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"Periphery-Centric" Approach as a Tactic for Everyday Digital In- and Exclusion of Indonesian Villages

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Abstract

Much has been said about the importance of digital inclusion in reducing the digital divide and ensuring equal access and use of ICTs for all. Generally, inclusivity has a positive connotation, meaning that no one should be left behind by digitalization processes. However, the inclusion of marginalized communities into the digital system could lead to new exclusions within the new system because it amplifies the pre-existing social inequalities that these communities face, creating digital inequality. By observing the implementation of School of Community Networks in 10 Indonesian villages, this article attempts to describe those inequalities and explain how rural communities actively design a strategy to make their involvement in Indonesia's digitalization more meaningful. The conceptual framework developed in this study adopts a "periphery-centric" approach, aligning with the user-centric approach, as it examines from the perspective of marginalized communities how they perceive, understand, and utilize digital technology by generating new forms of innovation that have real impacts on their community, such as tailored applications for public services and local internet infrastructure to reach remote areas. The approach poses the problem and strategic dimension of the issue and puts forward the ownership and locality of these innovations to overcome digital inequality. With the meaningful use of digital technology, the inclusiveness of socially less-advantaged groups into the digital system does not immediately create new inequality; rather, they make themselves the center of their respective bottom-up innovation projects.

Keywords

digital divide; digital exclusion; digital inclusion; digital inequality; Indonesia; periphery-centric; rural digitalization; School of Community Networks

1. Introduction

The digital divide, evident between developed and developing nations as well as within countries along socioeconomic lines such as income, gender, education, ethnicity, and urban–rural disparities, remains a pressing global issue (Alliance for Affordable Internet [A4AI], 2022; The World Bank, 2021). Specifically, approximately 87% of individuals in developed countries utilized the internet in 2019, whereas the corresponding figure for developing countries was 47% (International Telecommunication Union, n.d.). In Indonesia, the government has undertaken initiatives to address this gap, including the Inclusive Digital Transformation program led by the Ministry of Communication and Information. This program aims to enhance digital infrastructure in underserved regions, promote digital literacy and skills development, and enact supplementary legislation to complement existing regulatory frameworks (Setu, 2021).

This principle of inclusivity has been a cornerstone of Widodo's vision, emphasizing the importance of prioritizing attention to historically marginalized regions, particularly the 3T (*terdepan*, *terluar*, *tertinggal* or the frontier, outermost, underdeveloped) regions. This vision, called "building from the periphery," contrasts with the center-centric development approach, which focused heavily on Java and Jakarta, resulting in a development gap between urban centers and peripheral areas (Priyadharma, 2021). The center-centric development, which is marked by the centralized power held by the central government, often overlooks the context and needs of peripheral regions, highlighting the importance of adopting a periphery perspective in digital development initiatives to ensure inclusivity and context sensibility.

In recent years, Indonesian digital connectivity has seen substantial growth, notably through the Palapa Ring project. This project, completed in 2019, involved the construction of submarine and terrestrial fiber optic cable networks spanning over 55,000 kilometers, connecting more than 500 cities/regencies in Indonesia (Medina, 2020). The development of the Palapa Ring has had a significant impact on national internet usage. The number of mobile connections (approx. 370 million) has surpassed Indonesia's total population of 277 million in 2022. Meanwhile, the number of internet users reached 204 million, or 73% of the total population, with the number of social media users reaching 191.4 million (70%; Kemp, 2022).

However, the impressive digital connectivity figures do not reflect the ongoing digital inequality that continues to hinder comprehensive digital transformation in Indonesia. The urban–rural digital connectivity gap remains substantial and even shows signs of widening. Although the number of adults connected to the internet has nearly quadrupled from 2011 (13%) to 2019 (51%), 62% of them are in urban areas, compared to only 36% in rural areas. Additionally, digital disparities also occur across income, gender, education, generation, and other social dimensions (The World Bank, 2021).

The gap still persists because universal access does not always translate into meaningful access (A4AI, 2022; Banerjee et al., 2024). By 2021, only 13% of Indonesia's total population achieved meaningful connectivity, with 35% having basic access and 52% remaining disconnected (A4AI, 2022). Moreover, disparities persist along gender and geographical lines, with a 23% gap in meaningful connectivity between men and women and a 49% gap between urban and rural populations (A4AI, 2022). Despite A4AI's quantitative study, there remains a dearth of qualitative research reporting on community initiatives aimed at combating digital inequality and striving for meaningful connectivity, such as the School of Community Networks (SCN). This study aims to fill this gap.

Adopting the "periphery-centric" approach, this study analyzes issues of digital inequality by prioritizing the perspectives of rural communities. The research seeks to answer the question: How do Indonesian rural communities develop a strategy to navigate their daily digital in/exclusion in order to bridge digital inequalities? Key concepts such as the digital divide, digital inequality (problem dimension), and the periphery-centric approach (strategic dimension) will be elucidated, followed by a description of the SCN, a discussion, and a conclusion section.

2. Conceptual Framework

2.1. From Digital Divide to Digital Inequalities

The Organization for Economic Co-Operation and Development (2018, p. 11) defines the digital divide as "different levels of access and use of information and communication technologies (ICTs) and, more specifically, to the gaps in access and use of Internet-based digital services." Initially, the term referred to the disparity in access to and usage of ICTs, not only between countries but also within countries, including disparities between urban and rural/remote areas, and among different groups or communities (International Telecommunication Union, n.d.; Organization for Economic Co-Operation and Development, 2021; Sastre Reyes, 2019; Ye & Yang, 2020). However, the definition has evolved over time, with scholars recognizing that the term digital divide encompasses multiple dimensions simultaneously.

Tomczyk, Guillén-Gámez, et al. (2023) illustrate various cases of the digital divide occurring in many countries, depicting digital exclusion and strategies toward digital inclusion for disadvantaged groups. Yaqin et al. (2023) outline fundamental strategies for addressing the digital divide in higher education in Indonesia, which encompass enhancing internet infrastructure, ensuring equitable access to technological resources, and providing access to digital devices and facilities. However, Featherstone (2024) argues that closing the digital gap solely through the provision of ubiquitous access may have been a "misguided assumption" because "those experiencing digital exclusion—including people on low income or homeless, elderly, and many in remote and rural areas–were unable to access critical health, education, welfare, and banking services" (p. 14).

The concept of the digital divide as an access problem is understood as digital exclusion, distinguishing between the "haves" and "have nots" (Heeks, 2022; Ragnedda & Gladkova, 2020). Scholars identify three levels of digital divide beyond the access gap (first level). There are differences in technology use due to skills, knowledge, motivation, and purposes (second level), and differences in tangible outcomes or benefits from technology use (third level; Ragnedda, 2020; Ragnedda & Ruiu, 2017). Heeks (2022) categorizes access and technology use disparities within the information value chain and identifies social inequalities, such as income, gender, race, and education, as additional factors contributing to digital inequality.

Van Dijk (2013) identifies four different kinds of inequality related to the digital divide: societal (personal and positional categorical) inequalities, unequal resource distribution, disparate access to digital technologies, and uneven participation in society. He suggests that participation inequality can reinforce existing societal inequalities, deepening the digital divide. Van Dijk associates this divide with the network society, emphasizing the importance of social and media networks for information access and defining three layers within a society: the information elite (15% of the population), the participating majority (50–60%), and the unconnected and

excluded (at least 25%). Heeks (2022) critiques existing literature for focusing too much on digital exclusion and access, advocating for an examination of digital inequality from an inclusion perspective.

The digital inequality perspective shifts the focus from exclusion due to lack of access to digital inclusion, emphasizing pre-existing social disparities based on gender, race, socio-economic class, and cultural backgrounds, as well as urban–rural divide and people with a disability (Bozdağ, 2024; Brown et al., 2024; Karatrantou & Panagiotakopoulos, 2023; Livingstone & Helsper, 2007). While the sustainable development goals and the International Telecommunication Union advocate for inclusive development (International Telecommunication Union, n.d.), studies reveal disparities between intended inclusivity and real-world outcomes, with marginalized groups facing barriers or even increased social inequality in digital realms, particularly during the Covid-19 pandemic (Banerjee et al., 2024; Tomczyk, Mascia, et al., 2023; Yates & Carmi, 2024), which create a "digital inclusion gap" (Featherstone, 2024).

Heeks (2022) warns of "adverse digital incorporation" in the global South, defined as the "inclusion in a digital system that enables a more-advantaged group to extract disproportionate value from the work or resources of another, less-advantaged group" (p. 689). Adverse digital incorporation stems from factors like ignorance, compulsion, or lack of alternatives, resulting in design, resource, relational, and institutional inequalities. This phenomenon aligns with Toyama's (2015) "Law of Amplification," or van Dijk's (2005) reference to the "Matthew effect," where technology amplifies existing human forces, or a lack of them.

Addressing digital inequalities requires attention to both access and social disparities (DiMaggio et al., 2004; Stiakakis et al., 2010). Sastre Reyes (2019) points out the need to ensure the development of teachers' digital competence to renew education in relation to ICT in rural areas. Featherstone (2024, p. 34) highlights the need for a "place-based approach" and to:

> Consider local context and needs, ensure culturally appropriate and sustainable solutions…[he recommends] support for localized digital inclusion plans, with a flexible funding program to enable locally developed strategies to address identified barriers, building community capacity and ownership and greater engagement in the solutions.

A4AI (n.d.) draws conclusions from its survey on meaningful connectivity in nine low- and middle-income countries, including Indonesia, stating that "the new digital divide is not between online and offline but between observer and participant." In summary, finding solutions to digital inequalities necessitates that stakeholders focus not only on "connecting the unconnected" but also on supporting the "already connected" who still face disadvantages.

2.2. The Periphery-Centric Approach

"Periphery-centric" is a concept developed by the author and emphasizes regional and village autonomy to address local issues and fosters Servaes's (1999) idea of multiplicity in development programs. Therefore, it rejects the one-size-fits-all approach to solving development and societal problems. This new concept focuses on user-centric approaches, allowing marginalized communities to innovate and utilize digital technology according to their needs. This approach promotes meaningful and local ownership of technology, as well as inclusivity, without perpetuating inequality. Thus, enabling socially less-advantaged groups to lead bottom-up innovation projects.

The periphery-centric analysis challenges Galtung's (1971) center-periphery model, which portrays fixed and asymmetrical positions of countries and a feudal relationship between them. The proposed model indicates that periphery regions can become centers for others and that centrality and peripherality are not absolute. This perspective offers a new understanding of the center-periphery relationship, emphasizing the potential for change and redefinition of roles.

This conceptualization of center-periphery aligns closely with Mouffe's concepts of "radical democratic citizenship" (Mouffe, 1992a, 1992b), which examine democracy in terms of power and political participation. Power is not inherent to one's identity but articulated through various social and political identities, interests, and values within society. Mouffe also views citizenship as a constructed political identity rather than a legal status, emphasizing the fluidity of power dynamics. Rodríguez and Miralles (2014) note that Mouffe's understanding of citizenship emphasizes the continual effort to access power in specific historical contexts, suggesting that an individual's position in power structures is not static but subject to change. Due to its multiplicity, a subject's position can differ from one discourse to another or from one relational system to another. Therefore, it is highly plausible that simultaneously, an individual may occupy a center position and dominate in one relational system while being in the periphery and subordinated in another relational system, as Mouffe (1992b) does not view social agents as fixed entities in a "closed system of differences."

Figure 1 presents a dynamic view of the center-periphery relationship, departing from Galtung's fixed model. Here, the periphery (P) is not statically juxtaposed with the center (C) but can also function as a center, and vice versa. This is where the intersection between center and periphery (C/P) occurs simultaneously, as the adoption of digital technology places individuals and communities within multiple systems (depicted by circles). It is difficult to master all these digital systems (e.g., communication systems, business and financial systems, programming, applications design, digital literacy, and infrastructure) simultaneously and become an absolute center. This fluidity aligns with Mouffe's concept of citizenship, where power positions are not fixed but subject to change based on various factors. Mouffe (1992b) sees "citizenship as a form of political identity that consists in the identification with the political principles of modern pluralist democracy, namely, the assertion of liberty and equality for all" (p. 378). The periphery-centric strategy embraces this

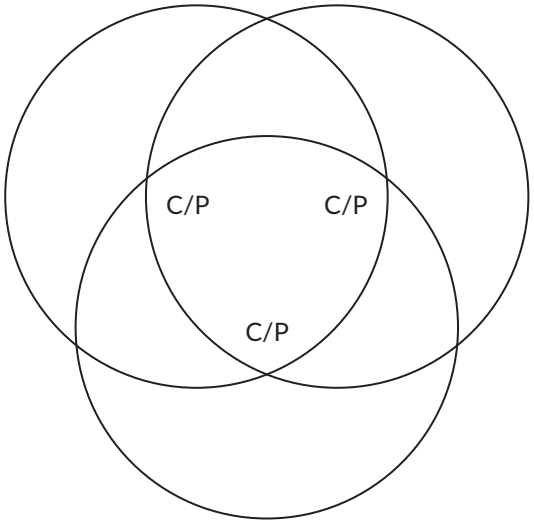

Figure 1. Periphery-centric approach model. Source: Adapted from Priyadharma (2021).

perspective, empowering marginalized groups to become centers by leveraging their unique resources and knowledge as they embrace digital technologies. This approach fosters emancipation by enabling active citizenship and the potential to transform social environments. In the urban–rural dynamic, this strategy frees rural communities from the pressure to conform to urban standards, allowing them to define their own development agendas without competing with urban areas or relying on centralized standards.

The positions of center and periphery become highly fluid and dynamic. This differs, for example, from Frank's (1966) conceptualization of dependency theory, and particularly Wallerstein's (1974) world-system analysis, which views core and peripheral countries in their totality within a one world system (which is capitalistic and hegemonic), thus providing a clear emphasis on "inequality," rather than on "liberty and equality," as argued by Mouffe.

3. Methodology

This study is part of a bigger research project investigating internet policy and regulations in rural areas, which was put together by an Indonesian NGO called Common Room (CR). Initially designed for this purpose, the study expanded to explore various aspects of rural internet development, including funding, technological impacts, and the SCN's unique approach to addressing the digital divide and inequality. While this article concentrates on the latter aspect, which the author is responsible for, findings regarding rural internet policy and funding have been separately documented as policy briefs and research notes.

The selection of SCN as a case study is purposeful, as the author was contracted by CR as a researcher. The study took place from March 2022 to March 2023, during which the researcher, aided by two assistants and a research collaborator, engaged in the SCN implementation across 10 Indonesian villages. Village visits were arranged by CR. Thus, field observations and (semi-structured) interviews were scheduled following CR's agenda. The total number of informants was 57, consisting of participants from various backgrounds, including government officials, SCN participants, ICT volunteers, village enterprise members, activists, indigenous representatives, teachers, students, fishermen groups, and development workers. For this article, selective analysis was conducted on interviews with seven informants, covering a range of perspectives and roles. This was performed solely by the author. The rest of the informants served the general research purpose about rural internet policy, whose analysis was conducted by another researcher.

Observations were focused on understanding village initiatives to address digital inequality, which were manifested in the SCN while considering factors like infrastructure challenges, environmental conditions, and local customs. Researchers documented these observations through field notes, photos, and videos, supplementing them with theoretical reflections and insights from informal conversations with stakeholders. Additionally, this study analyzed relevant documents related to the inception and implementation of the SCN initiative, including activity reports, publications on community networks, presentation materials, and webpages.

All data were stored in a shared online folder accessible to the research team, with most interviews transcribed by the assistants and checked for accuracy by the author. This article employs a conceptual framework divided into two dimensions: problem and strategic. The problem dimension involves debates about the digital divide and digital inequality, while the strategic dimension proposes alleviating these

disparities through a periphery-centric approach consisting of the five pillars of SCN (see Section 4). The coding process, executed independently by the author, involved both inductive (for the strategic dimension, e.g., "ex oriente lux," "meaningful connectivity") and deductive approaches (for the problem dimension, e.g., "digital divide," "digital inequality"), with verification performed through methods triangulation. MaxQDA was used to sort the data and partially for the initial coding. The selective coding was done manually. The data were then reduced based on their relevance to the research question, focusing on seven informants instead of all 57. Analysis results were shared during meeting sessions with CR and the research team.

Ethical considerations were addressed throughout this study by ensuring that each member of the research team was properly introduced to all stakeholders encountered during SCN activities, emphasizing their role in conducting research. CR consistently reminded local parties of the research objectives and obtained their voluntary consent to participate in data collection activities. The research team was equipped with an official letter from CR stating their identity and purpose as a researcher. Informed consent was obtained from all informants for the interviews and the recordings, with their identities protected by using only initials in this article. Not a single village member objected to being observed or interviewed for this research. Had that happened, data concerning the objecting individual would not have been gathered.

4. Findings: SCN or *Sekolah Internet Komunitas*

The SCN was launched in 2021 by CR. It aims to reduce the digital divide in rural Indonesia by providing internet access and digital literacy training. CR asserts that the SCN aims to support "citizen initiatives so that they can build an independent and sustainable community-based internet infrastructure in their area" (CR, 2021, p. 2). The SCN is expected to enhance "affordable and inclusive connectivity for underserved or excluded communities in low-income rural, urban, and peri-urban areas" (Association for Progressive Communications, 2020). The SCN emerged from the Rural ICT Camp series initiated by CR in 2020, with recent editions held in Kasepuhan Ciptagelar (2020 and 2021), Tembok Village (2022), and on Breueh Island (2023).

CR believes that there are five important pillars for addressing the digital divide, namely (a) meaningful equal access; (b) improving the quality, ability, and skills of human resources; (c) locality aspect; (d) a sense of belonging; and (e) the presence of key actors or agents as change catalysts (Indonesia Civil Society Organization of Digital Transformation Task Force, 2022):

> The existence of these five pillars reflects the principle of equity in development. In this case, the development process and efforts to reduce the digital divide cannot be considered equally in every area, including in terms of the need or utilization of the technology used. (Indonesia Civil Society Organization of Digital Transformation Task Force, 2022, p. 13)

These principles constitute the strategic dimension of the periphery-centric concept which draws upon Featherstone's (2024) "place-based approach" and Mouffe's (1992a, 1992b) concept of active citizenship. The examples to be presented in Sections 4.1–4.4 demonstrate how participation in meaningful digital activities (A4AI, n.d.; van Dijk, 2013) is part of enhancing digital capacity to reduce the second-level digital divide and increase the opportunity to gain benefits (third level) from digital inclusion (Ragnedda & Ruiu, 2017), while simultaneously mitigating the intensification of digital inequality.

During the data collection period, CR organized 10 SCNs across Indonesia. By the end of 2023, one additional village had joined, totaling 11 villages. Figure 2 shows the locations of the 11 villages, spanning from the westernmost point in Indonesia at Lapeng Village, Aceh, to the easternmost point in Indonesia at Nimboran District, Papua, covering the major islands in Indonesia. Due to space limitations, only four village initiatives will be outlined here. These four villages were selected based on the unique challenges they face and their creative and adaptive initiatives to address these issues. While other villages may have similar solutions (see Figure 2), these four villages provided the most comprehensive data, making them suitable case studies for this article. Ciptagelar and Tembok were specifically chosen for their significant contributions to the development of SCN, as evidenced by their selection as hosts of the Rural ICT Camp. The author personally attended the Tembok edition of the Rural ICT Camp in 2022 as part of his role as a researcher for this project.

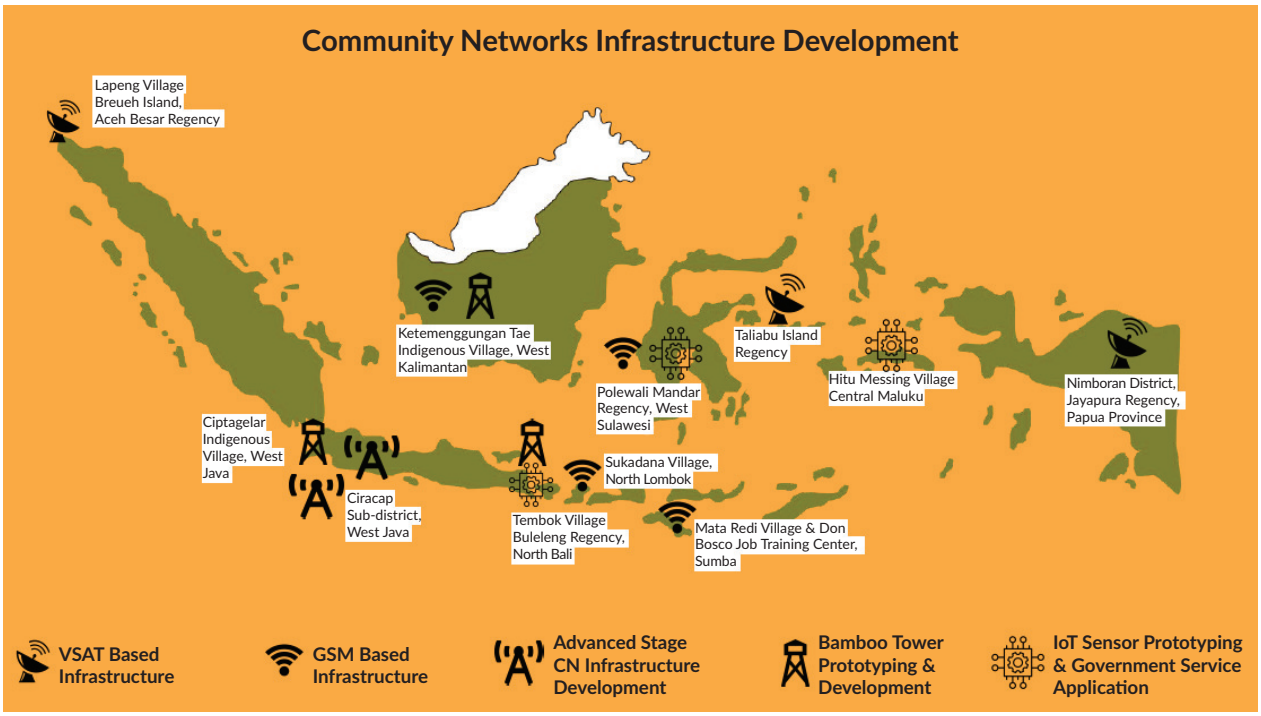

Figure 2. The 11 villages of the SCN in Indonesia with their specific and differentiated internet infrastructure development. Source: CR (2023).

4.1. Sukadana Village, Lombok

Sukadana Village, the poorest in North Lombok, faces significant challenges for women of all ages who are vulnerable and discriminated against. They frequently experience domestic violence, sexual abuse, harassment, early/child marriages, and mental health disorders. Culturally, women lack decision-making roles in the customary community but have crucial roles in household management. The 2018 earthquakes caused widespread devastation and loss of livelihoods in Lombok, particularly impacting men. Displacement in camps, worsened by the Covid-19 pandemic, exacerbates social problems, amplifying women's economic and psychological suffering. Ms. S, chairwoman of the Women's School community, notes that smartphone use among teenagers increases the risk of child marriages through digital contacts:

> Cases of child marriage are caused, firstly, by economic reasons and, secondly, due to the use of smartphones. They meet through smartphones, start dating, and eventually, curiosity and experimentation arise from their peers. Additionally, they are often lured into these situations because the perpetrators of child marriages are adults. For example, someone aged 16, 17, or 15, while the one who elopes is an adult, who may even have a spouse, deceiving them by claiming not to have a spouse, but when they arrive at the man's house, it turns out [he is already married]. (S, interview, May 20, 2022)

The issue described above indicates the existence of social inequality between marginalized groups, specifically women, both adults and adolescents, and adult men who generally hold power as decision-makers within families. It is essential to empower these marginalized groups to address the power deficit that leads to their exclusion from the digital system.

Since 2013, the Women's School has supported victims of various cases and advocated for women's empowerment. It focuses on empowering poor and vulnerable women to enhance their (digital) capacity for income generation. In 2019, the Department of Food Security and Fisheries launched a Vannamei shrimp cultivation program for North Lombok, which was discontinued due to a lack of planning. The Women's School proposed continuing the program by collaborating with community organizations for training. CR provided technical assistance and partnered with the community to improve the productivity of shrimp cultivation by developing Internet of Things (IoT) sensor prototypes for real-time data monitoring. IoT sensors for Vannamei shrimp cultivation may seem insignificant to many people, so it does not become the center of attention for them. But for the Sukadana community, this is a valuable activity, so what may be peripheral to many others can become central for these vulnerable women.

4.2. Nimboran District, Papua

CR's motto "*ex oriente lux*," meaning "light rising from the east," symbolizes the goal of providing internet connectivity to remote villages in Jayapura Regency, Indonesia's easternmost region. In his opening speech at the launch of SCN in Nimboran, GF, the director of CR, emphasized that:

> The SCN program is an important effort to address the challenges of the digital divide in Indonesia, particularly in all areas of Jayapura regency. Therefore, I hope that as our first lesson today, we learn to enhance our knowledge to improve all of our skills because overcoming this digital divide can also address other inequality challenges, such as the development gap between urban and rural areas, between centers and peripheries. (GF, interview, April 19, 2022)

CR acknowledges that digital inclusion must be accompanied by the solution to digital inequality, primarily through the provision of digital connectivity. Thus, by collaborating with a local internet service provider, the SCN trained local ICT volunteers to build satellite-based community internet infrastructure. The initiative was supported by the regency's Head of Communication and Information Office, GG, who emphasized the importance of very small aperture terminal in overcoming isolation, supporting economic empowerment, and facilitating online learning. Simultaneously, this situation illustrates the problem dimension, namely connectivity issues, and the strategic dimension, which involves providing internet connectivity via satellite and enhancing human resources through SCN training.

The Papuans enjoy learning from practical experiences and then delving into the concepts behind those practices. This form of reverse engineering is acknowledged by GG to possibly be influenced by the beliefs of the Papuan Christian community, who learn from what is referred to as the "Thomas Concept." In the Bible, it is recounted that Thomas did not believe in the resurrection of Jesus until he saw the risen Jesus with his own eyes: "The Papua people see first, then believe," said GG (interview, April 22, 2022). This concept was then implemented in SCN training, emphasizing hands-on practice to stimulate participants' curiosity and deepen their knowledge and skills. This approach takes into account Papua's local beliefs, which are adhered to in the periphery-centric model. GF acknowledges that the indigenous Papuans need digital literacy programs, which he considers a "gateway" for broader community participation in the community networks project.

4.3. Tembok Village, Bali

The majority of residents in Tembok, North Bali, have only an elementary school education. DK, the head of Tembok, recognizes this as "one of the factors contributing to their inability to cope with the changes" brought about by digital transformation. DK emphasizes the importance of education and digital literacy in addressing the "internal infrastructure inadequacies" in "responding to or even deriving positive value from the ongoing transformation." The SCN steps in to fill this gap by training villagers and local officials to improve their digital literacy level.

In addition, internet coverage is lacking, particularly in North Bali compared to South Bali, where tourism infrastructure and the economy are more developed. Addressing this deficit, DK implemented three good practices: a bamboo-based internet tower, the Djangkep public service application facilitating document services (e.g., birth certificates, marriage certificates), and a separate waste bank saving app incentivizing waste collection and conversion into bank savings, addressing local needs effectively:

> Regarding efforts to address the (digital) divide that occurs, one of them is by providing the infrastructure first…with the aim that the community can access the internet easily and affordably. Because there is a cost or living expenses that can be minimized. (DK, interview, March, 31, 2022)

Bamboo was chosen as a material based on cultural aspects, its cheapness, its ease of accessibility at the location, as well as its sustainability. Based on field observations, the bamboo internet tower serves at least three functions: (a) as an internet tower emitting Wi-Fi signals to the surrounding area, (b) as a security function as a watchtower, and (c) as a community gathering area at the base of the tower.

For the Tembok Village government, the internet has a crucial function as a public information channel through the Djangkep app. In 2021, Tembok received an award for public service innovations from the Ministry of State Apparatus Utilization and Bureaucratic Reform. Various initiatives in Tembok clearly illustrate the strategic dimension of the periphery-centric approach. In addition to offering solutions to the digital divide problem, these initiatives also demonstrate the locality and ownership aspects of digital infrastructure (internet tower and both public applications), as well as the agency of digital actors, especially DK, the head of the village.

4.4. Kasepuhan Ciptagelar Indigenous Community, West Java

The SCN originated in this indigenous community deep within the Halimun-Salak Mountain National Reserve. Despite its traditional values, the community has embraced digital technology through the Innovation Factory program which focused on ICT for agriculture and aimed to utilize ICT for agriculture sustainability, cultural preservation, forest conservation, and economic development.

According to a CR's report, community-centered connectivity in Ciptagelar now connects 37 out of 568 hamlets and 11 out of 360 villages, serving a population of 30,000 (CR, 2023). As in Tembok, a bamboo internet tower has been erected here, indicating advanced infrastructure development. The community's familiarity with ICT dates to 2008, with the operation of CIGA TV and Radio Swara 107.7 FM. CIGA TV now has a YouTube channel (@cigatvciptagelar6230), promoting ancestral traditions alongside modern concepts so that both values do not contradict each other. KY, the spokesperson of Ciptagelar, stated during the interview that this principle is fundamental and is difficult to replicate in other areas, emphasizing its locality:

> We must be able to balance the development of current conditions through technological parameters without abandoning customs and traditions. The saying "*Kudu Bisa Ngigelan Jaman, Tapi Ulah Kabawa Ku Jaman"* means we need to adapt and follow the developments without abandoning the traditional order. Now, if we look at the neighboring community, for example, the (inner) Baduy tribe, they will never incorporate modern values because of their traditional concept, "*pondok teu meunang disambung, panjang teu meunang dipotong*" (no addition or reduction), that's it. No additions are allowed. (KY, interview, April 11, 2022)

Leadership, particularly that of Abah Ugi, their respected traditional leader, has been pivotal. While upholding traditional values, he encourages technological adoption as long as it aligns with core traditions, especially regarding sacred cultural practices and rice management, which remains unchanged due to its cultural significance. This principle, known as "*ditambah boleh, dikurangi jangan*" (additions are welcome, reductions are not), is significantly different from that of Baduy, which underscores indigenous purity.

When asked whether modern education is a prerequisite for openness to adopting new technological innovations, KY and BU (the treasurer of the Ciptagelar business unit) unanimously said "no." This is an interesting finding because the fact that the majority of Ciptagelar residents have only completed secondary education does not prevent them from utilizing modern technology. BU stated that the main determinant is the traditional leader who has an "open mind that indirectly influences the residents…as long as we firmly uphold tradition" (interview, April 11, 2022).

To ensure sustainability, the community developed a business unit through Ciptagelar Hotspot, in cooperation with local internet service provider Awinet and with CR's support. This unit acts as a reseller of internet access vouchers, offering affordable schemes (hourly, daily, weekly, monthly) starting at 2000 IDR (15 cents USD) per hour and selling 238,320 vouchers within a year through 86 agents. Until 2023, they operated 520 public Wi-Fi hotspots and 10 private ones, employing 10 technicians for continuous service. From August 2020 to July 2023, they generated a total gross income of 353,909.77 USD. Additionally, free internet access is provided for teachers needing to upload data, while SCN supports technicians in maintenance, offers routine monitoring, enhances capacity through workshops, and conducts training for content creation and digital literacy (CR, 2023).

Above, both the problem and strategic dimensions are portrayed in Ciptagelar. The community's isolation in the middle of the forest does not always lead to communication isolation due to their participation in the digital system. This community is cleverly able to build meaningful connectivity through the operation of various media channels and the development of community networks. Moreover, they are able to build a business and profit from this network by serving their community. In addition, the SCN appreciates their local values and culture, making its locality aspect compelling. Although geographically on the periphery, this community has been positioned at the center of digital activity by a strong leader, supported by numerous agents acting as catalysts.

5. Discussion

5.1. The Problem Dimension: Various Types of "Gaps"

No matter how hard we criticize universal access policies, it cannot conceal the fact that, indeed, digital access for rural communities is highly inadequate. However, it turns out there are different types and levels of disparity experienced by these villages. Based on the observations, although not fully detailed in this article, the first level of the digital divide, i.e., the access gap between the "haves" and "have nots" (Heeks, 2022; Ragnedda & Gladkova, 2020), exists in all 10 SCN villages, and the SCN is present to bridge this gap. Figure 2 illustrates how the SCN program attempts to address this access issue by building community networks in the 11 participating villages. Specifically, as discussed in the findings, unique solutions to mitigate this gap can be represented by four villages. Bamboo internet towers were established in Tembok and Ciptagelar, while satellite-based internet connectivity was built in Nimboran. The same applies to the second level of the digital divide in terms of differences in skills and knowledge to utilize digital technology (Ragnedda & Ruiu, 2017). Various SCN training sessions are intended to address this gap. In Sukadana, training in the use of IoT for Vannamei shrimp farming was held with participants from women's groups. In Tembok, the training menu was the development of public service applications. Meanwhile, Ciptagelar's training focused on business management for the Ciptagelar Hotspot, which is community service-oriented and profitable. The success (or failure) of this training will affect the narrowing (or widening) of the third level of the digital divide, i.e., in terms of outcomes or benefits that can be derived from the use of digital technology (Ragnedda & Ruiu, 2017). The activities carried out in the SCN show the efforts of these communities to move from being the unconnected and excluded group to the participating majority in van Dijk's (2013) network society classification.

The four case studies outlined above also show that, indeed, social inequalities have become a factor in the formation of digital inequality (Ragnedda, 2020; Stiakakis et al., 2010). For example, the digital violence experienced by teenagers as victims of child marriage in Sukadana shows the situation of adverse digital incorporation (Heeks, 2022), where the "inclusion in a digital system…enables a more-advantaged group to extract disproportionate value from the work or resources of another, less-advantaged group" (p. 689). In this case, teenagers with low digital literacy and economic levels become victims of cyber and digital grooming (Lorenzo-Dus, 2022). They are manipulated online so that their involvement in the digital world deepens the digital inclusion gap (Featherstone, 2024), instead of reducing it.

In addition to gender and age dimensions, which are factors of social inequality, differences in economic and educational levels (in Tembok and Nimboran) are also indicated as other forms of gaps that can create new

digital exclusion. The SCN is present to address this problem by offering a strategy of digital inclusion for the villagers, thereby resulting in a more balanced power relationship between the center and the periphery. It provides training on digital literacy as well as IoT (knowledge and skill level) in the field of fisheries and encourages community members to adopt the waste bank app to provide a positive economic impact (outcome level), thereby reducing the social disparities which are the factors contributing to digital inequality.

5.2. The Strategic Dimension: The Five SCN Pillars

As an integral part of the periphery-centric approach, the SCN refers to five important pillars that address the emergence of various gaps, as explained in Section 5.1. The pillars allow rural communities to focus on their potential in their digital participation. Their active participation in solving local digital problems can transform their peripheral position into a central one, meaning it becomes relevant for their own community, in line with the principles adopted in the periphery-centric approach. While these pillars apply to all SCN villages, the following sections will illustrate how these principles contribute to reducing digital divides and mitigating digital inequalities, specifically in the four villages outlined above.

5.2.1. Meaningful Connectivity

The CR project aims to bridge the digital divide by establishing last-mile connectivity, addressing the first level of the divide related to access to digital technology. However, the project goes beyond mere access by emphasizing meaningful connectivity through initiatives like bamboo internet towers, the Djangkep public service app, waste bank apps, and affordable Wi-Fi schemes. This approach acknowledges that universal access alone does not tackle digital inequality but rather can exacerbate it by amplifying existing social and structural inequalities in the digital realm. For instance, low community purchasing power may lead to increased expenses for internet data packages or reliance on online loans, worsening the digital divide. Meaningful connectivity is therefore crucial for rural residents to navigate and mitigate these new inequalities amidst growing digitization.

The SCN transcends both initial identification of those left behind and disparities in skills and knowledge, focusing on a user-centered perspective to comprehend and address the impacts of digital inclusion. It encourages bottom-up initiatives tailored to local cultural values, as seen in indigenous villages like Ciptagelar. Inspired by Mouffe's (1992a, 1992b) radical democratic citizenship and her emphasis on the principle of liberty and equality for all, digital inclusion under this periphery-centric approach does not imply the exclusion of traditional values but rather offers a new trajectory for digital citizenship and participation. This is what transforms them from being an observer to a participant in the digital realm (A4AI, n.d.). It suggests that digital exclusion in one domain (e.g., a lack of orientation towards urban development models) may lead to inclusion in another (e.g., distinctive rural digital development models), allowing villages to emerge as new centers, challenging the notion of absolute peripherality or being "left behind" as pictured in Galtung's (1971) model of center–periphery.

5.2.2. Human Resource Capacity

Enhancing the human resource capacity of local communities involves active community engagement in transforming their surroundings and empowering themselves through training and workshops conducted

with vocational schools and training centers rather than relying on external entities. These activities aim to address social disparities and prevent adverse digital incorporation, benefiting participants from various backgrounds and educational levels within the SCN.

Participants, including domestic violence survivors in Sukadana, young people in Nimboran, indigenous community members in Ciptagelar, and government employees in Papua and Bali, engage in these activities to enhance their digital literacy, with SCN offering relevance to their daily lives, such as employing IoT for fisheries in Lombok. This is an emancipatory activity that enhances their value as citizens and strengthens them and their communities through meaningful participation in society, thereby significantly changing their citizenship position from being observers, even victims who are excluded, to becoming participants in the digital system (A4AI, n.d.; Mouffe, 1992a, 1992b; van Dijk, 2013). From a periphery-centric perspective, this is their strategy for daily digital inclusion to empower themselves and elevate the importance of marginalized individuals, particularly those in rural areas, with the help of digital technology.

5.2.3. Locality of Digital Initiative

The SCN operates within a context-specific framework, avoiding one-size-fits-all policy or "packaged interventions" (Toyama, 2015) and tailoring solutions to local needs. For instance, Djangkep and waste bank saving apps collect data reflecting the local context, aiding village administrations in decision-making. This bottom-up data collection contrasts with top-down approaches from the central government. Internet towers were built in Tembok and Ciptagelar using affordable, locally available materials like bamboo, embodying principles of affordability and low maintenance. Traditional/religious values and modern technology coexist in villages like Ciptagelar and Nimboran, reflecting a hybrid community ethos. The periphery-centric approach fosters this coexistence, allowing for simultaneous digital inclusion and exclusion and empowering communities to address digital inequality locally.

5.2.4. Ownership of Digital Technology

The SCN empowers local participants by ensuring that the outcomes belong to them, acknowledging that they may not always be quantitatively measurable and cannot be compared with urban digital development achievements. This decentralized approach helps address the inequality of outcomes resulting from digital technology use (the third level of the digital divide), as it allows rural communities to tailor technology to their needs, for example, the need for improving shrimp cultivation productivity by utilizing IoT sensors in Sukadana. The ownership of material and immaterial capital, such as data and local knowledge (e.g., in Ciptagelar with their traditional principle), enables communities to create relevant outputs, like waste bank and public service applications as seen in Tembok. This ownership grants autonomy and power to manage resources and make strategic decisions for the community's benefit.

5.2.5. Agency

The SCN transforms diverse individuals in the four villages, including village chiefs, government agency heads, ICT volunteers, students, activist mothers, and youth, into change agents. As digital citizens, they actively engage in social and political transformation and are driven by diversity and even conflicting perspectives, embodying "agonistic pluralism" as conceptualized by Mouffe (2020). These individuals reject

top-down digital development initiatives and aim to be central figures in regional projects, constructing the "we" as "radical democratic citizens" (Mouffe, 1992b). They enhanced their agency in digital development through various activities, created demand and supply, proposed funding and legality for their initiatives, designed business models, collaborated with different stakeholders, built networks, and employed good organizational governance.

An interesting observation in this context is how local leaders play a crucial role in a social process that encourages their communities to form this "we" identity and actively engage in enhancing their digital capacity. This phenomenon is observed in Nimboran, Tembok, and particularly in Ciptagelar, where adherence to traditional leaders is a reliable strategy for gaining access to digital technology and addressing disparities in formal education, thereby strengthening the position of indigenous communities in the digital transformation process.

The user-centric approach of the SCN leverages individuals' multiple roles and identities, emphasizing multi-stakeholder collaboration within the periphery-centric approach to optimize network members' potential. This approach recognizes and activates the potential of every agent within the network, including marginalized individuals like domestic violence victims in Sukadana.

6. Conclusions

This article not only acknowledges that digital divides occur among and within countries, such as urban–rural and gender digital divides, but also recognizes that digital inequalities can emerge and even widen due to pre-existing social disparities (Heeks, 2022; Livingstone & Helsper, 2007; Ragnedda, 2020). Marginalized groups such as women, children, or people living in rural areas are the most affected by this digital inclusion, which creates new exclusions within the digital system. Government efforts to eradicate rural digital divides through universal access provision are only sufficient to address the first level of the digital divide, which is the access gap, but insufficient to tackle diverse digital gaps at the local level, such as gaps in skill and knowledge as well as outcome disparities (Ragnedda & Gladkova, 2020). Those are the problem dimensions of this research. Support is needed for bottom-up efforts that aim to solve the problems of rural digitalization.

By examining rural digital development through the SCN project, the periphery-centric model was employed as a strategy to navigate rural communities' daily digital in/exclusion in order to bridge digital inequalities, challenging the conventional center-centric model, which revolves around the government's national digitalization agenda. This new model empowers villages by fostering local participation in developing context-specific digital initiatives. It emphasizes integrating local norms and values into digital technology adoption to enhance community value without depleting resources. This is the strategic dimension of this research.

Strategically, the SCN adheres to the five principles as parts of the periphery-centric approach, namely prioritizing meaningful access, enhancing human resource capacity, addressing localized aspects and ownership of digital technology, and promoting agency. Among the examples of these initiatives in the four villages depicted above are incorporating indigenous and religious values, building bamboo internet towers, developing public service and a waste bank app, as well as designing IoT technology for the fishery.

Additional solutions from other SCN villages not described in this article include satellite-based internet infrastructure to reach the remote islands of Breueh and Talabu, solar-powered GSM connectivity in Mata Redi, where state-supported electricity is non-existent, and an IoT sensor prototype in Hitu Messing, in addition to the one in Sukadana. Furthermore, the integration of bamboo culture and traditional values is being employed to develop local connectivity in Ketemenggungan Tae. These findings support Featherstone's (2024, p. 34) recommendation to:

> Consider local context and needs, ensure culturally appropriate and sustainable solutions…support for localized digital inclusion plans, with a flexible funding program to enable locally developed strategies to address identified barriers, building community capacity and ownership and greater engagement in the solutions.

Therefore, while the findings presented in this article are primarily based on the four exemplified villages, it can be concluded that all SCN villages benefit in various degrees from their orientation towards the aforementioned five strategic pillars of SCN in their fight to reduce digital inequality.

By implementing the aforementioned strategy, numerous centers have emerged, as depicted in Figure 1, aligning with the multiplicity paradigm (Servaes, 1999), which rejects the total and feudal model of center-periphery relations (Frank, 1966; Galtung, 1971; Wallerstein, 1974). These diverse centers are determined by different contexts and discourses, which may occur because individuals can occupy multiple "subject positions," as theorized by Mouffe (1992a, 1992b). The SCN villages, particularly the four ones, have proven that they can transform into centers despite their geographically, politically, and economically peripheral positions. Behind undeniable real barriers such as remote locations, limited internet access, high connectivity costs, and scarce resources such as electricity and finance, they have succeeded in developing meaningful digital initiatives. Digital actors in these villages thereby foster their agency as "radical democratic citizens" (Mouffe, 1992a, 1992b). The SCN exemplifies how rural digital development and citizenship intertwine under this approach. For the broader academic debate on digital inequalities and center-periphery relations, this implies that although various forms of digital divides are found in all SCN villages, these divides can be mitigated with the implementation of periphery-centric principles. As a result, pre-existing social inequalities are not amplified into the digital realm (Toyama, 2015), and new divides do not emerge.

The four case studies above demonstrate that social inequality does not necessarily become an absolute precondition for new digital inequality when these communities participate in global digitalization projects. Rather, it is the meaningful adoption and adaptation of digital technology that provides their peripheral position with added value, thereby altering the power dynamics between the center and the periphery. Complete disconnection from the digital system is not a solution to avoid digital social stratification; rather, the meaningful utilization of digital technology, as embraced in the periphery-centric approach, can prevent these groups from being entirely digitally excluded.

Despite its potential, there are some critical remarks for the periphery-centric model. First, these initiatives cannot be replicated entirely as forms of information and communication technology for development intervention in other locations due to their context-specific nature. Therefore, they are not "best" practices but a series of good practices from which other communities can learn (Unwin, 2017). Second, with its focus

on meaningful access, this approach could overlook the importance of equitable and affordable distribution of digital access and infrastructure. Third, it may provide governments with an excuse to shirk their responsibility to provide fair, equitable, and affordable basic infrastructure and internet access by attributing greater value to grassroots initiatives. Therefore, further research is needed in other locations to capture the variety of initiatives that use the periphery-centric model and the potential differences in research outcomes. Longitudinal research is also advised in both old and new SCN locations to measure the sustainability of these initiatives, especially if there are changes in the issues faced and the possibility of discontinuation of support from external parties such as CR in the project.

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Conflict of Interests

The author signed a contract with the Common Room for the aforementioned project as a researcher. However, the author affirms his independence throughout the research process and confirms that no directives were received that could influence the research outcomes.

Supplementary Material

Supplementary material for this article and the information about the Association for Progressive Communications's project can be explored here https://www.apc.org/en/project/supporting-community-led-approaches-addressing-digital-divide and here https://commonroom.info. As the School of Community Networks project remains in progress, the data set may be subject to modifications.

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