation and lack of stakeholders' support [6, 7]. In particular, the lack of infrastructure that contributes to limited connectivity in rural areas can increasingly inhibit adoption success [3].

The socio-culture and socio-economic challenges also hinder adoption in rural areas due to existence of digital divide, poverty and low awareness [6, 8]. The digital divide defined as "The gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access ICT and to their use of the Internet for a wide variety of activities" [9].

In Indonesia, a developing country located in South East Asia, the digital divide mostly exists in eastern areas such as Papua Province due to low quality of infrastructure and low people IT skills [8]. The transaction valuation of e-commerce in Indonesia has been increasing since 2011, reaching more than US$ 3 billion in 2015 and predicted to reach US$ 16 billion in 2020 [10, 11]. With this potential, the government of Indonesia has attempted to optimize the development of E-commerce by declaring the E-commerce National Roadmap 2017-2019 [12].

The aim of this paper is to assess the effectiveness of Indonesian e-commerce road map in term of implementation based on existing literature in the information systems area and rural development strategy. The scientific contribution of this paper is to identify gaps between the road map implementation and rural area development strategy reviewed from the literature.

II. BACKGROUND

A. Cloud Computing and E-commerce

Cloud computing is commonly described as the technology which offers virtualization of IT infrastructure resources (hardware, software and networks) in order to achieve cost reduction [13, 14]. Virtualization of IT infrastructure generated by cloud computing is based on its ability to provide "on-demand" infrastructure, platform and software for the service users [15]. The cost reduction obtained by cloud computing is its huge capability in supporting large data center and distributed hosting [16].

Cloud computing can be described using five essential characteristics, three service models and four deployment models [17, 18]. The essential characteristics include on-demand services [13], elastic computing [19], broad access [14], resource pooling [4], and measured service [18]. The service models consist of three main types, namely Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS) [3, 20]. The distinction between these service models lies on the purpose of services to achieve effective adoption [2, 17].

Cloud computing deployment model comprises of public cloud, private cloud, hybrid cloud, and community cloud. The differences among the deployment models include the intended service of deployment of cloud computing such as private vs public data centers as well as general vs specific purposes of the deployment [7, 20].

The main concept of e-commerce is the ability to process online transactions over the internet technology [5, 20]. The central idea of online transaction process is closely related to the availability and connectivity of internet technology facilities [6, 21]. The transaction process in e-commerce includes the exchange process between buyer and seller electronically [5, 22]. Here, the exchange process can include data and information, products, services and payments for commercial purposes using communication technology to facilitate business transaction [5, 18].

Furthermore, the digital transaction process in e-commerce can engage by several entities. From the business perspective, these includes customers, service enterprises, partners and employees at organisational or individual level [3, 17]. However, other perspective stakeholders such as suppliers and governments also contribute significant roles for effective online transaction process [23, 24].

Referring to the above concepts, it can be seen that e-commerce is the integration of business and ICT [3, 25]. This integration includes application of data exchange such as email, data provided such as website information, and automatic data capture such as barcode and Radio Frequency Identification-RFID [22].

B. Cloud Computing and E-commerce in Indonesia

The development of e-commerce in Indonesia began in the early 1990s, which was initiated by the introduction of Bhinneka.com in 1993. In 2012, the E-commerce Association of Indonesia (idEA) was founded by nine pioneer e-commerce enterprises in Indonesia, in response to increasing number of new e-commerce enterprises. Currently idEA has more than 320 registered members [26].

The e-commerce ecosystem in Indonesia is dominated by the business to customer (B2C) e-commerce platform, which comprises more than half of Indonesian e-commerce population [27]. These e-businesses mostly serve popular products and services such as fashion and apparel, home and living, electronic and gadgets, beauty, lifestyle and travel, women and baby, food and grocery [27]. A report from the Ministry of Communication and Information Technology (MCIT) of Indonesia in 2016, stated that fashion products have the largest sales from online shopping, followed by cosmetics and medicine, electronic device, transportation, and household [28].

The e-commerce valuation in Indonesia promoted by emerging internet and mobile technologies, reached 88.1 million mobile internet users in 2015 [29]. It is predicted to reach 215 million users and create potential e-commerce value of US$ 13 billion in 2020 [30, 31]. The increasing potential in online shopping value is recognized as an important aspect to the increased in national economic development of Indonesia [32].

The Association of Cloud Computing Indonesia (ACCI) was established in 2012, with the aim to synchronize cloud computing development in Indonesia as well as to improve the quality of human resource for industrial needs [33]. However, information of cloud computing development in Indonesia is still limited in terms of academic research. This makes it difficult to provide a complete history of the cloud computing development in Indonesia [34]. To date, there are reports that present case studies on how some e-commerce enterprises in Indonesia have implemented cloud computing technology to improve its competitiveness and market expansion [22]. This include the ability of cloud computing adoption to reduce the infrastructure needs that is beneficial to support the conditions in rural areas [25].

C. Challenges in Rural Areas

Current literature that reports on challenges encountered in rural areas in adopting the cloud computing and e-commerce in low middle-income countries include lack of telecommunication infrastructures, socio-cultural and socio-economical constrains [6, 7]. Infrastructure challenge is reported as the most relevant factor in rural areas [35].

The lack of infrastructure contributes to limited connectivity as well as socio-cultural and socio-economic hindrances such as low education and literacy levels, lack of awareness of e-commerce usage, limited language understanding provided by e-commerce website, and poverty

that can result in low online shopping penetration in rural areas [6]. The lack of awareness in e-commerce usage resulting in lack of concern in security and trust issue such as buyers' deceptive activity and fraudulent behaviors [21]. This condition can be aggravated by low government regulatory support, particularly in low-middle countries [7, 18].

Other challenges faced by rural areas include the lack of stakeholders' support such as low market participation [21], lack of logistic vendors [36]. This can result in the difficulty to establish e-commerce ecosystem and disconnection between products and services delivery in rural areas [4].

In the context of Indonesia, factors that have the most implication to rural areas of Indonesia are infrastructure, security, regulatory framework, stakeholders' support and user acceptance [35]. A 2016 survey conducted by the E-commerce Association of Indonesia [37] reported a huge gap of e-commerce penetration between rural and urban areas. The survey reported only 11% of total rural area population, have had experience in online shopping, compared to 39% of total urban population. See Fig.1.
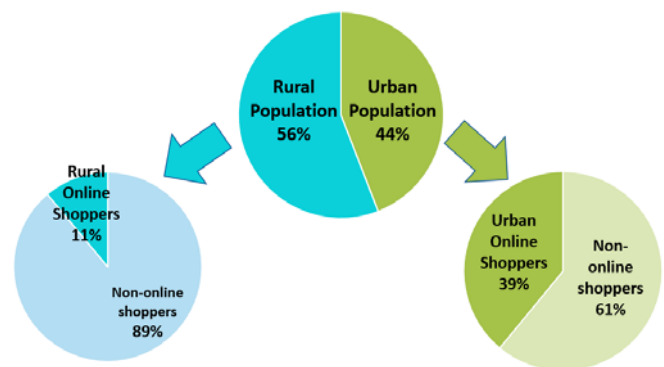

Fig. 1.   Online Shopping Penetration in Indonesia in 2016 [37]

In 2017, a survey by Ministry of Communication and ICT similarly reported that internet usage in Indonesian rural areas was low, reaching only 32.5% of total population, which is half of the internet penetration rate in urban area (61.83% of total population) [38]. The internet penetration in eastern area of Indonesia such as Maluku and Papua Islands is only 20.65%, much lower than the penetration rate of internet in western Indonesia such as Java Island (61.35% of total population) [38]. This indicates the low infrastructure quality can affects the user acceptance in rural areas. It is also reported that more than 58% respondents have indicated that they are reluctant to participate in online shopping due to distrust of e-commerce security and uncertainty in relation to on-time delivery [37].

D. Government Effort

The Indonesian government has made several programs to develop rural areas. As indicated in Fig 2, the comprehensive national e-commerce development initiatives, stated in the presidential decree of E-commerce Road Map of Indonesia 2017-2019, covers eight aspects include funding, tax, consumer protection, education, committee, cyber security, logistic and infrastructure [12, 39].

Fig. 2. E-commerce Road Map of Indonesia [12, 39]

To follow up the road map, the government has formed a committee of e-commerce road map of Indonesia to coordinate, synchronize and monitor the implementation of the e-commerce road map, called the monitoring committee of electronic based national commerce system road map, which consists of several ministries, presidential office, and central bank [40].

From the infrastructure aspect, the government has developed the "Palapa Ring" national telecommunication infrastructure project since 2006 [41]. The project covers 34 provinces and more than 500 regencies in Indonesia. This project is expected to complete by the end of 2018 [42]. This project intend to reduce the lack of infrastructure in rural areas The goal is to overcome, the digital divide that still exists in rural areas [8]. The completion of the project will be a massive opportunity for the government of Indonesia to maximize adoption of cloud computing and e-commerce in rural areas [43].

In education aspect, the government has provided training to improve digital literacy for housewives and people with disabilities in the rural areas [44, 45]. For cyber security and consumer protection, the Law of Information and Electronic Transaction as well the Government Regulation on Electronic System and Transaction have been applied to reduce the fraudulent behavior and transaction protection in all area of Indonesia [46, 47].

The funding aspect has been followed up by the government, the MCIT, by providing financial support for a thousand of new digital startups in Indonesia to assist in starting their businesses [48]. For the tax aspect, the government provides easier process of tax administration for small medium enterprises (SME), equality treatment and easier procedures for new e-commerce registration [49].

III. METHODOLOGY

The method that was used to investigate consistencies and potential gaps between the e-commerce road map of Indonesia and the literature is one based on literature review use Webster and Watson strategy [50]. After distilling research themes based on key words, rural area development strategy, cloud computing and e-commerce keywords the literature was analysed. Using the eight parts of Indonesia e-commerce roadmap as an analytical framework the literature was analysed for areas of consistency, divergence and gaps.

IV. RURAL AREA DEVELOPMENT STRATEGY

The academic literature devoted to the topic of rural development strategy provides a useful reference point from which to conduct an analysis of the E-commerce Road Map of Indonesia. A literature search was undertaken using the database Association for Information System Electronic Library (AISEL) and fourteen publications were selected for review (see Table I).

TABLE I.   RURAL AREA DEVELOPMEN STRATEGY

No	Authors	Strategy
1	Jansen [51]	Diffusion of Information Technology - Infrastructure and telematics development - Community teleservices centers establishment - IT-investments - User competence development
2	Leong et al. [52]	- Villagers' online purchasing assistance
3	Duan et al. [53]	- Infrastructure development - Human capacity investment - Service stimulation (internet, online public services, content and digital, agriculture extension) - Environment investment
4	Sabo et al. [54]	- Wireless network project for telemedicine, community information, and communication
5	Huang et al. [55]	- Building double e-markets - Integrating dual positive logistics - Constructing of agriculture supply chain traceability system - Construction online supermarket chain - Operating the construction of rural distribution center - Forming rural inventory pool - Building online community - ICT farmer training
6	Liu [56]	- National broadband plan
7	Shuai et al. [57]	Cost and profit sharing for rural business project
8	Bedekar & Peter [58]	Empowerment initiatives
9	Huang [59]	- Eco-innovations - Last-mile delivery program
10	Khairiansyah [60]	Telecenters for people community: - Organisation - Government support - Financial support - Social support - Operational support
11	Cazier et al. [61]	- Financial incentive - Social media encouragement - Interactive web interface for low literate people
12	Yenni et al. [62]	- Bridging digital competency gap - Strengthening digital and business capabilities - Creating sustainable ecosystem
13	Yue et al. [63]	Community empowerment
14	Xia [64]	Rural e-commerce framework

As indicated in Table I, the literature that reports rural area development strategy mostly focuses on human capacity empowerment and community development [53, 58, 60, 63]. The authors report that human capacity empowerment and community development can be delivered effectively using Telecenters for community [60].

Three authors reported telecommunication infrastructure development that include national broadband, and wireless network project [51, 54, 56]. Logistic development were also reported as the strategy for rural area development [55, 59]. It can be seen that several stakeholders' such as government, business players, logistic vendors and people are engaged in all these development areas.

Human capacity empowerment and community development area is related to government and business players endeavor to support increasing people understanding and usage of cloud computing and e-commerce. Since the digital divide is closely related to the socio-economic and socio-cultural level of the community, therefore, to reduce the digital divide, an effort should exist to increase the literacy levels in rural areas in order to engange more people to adopt cloud computing and e-commerce [63].

The government initiative to support people in rural areas to have access to ICT can be provided Telecenters for digital community The Telecenters can be used as a place to provide training of digital skill, service stimulation, and capital incentives [52, 53]. However, this effort needs to be supported by other stakeholders' such as educated people in rural areas and business players [55, 59]. For instance, the business players can provide user friendly e-commerce websites for users to facilitate easier usage, and also cost and profit sharing from larger business players to SME for business empowerment [57, 61]. The educated people in rural areas can also encourage community interaction with some ethical education in social media usage [61].

Infrastructure project is also reported as an important effort to reduce digital divide in rural areas. Good infrastructure can improve connectivity and access for people in rural areas [51, 56]. In the context of low- middle income countries such as Indonesia, infrastructure development such as broadband and wireless network are becoming a major agenda of national development [56]. This is evidence in the case of Indonesian government effort, in completing the "Palapa Ring Project" in 2018.

Logistic system development is essential for goods delivery process in rural areas to support agriculture products delivery. Literature review shows the logistic development using the dual positive logistic method and last-mile delivery program, as a potential solution [55, 59]. The supply chain system with decent distribution center and inventory are also critical for adequate supply of goods [55].

In addition to logistic system, the rural e-commerce framework is proposed by [64] to improve buying decision-making for people with low literacy in rural areas. This framework consists of big data, cloud computing, decision-making and Internet of Things (IoT). The rural e-commerce framework also intends to improve the agriculture products sales in rural areas by integrating the decision-making framework with smart agriculture system. The decision-making system can increase people e-commerce usage in future transaction [64].

A. Comparison of E-commerce Road Map of Indonesia with Rural Development Strategy

To assess whether the E-commerce Road Map of Indonesia 2017-2019 has accommodated the purpose of rural area development in Indonesia, it is worthy to compare the implementation program and project plan of e-commerce road map to rural development reported from literature. The comparison is summarized in Table II below.

TABLE II. COMPARISON BETWEEN E-COMMERCE ROAD MAP OF INDONESIA AND LITERATURE RURAL DEVELOPMENT STRATEGY

No	Aspect	E-Commerce Road Map Implementation and Project Plan	Literature Rural Development Strategy
1	Funding	- National Program 1000 New Digital Startup [48] - Soft loan for small enterprises [65] - Business incubator for startup [65]	- Financial incentive - IT investments - Cost and profit sharing
2	Tax	- Tax incentive [65] - Easy permission and procudere [49, 65] - Tax equality [65]	-
3	Consumer Protection	- Government Regulation of Implementation of Electronic Systems and Transaction [47] - Regulation harmonisation [65] - National payment gateway development [65] - Certification and accreditation [65] - Transaction protection [65]	-
4	Education and Human Resources	- Awareness campaign [65] - National incubator program [65] - E-commerce curriculum [65] - Education for consumer, business player, and law enforcer [65] - Digital literacy trainning for housewives [44] - Digital literacy trainning for disable people [45]	- Empowerement - Social media encouragement - Interactive web design - Farmer ICT training - Human capacity investment - Service stimulation - Online purchasing assistance - User competence development
5	Committee	Systematic committee from various government institutions [65]	-
6	Cyber Security	- Education for consumer, business player, and law enforcer [65] - National monitoring system model [65] - Improving cyber awareness - Storage, certification, and consumer data protection regulation [65]	-
7	Logistic	- National Logistic System (NLS) [65] - State Post company revitalisation [65] - E-commerce logistic facilities outsourcing development [65] - Logistic development in urban and rural areas [65]	- Integrating dual positive logistic - Agriculture supply chain traceability system - Online supermarket chain - Last-mile delivery program
8	Infrastructure	National "Palapa Ring" Telecommunication Project [41]	- Telecommunication Infrastructure development - Broadband plan
9	Community	-	- Community telecenters/ teleservice centers - Onlince community - Community empowerement
10	Framework	-	Rural e-commerce framework

As indicated in Table II., four of the eight aspects of E-commerce Road Map of Indonesia 2017-2019 are consistent with literature on rural development strategy. These include funding, education and human resources, logistic and infrastructure. Tax, consumer protection, committee, and cyber security aspects, which are found in the road map have not been presented in the literature. The community and framework aspects, which are reported in the literature, have also not included in the E-commerce Road Map of Indonesia.

The funding as logistic and infrastructure aspects in E-commerce Road Map of Indonesia are consistent with rural development strategy. Although the education and human resource aspect in E-commerce Road Map of Indonesia is consistent with literature, this aspect has not included the training of digital literacy to improve farmer literacy level, particularly in rural areas.

The rural e-commerce framework as proposed by literature can also fill the gap as it integrates smart agriculture system with decision-making framework to improve agriculture products sales and people's e-commerce usage intention in rural areas. Moreover, providing Telecenters in community development aspect can enhance education and human resource development strategy.

V. Conclusions

Cloud computing and e-commerce adoption in Indonesia is addressed to increase the national economic development. The E-commerce Road Map of Indonesia 2017-2019 has been set up to support e-commerce development in Indonesia, which covers eight areas. However, the existing digital divide in rural areas, requires the road map to accommodate the rural area development.

The comparison of E-commerce Road Map of Indonesia 2017-2019 with academic literature supports four aspects of development areas include funding, education and human resource, logistic and infrastructure. Yet, education and human resource aspect in the road map needs to promote agricultural and farming factors in rural areas.

To improve people engagement in the road map implementation, community empowerment can be instigated by providing the Telecenters, a space for stakeholders' interaction. This can promote better collaboration between stakeholders in rural areas.

It is worthy for future research to investigate the rural area community development and the decision-making system in practical perspective, in order to identify the effectiveness of the strategy in the context of Indonesia.

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