Technopreneurship and Digital Inclusion: How Can Tech-Startups Promote Technology Access in Remote Areas?

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Abstract. This project aims to investigate how technopreneurship can foster a more inclusive digital economy, particularly within the higher education sector of rural Indonesia. With the increasing discourse surrounding the digital economy, technology-driven start-ups are playing a pivotal role in enhancing access to financial, educational, and health solutions in underserved communities, particularly within the fintech, edutech, and healthtech sectors. Despite the considerable progress achieved, substantial challenges like infrastructure and digital literacy continue to present significant barriers to enhanced digital inclusion. The investigation emphasizes the necessity for collaboration among governmental bodies, the private sector, and technology innovators to bridge the digital divide, fostering a more cohesive ecosystem. Summary A mixed-methods study reveals that technopreneurship holds significant promise as a key contributor to economic well-being in marginal, remote, and peripheral regions, while simultaneously fostering the digital economy inclusively and responsibly.

Keywords: Technopreneurship, Digital Inclusion, Remote Areas.

1 Introduction

1.1 A Subsection Sample

Indonesian technopreneurship has been proliferating in recent years and is one of the leading sections of Indonesian growth in the economy and jobs. Many tech startups have sprung up with government and private institution support to find innovative ways to solve various social and economic challenges in the country [1]. The next factor which plays the great role behind the success of technopreneurship in Indonesia is the growing entrepreneurial ecosystem. The research shows that the role of government policies, funding, and social networks is significant in forming a conducive environment for entrepreneurs [2, 3]. Programs led by governments and private institutions for incubation and acceleration have helped many startups get the resources, training and networks they need to grow and succeed [4].

One of the answers to increase digital inclusion not only in urban areas, but most importantly in far flung areas are to develop technopreneurship or entrepreneurship of

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technology in nature. These, of course, are areas that tend to struggle with a wide digital divide and tech start-ups help to bridge this. In summary, by allowing easy access to services and information through digital innovation, technopreneurship is deemed to empower local communities to improve their welfare [5].

We are also seeing technology start-ups contributing to digital inclusiveness through applications and platforms specifically designed to suit the needs of people in areas distant from the metropolitan masses. For instance, the applications that connect financial services with health information allows for a far reach with communities that are distant from both [5]. Digital is one of the solutions to the financial inclusion problems faced by MSMEs in remote areas that have not yet accessed bank credit and has been proven by research in the financial sector to directly have a positive effect on the gap such as this [5].

Digitalization of rural administration – This serves as one of the primary pillars for promoting digital inclusion. Sarjito argues that the use of technology-based administrator systems in local government has the potential for a more effective public service for the benefit of the public and for the wider dissemination of public information to the public. For an effective promotion of public trust [5], it will not only speed up administration, but also improve government transparency and accountability. Yet, they struggle with their efforts on making digital access in rural neighborhoods. Geographical isolation, inadequate infrastructure, and low manpower with technological knowledge make it difficult to introduce new technologies [6]. Thereby, tech startup needs to work with the government and non-governmental organisations to educate and train to improve its digital skills [7]. That means, not just access to technology, but the ability to really use it.

Moreover, Technopreneurship will lead the way to local economic development through MSME that will be able to hiring and being competitive. One of the applications of digital innovations in the tourism sector, while introducing tourism potentials in these remote villages so that many visitors come to the region and the income opportunities of the village community [8] it is intended that by using information technology, villages can market tourism communities can find out if there is a way to develop villages that are the goals of other to increase opportunities and marketing tourism villages can improve the welfare of the village community as a whole. One of the factors that lead to success is technopreneurship contributing to digital inclusion. On the other hand, the partnerships startuplen will innovate and provide new approach to these issues so that people living in remote area, poor village who have no service and limited resource to connect to the digital economy and have opportunity to participates [5, 9].

However, even as one of the more emerging business opportunities, entrepreneurship in Indonesia faces several challenges, including shell institutionality and capital access [2] [10]. A startup is a business type with limitations on a daily basis related to the difficulties in product development, business expansion, and especially in underdeveloped areas [2]. Therefore, the government can assist its development by providing policies that facilitate access to funding and skills training in order to foster Technopreneurship [1, 3].

Furthermore, the advancement of Technopreneurship in Indonesia is also closely linked to the technological realisation of the phenomenon of digitalisation. The

COVID-19 pandemic has hastened the digitalization of a number of sectors, micro, small, and medium enterprises (MSMEs) included [11]. Despite the fact that only a small percentage of MSMEs have successfully embraced digital technologies, the growth opportunity remains tremendous. More MSMEs can take advantage of opportunities that are present in the digital market through improving digital literacy and access to technology [11].

Technopreneurship also contributes to solving social (e.g., poverty alleviation and access to education) problems. Many of these startups are focusing on applications and platforms that deliver education and training services[12]. These efforts not only enhance the quality of life (QOL) of an individual, but also promote more inclusive economic growth [1, 12].

Indonesia has a great potential of technopreneurship in both innovation and economy. This can encourage the development of more competitive companies within the national and global market, for example, Indonesia can leverage the digital economy opportunities in the digital age to build a larger and sustainable entrepreneurial ecosystem with the right government and private sectors supports and a broader public digital literacy.

Unfortunately, the emergence of the digital divide in Indonesia has become a serious issue that needs to be this research urgently conduct. There is still a wide gap that defines the digital divide, particularly on the resource market for urban and remote population. For the most part, especially outside the major metropolitan areas, the Internet, technological devices and knowledge of how to use them is almost non-existent. As a result, communities that are most in need in these hard to reach places of the world are missing out on the technology platform for key components of life – education, health and economic growth. If this digital gulf is not bridged, social and economic equality could worsen. Thus, the need for research to find out how technopreneurship can be the answer to this gap. Hence, this research is important to assess the important role of startups in underdeveloped regions during the digital economy. High-Wage Jobs For Nontraditional Markets Expanding job growth in tech startups could create jobs in out-of-the-way areas through a broader digital ecosystem. The urgency for this is increased by population growth as well as more complex economic demands. Technopreneurship implements youth unemployment by providing employment spaces based service (ex: online transport) and Production (ex: e-commerce for local products); freedom is founded by entrepreneurship enterprises that generate employment opportunities. Such research is crucial for assessing the employment potential of tech startups, and how local communities are actually being incorporated into the digital economy.

2 Literature Review

Technopreneurship is the convergence of technology and entrepreneurship regarding technological innovation in manufacturing business solutions [13], which, at their core, aims to resolve market problems or meet consumer demand. Technopreneur Technopreneurs — For this case: Someone or a group who uses technology as their foundation to build a new product (or service) based off their own human desire to solve

problems. According to [14], technopreneurship encompasses the domain of technology development and the ability to create sustainable business models.

As technology grows in an era, technopreneurship become a more outsized part of the world economy. As per the study by [15], the critical element of innovation in the digital economy lies with technopreneurship. Digital technology-based startups are also more nimble than larger institutions, and are able to quickly scale solutions up or down as the market calls for it.

Digital inclusion is providing equitable physical and economic access to technology and the internet, so everyone can participate in the digital economy [16]. According to research by [17] mention that access to tools together with digital skills and using technology to access information would be the three essential components in digital inclusion. In less developed areas, it helps maintain the tech gap – which is very important. Urban digital divide The fact that causes, the most important one is the urban and rural gap It defines the digital divide which is access these time tools. The gap is mainly due to bad infrastructure and high expenses [18]. In multiple developing countries such as Indonesia, the digital divide is preventing remote residents from participating in the digital economy. For example, [19] shows how the educational, health, and economic opportunities are limited for regions that can not access the internet.

In particular, technopreneurship has a great potential to bridge the digital divide and also in remote area. Because tech startups provide more flexible and agile solutions which can be tailored to overcome infrastructure Constraints [20]. Like your example of loans provided by fintech startups, loans that can be offered to them by just installing an app on their mobile phones without requiring to build complex banking ecosystems. Tech startups play an important role in driving digital inclusion by providing access to previously inaccessible digital services in remote areas. According to [21], startups are able to develop disruption faster than large firms and adapt the solutions to the local needs. In Indonesia, Gojek and Ruangguru are among the startups that have brought transport, education and digital payment services to hard-to-access areas.

[22] research indicates that telecom infrastructure is the most important element for digital inclusion. Limited infrastructure, such as high-speed internet access, is a significant obstacle in remote areas. Tech startups can contribute by offering more efficient and cost-effective solutions, such as mobile network access to digitalized services and infrastructure. We need government support in building an ecosystem that enables technology entrepreneurship. According to [23], the government can supply basic infrastructure, fiscal incentives, and regulatory frameworks to facilitate technology.

Remote areas face the biggest challenges when it comes to access to financial services. In particular, fintech startups have played an important role in making digital financial services more accessible, such as e-wallets and online loans, for individuals in remote areas [24]. Digital access is only one part of the puzzle; digital literacy is also a key driver of digital inclusion. According to [25], it is necessary for individuals to possess sufficient digital skills to utilize technology effectively. Digital literacy training and education can be offered by tech startups to improve the skills of communities in these remote areas.

Technopreneurship is a promising area; however, most technology startups in these regions suffer from resource and capital constraints. Research from [26] reveals that

startups in remote locations often have fewer access to funding and technical assistance. This presents a significant hurdle for technopreneurs in developing sustainable technological solutions. For one, startups working in geographies outside the traditional tech hub must work around limited infrastructure. “Innovative technologies, in many cases renewable energy based or satellite based, can address the infrastructural limits that can hinder the extension of digital services [27].

3 Methods

Hence, this study intends to perform a mixed methods analysis using qualitative and quantitative data to examine and quantify the impact technopreneurship plays in driving digital inclusion in far flung areas. This way will be beneficial to study due to the in-depth nature, so focusing on the issues, opportunities and impacts of tech start-ups and enabling to track tangible results. This research will use descriptive-exploratory research design, where this research describes the phenomenon and the exploration of technopreneurship strategies and impacts are constructed in terms of digital inclusion in remote areas. This design was determined when in mind with researchers who wanted a shape exploratory to allow multiple lenses to the rich data. The study population is people in remote regions in Indonesia that have recently started using digital technology in several sectors including education, health, and finance. Tech startups providing digital services in these industries — fintech, edutech and healthtech — also belong to the population. In this context, purposive sampling was used to identify service users from the community of digital service users in remote areas and ensure that the respondents represent service users from all sectors such as education, health, and finance. The sample was based on users of applications such as Ruangguru, Halodoc and Modalku. There was also a group of tech startups from any remote area that was identified through snowball sampling among a network of startups and business incubators focused on innovation in remote areas.

While this research seeks to provide deep insights into technopreneurship and digital inclusion in outlying areas, the study is bounded by several constraints that could skew the results. However, these limitations are related to limited time and resources we have to access remote areas with little infrastructure and bias of participants to this study.

4 Results and Discussions

Based on a previous survey and interview, the majority of tech startups operating in remote areas in Indonesia are fintech, edutech, and healthtech. These startups have emerged in response to challenges common to underserved or disadvantaged communities, developing tech-enabled solutions to help overcome and alleviate such challenges. Fintech, like Modalku and Kredivo, contributes mobile apps to provide access to microloans and digital payments for people in depopulated areas. On the other hand, Ruangguru and Zenius provides access to quality education via its online learning platform which can be accessed even in limited internet network. Healthtech startups such

as Halodoc have provided online health consultations which allow people living far in remote areas to receive medical attention without having to travel miles. The move has greatly assisted those citizens living in town areas with limited access to health services, particularly during COVID-19. In more specific findings derived from observations and in-depth interviews with startups, inadequate infrastructure was found to be the instrumental challenge, and for startups based in remote regions, this was primarily the internet and telecommunication network. Internet infrastructure in remote areas is still limited and, when available, provides slow speeds and is costly, limiting the best possible use of digital technology. Digital literacy among communities in rural areas is another huge challenge. The majority of the population in these geographical areas does not know how to operate digital kits, such as a mobile phone or applications which are used to integrate and utilize the services provided by tech startups; hence they must be realized so that they get the services offered by the tech startups. Some startups such as Ruangguru and Modalku have conducted digital literacy programmes to teach users how to make use of their offerings.

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Indonesian government has been trying to support internet connectivity to area ride, and through has Palapa Rings programme show, but the studies show more needs to be done like improve more sustainability connectivity and coverage of the network. Tech startups also said they want additional incentives and regulatory flexibility to relocate operations to remote areas. However, despite the presence of other national government programs such as the 1000 Digital Startups Movement, which was founded to establish a conducive environment for the generation of creative solutions by technopreneurs, this research identifies still available gaps for startups across the country as those in rural regions feel they are unable to access funding or business incubation comparable to urban startups.

This study showed that tech startups in rural areas ended up playing a crucial role in enabling digital inclusion. With the help of fintech services, remote areas have been able to bank and access lending services that were once elusive. According to the survey, over 70% of respondents using fintech services feel that technology made their financial transactions easier, including in small and micro business management.
Edutech startups, in the education sector, have contributed in an immensely positive way to the learning processes in remote areas. Despite internet access still being a limitation, the online learning app Ruangguru makes it possible for students across the

region to engage better with lessons. Viser about 60 per cent of the teachers and parents said their children developed an improved understanding in class following use of the digital platform, based on interviews with the teachers and the parents. Healthtech is one area where technology has proved to be beneficial, particularly in terms of access to healthcare in remote locations. Online services like Halodoc enable people to consult with doctors and receive prescriptions delivered to their doorstep. More than 65% of respondents cited that these services are helping them, as they are not required to travel long distances to get the health service.

The study also identified several successful business models in remote areas. The freemium model is one that many startups utilize - in this model, basic services are given free of charge and users are given the option to pay for premium features., Ruangguru, free learning videos but sells you paid packages for exclusive access. Additionally, some startups adopt a community model where they partner with local governments or community organisations to bring digital services to the public. Since it requires active engagement with local communities, this model has been quite successful at improving uptake of technology.

The common concern towards low digital literacy led some startups to implement community-based education as a strategy to enhance the digital skills of remote population. Fintechs like Modalku facilitate actual training for MSME players in less urbanised areas on how to use digital financial application. This led to vast improvement for the trainees in their comprehension and ability to perform with regards to using fintech services to aid their enterprises. Edutech startups like Ruangguru also run digital training programmes for teachers in remote areas, enabling them to implement technology in a more seamless manner during the learning process. This programme not only allows teachers to become experts on technology but also assists in their delivery of materials through the web.

The study shows that mobile technology is essential to expand the area of inclusive digital reach in remote areas. Many technology start-ups are developing mobile phone–based applications in order to reach people in places with limited access to computers. According to this survey, nearly 80% of the people gave their vote in favor of using smartphones more than other devices to use digital services. Mobile based services allow to have technology usage in payment transfers, education and access to health services during the day. Lightweight, easy-to-use apps that were not bandwidth-heavy are also considered essential for tech startups in less urban areas.

One of the most interesting of these findings being how much transformational change in socio-economic well-being had been brought about by digital inclusion for communities in remote regions. BIS: In fact, a large share of the respondents who had used either fintech or e-commerce services reported increasing incomes in the course of the pandemic period, with a particularly salient effect among MSME players. Approximately 55 per cent of the respondents reported that improved access to technology has given them access to a bigger market, which subsequently resulted in an increased volume of sales for community products. E-commerce platforms also assist enterprises located in distant regions to obtain raw materials or final products at lower prices. Rural users of apps like Tokopedia, for example, can find goods that may otherwise be expensive and hard to access.

In general, this study indicates the importance of collaboration between technology start-up, government, and private sector involvement to foster the access to technology in remote places. Meanwhile some startups have collaborated with local governments on the development of internet infrastructure while others worked with telecommunication companies to roll out dedicated data packages for people living in remote locations. Such collaboration has been demonstrated to maximise the outcomes of digital inclusion programmes. Partena for example, collaborations between fintech startups and local banks enabled digital banking services to reach people in remote locations — even ones where physical banks were once inaccessible.

Based on the research findings, several recommendations can be provided to enhance technopreneurship development and digital inclusion in remote areas:

1. Technology Infrastructure Strengthening: The government and private sector should work together to strengthen internet and telecoms infrastructure in remote areas, especially by expanding the coverage of high-speed internet networks.
2. Sustainable Digital Literacy: Tech startups should continue to invest in digital literacy training programmes, especially for people in remote areas who are not yet familiar with digital technology.
3. Multi-stakeholder Collaboration: Partnerships between startups, government, and the private sector should be expanded to create more inclusive and sustainable technology solutions.

The survey results obtained through questionnaires distributed to the research sample who are technopreneur application users are as follows.

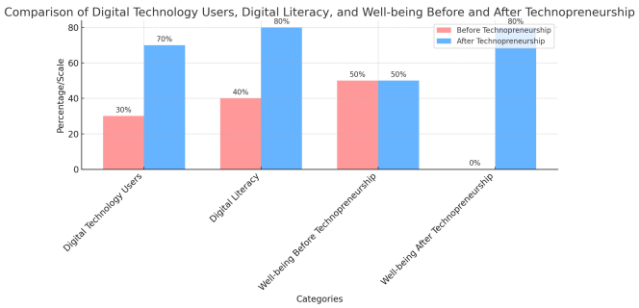

Fig 1. Comparison of digital technology users, digital literacy, and well-being using technopreneurship

The following table will explain how technology startups can encourage access to technology in remote areas.

Table 1. How Tech Startups Encourage Technology Access in Remote Areas

Activity	Description
Providing Digital Services Through Mobile Platforms	About a decade ago, tech startups in Indonesia began hopping on the mobile bandwagon, expanding services to more remote regions, where internet access is still patchy. As smartphone usage increases, startups such as OVO and Gojek are implementing applications that can be used through the mobile phone network. Doing so creates easy access for those in the periphery of society to avail of services such as transportation and logistics, finance, and many more without having to circumvent complicated infrastructural requirements.
Providing Education Through Online Platforms	This is where edutech startups such as Ruangguru and Zenius come into play to help overcome this access to education in the more remote areas as online platforms can help bridging this gap. Conveying what is potentially outdated in learning material to realistic availability for students in variety of locations — where education scaffolding is still in its infancy. This results in students from remote places dwelling the similar study stuff as the students of cities, and closes the gap of education.
Online Healthcare through Healthtech	Start-ups like Halodoc are applying technology to open up access in remote and outlying areas For example, some people who are far from health facilities can now just use an app to speak with a doctor The app now also provides a medicine delivery service, allowing patients to take their medicine at home.
Fintech to Boost Financial Inclusion	Nexus of tech startups in the Fintech sector are doing scores of good to boost the incessant progress of financial inclusion in those far flung areas which are almost unapproachable by traditional banks. Increasing financial inclusion in this region is made by digital financial services which are offered by platform such as Dana, OVO, or even Modalku make people in remote area able to make transaction, take microloans, and saving more.
Utilisation of Technology to Increase Agricultural Productivity	For examples in the agriculture vertical, agritech startups like TaniHub and eFishery deliver technology-based services to farmers and fishermen in rural areas. These startups use Internet of Things (IoT) technology to manage land and efficient fisheries (such as feeding automation or land condition monitoring in real-time). Here innovations enhance productivity while bringing down operational costs.
Expanding Markets for MSMEs through E-commerce	For example, e-commerce startups like Tokopedia and Bukalapak create opportunities for MSME players in the regions to market their products more widely through online sales. Marketing access was a challenge for small scale industries in rural areas prior to these platforms. Through e-commerce, people can sell products to consumers throughout Indonesia, which will directly increase income and the economy in the region.

Collaboration with Government to Strengthen Technology Infrastructure	Several tech startups play a role in working with the government to establish internet connectivity in remote areas. For example, programmes like Palapa Ring have been designed to enhance telecommunications infrastructure throughout all the regions of Indonesia. With this infrastructure, tech startups can deliver more reliable and far-reaching digital services for underserved regions.
Improving Digital Literacy in Local Communities	Poor digital literacy is one of the key barriers to increasing access to technology in remote communities. There are fintech and edutech startups that provide training programmes to help people better understand the use of digital services such as training for MSME players in the use of digital wallets or e-commerce platforms and digital literacy for teachers and students in remote schools.
Affordable and Accessible Technology Solutions	Many startups are developing solutions with technology that overcomes infrastructure bottlenecks in a capital- and time-efficient manner. Startup apps built on these principles are lightweight and do not need high-speed internet, thus are more accessible for users in countries where an internet network is not yet well developed. This means that even if the infrastructure in an area is not up to scratch, startups can still have their services running functional.
Collaboration with Local Communities	Many of these tech startups collaborate with local communities to roll out digital services in salt pan areas. They use local leaders or institutions to help introduce the technology to locals. This method expedites the movement into digital tech brushing aside the communities that did not have experience with t

Technopreneurship and digital inclusion are also linked to the implementation of the Sustainable Development Goals (SDGs) programme. It individually has tech and entrepreneur meaning, so in general, Technopreneurship is what is based on technology innovation and implemented for entrepreneurship purpose. On the other hand, digital inclusion there offers reach to such technologies and innovations to all levels of the community, inclusive of remote and marginalised area citizens. Technopreneurship and digital inclusion could be a vital engine in the SDG endeavors as it could help democratize access to technology, strengthen the digital economy, and remedy societal disparity.

There are also linkages to the notion of new economic opportunities for poverty (SDG 1) and equality (SDG 10) against inequality which highlights the relevance of technopreneurship. Tech-based financial sector startups, such as fintech, offer mobile application-based financial access on the device the poorest can now afford – a phone. This assists in addressing banking access, insurance, and microloans to the formerly unbanked. Technopreneurship creates avenues for the poor to build micro enterprises, rise income and penetrate the formal economy through technology applications.
Technopreneurship also helps on the equalization of the disparity between the rich and the poor across the digital divide through digital inclusion. By accessing technology in remote pockets, it has allowed more room for jobs and business with good education

like urban. Directly alleviates economic and social inequity and balances out resource access.

Inclusiveness and technopreneurship are also necessary for access to quality education itself (SDG 4). Quality education is difficult to access not only in Indonesia, but also in many other developing countries, for people in underprivileged and remote areas. Even technology based product/solution that initially driven by profitability, such as edutech startup, in a shortage of infrastructure and high poverty area like Indonesia, persists to grow, as demonstrate by the presence of Ruangguru, Zenius, Sakuku, and many more, that provide online learning platform with high quality educational content that child can access —yes, even the one who come from rural area that lack of education infrastructure. Techno-entrepreneurship at educational institutes enables greater access to learning resources, its unique solutions for AI driven learning, curriculum, personalisation of studies and interaction with teachers from other parts of the world. So, technopreneurship helps create a better, more inclusive, and equitable education system.

In the health sector, technopreneurship has been crucial for promoting greater access to better health (SDG 3). Healthtech is a part of this technology — health application such as telemedicine application (i.e. Halodoc, Alodokter) that made people from rural area able to consult to physician with online-tech. This is specifically beneficial for those who are far away from health facilities. So this digitalisation in health care sector helps for bridging the gaps in the reach of health care services to the people, as everyone get health services providing to proper medical treatment regardless of their geography as human. Apart from telemedicine, some healthtech start-ups build technology-powered devices which help in early assessment and tracking of health problems at a distance. Technopreneurship is defined as making health care affordable, efficient, and equitable to the public, so as to improve the health of the public.

FDI and portfolio investment Technopreneurship for Inclusive Economic Growth Technopreneurship is fundamental to the attainment of quality employment and decent work for all (SDG 8). Creation of New Jobs: Since a start-up has to adopt technology-based business models, it can tend to create new jobs, especially in the digital economy. Jobs like these are in fields like technology, customer service, logistics and digital marketing where they can be done by anyone in some remote area. Additionally, with increasing access to the internet and technology, particularly in Indonesia, many MSMEs (Micro, Small and Medium Enterprises) will have the opportunity to use e-commerce platforms such as Tokopedia and Bukalapak to market their products on the internet. It deepens market access for MSMEs whilst driving local economic growth.

In essence, it fosters a digital economy ecosystem that accommodates inclusion where all benefactors of the digital economy system can partake in its rise. The same is expected for innovation in the energy sector in particular in provision of clean and affordable energy (SDG 7) Numaligarh Refinery in India and Diawrigne and Luyap operate equivalent technopreneurship startups with technology-based solutions in communities located in remote areas that produce access to electric power derived from renewable energy, such as solar or wind energy. Innovations in energy technologies, especially in renewable sources, are it getting easier to use and more environmentally

friendly each passing day, and thus are supplying isolated communities and disadvantaged populations with more affordable low-carbon energy possible solutions as well as stepping back a little to catch-up in the addiction of using fossil fuel energy.

Through developing technologies that contribute to digitalisation and technological inclusion in remote areas, technopreneurship allows for the development of inclusive, resilient and sustainable infrastructure (SDG 9). Digital infrastructure such as telecommunication networks and fast Internet are important requirements in bringing digital inclusion. Tech startups, in collaboration with the government and private sector, are expanding internet access in remote areas via satellite, fibre optic or cellular network technologies. Moreover, technopreneurship also contributes to more efficient use of resources (water, energy) using IoT (Internet of Things) technology, which in turn supports sustainable infrastructure development.

5 Conclusions

Fintech, edutech, and healthtech technology startups have a role in extending more access to digital services to the farthest reaches. This was something that surely impact community in hard to reach areas, with the emergence of lots of startups such as Ruangguru, Halodoc, and Modalku who leverage digital technology to help them access education, health, and finance. As a result, these initiatives have a direct influence on enhancing digital inclusion and community welfare in these regions.

A major impediment to expanding digital inclusion to remote areas is limited technological infrastructure, particularly slow and expensive internet access, despite these advances, the study also found. Moreover, the high levels of digital illiteracy among communities in remote areas delays the effective adoption of digital technologies. Despite improvements over time, continued investments are required to enhance digital infrastructure and literacy in these regions.

This research underscores the role of government support, as collaboration between tech startups, government, and the private sector has a potential accelerator effect for digital inclusion. Various programs such as Palapa Ring and the 1000 Digital Startups Movement have contributed positively, but we have yet to strengthen the technopreneurship ecosystem in remote areas. This closer collaboration will lead to better solutions that are more innovative and fit for purpose. The digital initiatives by startups have shown genuine positive impact on the economic livelihood of individuals in hinterland. Digital financial services, online education and online health have improved people's income and their quality of life. Technopreneurship is emerging as a crucial trigger of digital economic growth in previously marginalised locations.

To maximize the role of technopreneurship in advancing digital inclusion in remote areas, technology infrastructure needs to be improved, investment in digital literacy programs must increase and multi-stakeholder collaboration needs to expand. It is important that the government and private sector forge ironclad partnerships to ensure equal and affordable access to technology for everyone, as well as to provide support to tech startups so that they can extend their reach in areas of greatest need. In conclusion, technopreneurship has great potential in tackling problems of digital inclusion in

Indonesia's remote areas. If supported appropriately, tech startups will continue to spearhead positive societal change with national implications for social and economic development.

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