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The Role Of Blockchain And Ai In Driving Financial Inclusion In Developing Countries Through Digital Infrastructure

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Abstract

Developing countries face challenges in the adoption of advanced technologies such as blockchain and AI due to infrastructure limitations. This limited access to technology hinders the integration of people in an inclusive digital economy. The purpose of the study was to analyze the role of blockchain in enhancing financial inclusion and environmental sustainability through digital integration that supports green economy and energy efficiency in developing countries. The research methodology used a qualitative approach with a literature review method. The researcher collected and analyzed data from journals, identified key themes, and interpreted the interrelationships between themes in the advanced technology-based digital economy. The results of this study found that blockchain technology and AI have great potential in promoting financial inclusion and economic efficiency in developing countries. The challenge of uneven infrastructure in many regions is a major obstacle, especially in the application of blockchain and AI as a means of increasing productivity. On the other hand, the adoption of these technologies requires a comprehensive approach to create regulations that are in line with the needs of the digital market and sufficient security. The success of blockchain adoption in financial inclusion is also influenced by the readiness of the public to adapt to this technology, which still requires a comprehensive increase in digital literacy. This study concludes that blockchain and AI support financial inclusion by expanding access to affordable services. Flexible regulations and public-private sector collaboration are needed to overcome structural challenges

Keywords: Financial Inclusion, Blockchain, Advanced Technology

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1. Introduction

This current era present challenges and opportunities new For expand inclusion economy through digital integration across various sector. Blockchain, with his ability take notes transaction in a way transparent and safe, strengthening connectivity in economy blue at destination island smart (Diaz Pranita et al., 2023). Agglomeration digital economy also allows the occurrence management source more power effective , connecting various sector industry For support sustainability environment. Technology This in a way direct impact on management source power and reduction footsteps carbon , making it element important in the economic era inclusive green.

Integration between AI, IoT, and blockchain contributes to optimization source Power energy with use approach intelligent . AI models predict need energy in various sector , allowing more scheduling efficient

For reduce waste . With big data system , big data analysis allow learning deep for AI use increase accuracy prediction as well as efficiency operational (Li et al., 2022). IoT platforms play a role important in connecting AI with device others, such as sensors and equipment production , so that the automation process can implemented in a way wide in sector industry. Blockchain completes this process with facilitate trading decentralized energy, enabling more system efficient and transparent.

Technology Era also presents challenge in form inequality economy and access to technology . In developing countries , access to technology advanced like AI and blockchain still limited , especially consequence constraint infrastructure and expertise technology that has not been evenly. Challenges This can overcome through collaboration cross sector For push inclusion more finances widespread in society. With utilise technology this, the perpetrator business Micro, small and medium enterprises (MSMEs) are expected capable adapt with digital change, enabling they increase Power competition and access to the global market. Digital transformation in the MSME sector will give impact positive on alleviation poverty and creation field work in the area isolated.

First study related problems that arise in integration of blockchain and AI in economy inclusive is How limitations infrastructure hinder implementation technology in developing countries. Infrastructure technology that has not been adequate result in digital divide, where society not enough accessible with technology sophisticated that can increase productivity and efficiency. On the other hand, partnerships international and investment from sector private can give solution with help development infrastructure and development expertise in society. Through this strategy, developing countries expected capable adopt technology advanced optimally.

The second study covers the environmental impact of digital economy agglomeration. Although digitalization contributes to an inclusive economy, increased digital activity can increase energy consumption and carbon emissions, which have the potential to damage the environment (Ren et al., 2022). The use of AI and blockchain technology in smart energy management is a solution to reduce this impact. AI systems can predict and manage energy consumption in an effective manner, while blockchain ensures accuracy and transparency in energy transactions.

Thus, sustainable development can be achieved without sacrificing environmental sustainability. The third study focuses on the aspect of financial inclusion which is still an obstacle in various developing countries. Many people are not yet integrated into the formal banking system, making it difficult for them to participate in the digital economy. Blockchain technology can provide a solution by providing access to more accessible and decentralized financial services. With the use of this technology, financial transactions can be carried out at low costs, making it easier for people to access banking services without geographical barriers and also high costs. In addition, increasing digital literacy is an important factor for people who are able to utilize this technology properly.

The integration of blockchain and AI in an inclusive digital economy also supports sustainable development goals that include economic, social, and environmental aspects. Optimizing the use of this technology can improve people's welfare while maintaining environmental sustainability. By adopting a digital economic model based on smart technology, developing countries are expected to be able to face the challenges of globalization while increasing competitiveness at the international level.

2. Literature Review

Insfractructure Technology in inclusive Economy

The theory of infrastructure limitations that hinder the implementation of blockchain technology and artificial intelligence (AI) in developing countries itself is based on unequal access to technology. The digital divide is a major obstacle because the technological infrastructure in many developing countries is still far from adequate (Pansera et al., 2024). This limitation reduces the public's ability to access

advanced technology as it should which can increase productivity and efficiency in various sectors. Without strong infrastructure, the potential for implementing blockchain technology and AI will be difficult to realize optimally.

Factors that influence these infrastructure limitations involve aspects of international partnerships and the private investment sector. International partnerships play an important role in providing the resources and expertise needed for the development of digital infrastructure (Song et al., 2024). On the other hand, the private investment sector is also a major driver in accelerating this development. Through the involvement of these second parties, developing countries have the opportunity to increase their infrastructure capacity, which ultimately opens up public access to modern technology.

Studies show that digital financial inclusion is also a relevant factor in accelerating technology adoption in developing countries. Digital financial inclusion not only facilitates access to modern financial services but also encourages green technology innovation and R&D investment (Sun et al., 2024). This increased financial access enables communities to be more prepared to adopt new technologies, which can drive economic growth in a sustainable and inclusive manner. The implications of digital infrastructure development for sustainability must also be considered in long-term planning. Developing countries that wish to adopt advanced technologies such as blockchain and AI need to pay attention to the impact of the resources used, especially in the context of de-growth or sustainable development (Ghimire et al., 2024). The balance between economic growth and environmental conservation is key to the implementation of this technology can provide long-term benefits without sacrificing existing resources.

Impact Environment from Digital Economic Agglomeration

Digital economy agglomeration influences economic inclusion and sustainable development in different regions. The digital economy refers to the integration of technology into economic activities, creating digital business clusters that enhance efficiency, connectivity, and innovation in both urban and rural areas (Liu et al., 2024). This agglomeration supports inclusive growth by providing jobs and facilitating market access. However, the intensive agglomeration activities of the digital economy also increase energy consumption and carbon emissions that can damage the environment (Ma et al., 2024). To balance economic benefits and environmental risks, intelligent energy management is essential. The use of advanced technologies such as AI and blockchain in energy management is an important solution. AI systems are able to predict energy consumption patterns that help in planning energy distribution in an efficient manner (Chen et al., 2024). With the ability to process data in real-time, AI can also reduce consumption over time, thereby reducing carbon emissions. Blockchain complements AI systems by ensuring transparency and accuracy in energy transactions. This technology prevents manipulation of energy consumption data and ensures accurate measurements, thereby helping to minimize environmental impacts. However, the impact of digital agglomeration on the environment varies from region to region. Densely populated urban areas or resource-based cities experience more intense environmental impacts than other areas (Liu et al., 2024). The presence of digital economy clusters in these cities often results in higher emissions, despite their positive contribution to energy efficiency. Therefore, the policies implemented must consider the specific ecological and social aspects of each region (Ma et al., 2024). This is important so that the impact of agglomeration remains in line with sustainable development goals. The implementation of smart city design is one of the strategic steps to support sustainable economic growth. Smart cities are developed by grouping economic activities that can increase productivity and economic inclusion, but are often accompanied by increased greenhouse gas emissions (Stamopoulos et al., 2024). In this context, the role of government regulation and strong judicial support are needed to encourage companies to innovate greenly. Appropriate regulation and

structured environmental support can maximize the benefits of the digital economy while minimizing negative impacts on the environment (Chen et al., 2024).

Inclusion Finance through Blockchain in Development Countries

Inclusion finance in developing countries faces big challenges, especially in accessing formal banking services. Many people in this area Not yet integrated with conventional banking system. Blockchain technology offers a solution for this problem by providing a decentralized finance service, allowing individuals who previously no served to access the service easily (Gan & Lau, 2024). Blockchain enables transactions with low cost, open opportunity for public For connected with financial system although hampered by geographical limitations. So that this technology can be utilized in a maximum way, increasing digital literacy among society is very necessary To understand and use blockchain effectively.

Adoption of blockchain technology in the banking sector is influenced by a number of factors, one of which is trust to those technologies. More societies and communities open to use new technology tend to adopt blockchain more quickly in their transaction finance. Trust this is very important in ensuring successful blockchain implementation as solution inclusion finance (Gan & Lau, 2024). Without the existence of a high level of trust, society Possible will hesitate to switch to decentralized system this, which can limit the potential benefits that can be obtained from the technology.

Blockchain, when combined with artificial intelligence (AI), can increase efficiency in various sectors, including supply chain and financial transparency. AI provides the ability to process data automatically more quickly and accurately, while blockchain ensures that the data generated can be trusted and cannot be manipulated (Hong & Xiao, 2024). Second technology This works the same For reducing negative impacts to the environment with increasing efficiency use source power. In the context of financial inclusion, integration This makes it easier access to efficient financial services, improving transparency of transactions, and reducing costs associated with traditional banking services.

Finance digital inclusiveness driven by blockchain technology also plays a role in supporting inclusive green growth at the regional level. With increased access to services more finances efficient, blockchain enables society in developing countries For easier access to the capital needed To support the real economy (Li et al., 2024). Greater access Good to service finance This leads to a reduction in economic inequality and supports sustainable economic development. This can help speed up the transition to a more green economy, because sectors like agriculture and energy environment friendly can more easily get funding.

In addition to efficiency and transparency, blockchain also has the potential to increase compliance to regulations, such as preventing money laundering (AML). Blockchain based infrastructure can automate tasks related to verifying identity and monitoring transactions, which usually require lots of time and resources. Power in traditional banking systems (Daugaard et al., 2024). By reducing excessive verification and increasing monitoring transactions, blockchain can lower costs for banks, at the same time comply with strict regulations. Implementation of this technology in the banking system can help increase the integrity and stability of the finance sector in an overall way, supporting objective financial inclusion and sustainable development in developing countries.

Integration of AI and IoT Technology for Energy Efficiency

The integration of Artificial Intelligence (AI) and the Internet of Things (IoT) is an important factor in more energy-efficient resource management. AI utilizes predictive algorithms to estimate energy needs in various sectors, which allows for more effective energy distribution scheduling and reduces waste. In addition, AI can also optimize energy use by adjusting consumption based on predicted patterns. The IoT platform acts as a bridge between AI and device production, ensuring that automation processes in the industry run optimally. This system connects physical devices with digital technology

that enables real-time energy control and monitoring, thereby increasing the efficiency of the overall energy system. IoT technology powered by AI is widely applied in energy management in smart cities. In this case, AI-powered IoT systems are used for intelligent metering, load forecasting, and optimal energy delivery. Xing Li et al. (2024) stated that this technology improves various aspects of the energy life cycle, including generation, transmission, distribution, and consumption. With the ability to monitor and analyze data in real-time, this system enables more accurate energy management and is responsive to changing demands. This is very important for reducing energy waste and maximizing the use of available renewable energy. However, while the integration of AI and IoT offers many benefits, there are challenges in energy efficiency, especially in battery-powered devices. Omar El Ghati et al. (2024) stated that while IoT-based devices, visual cameras, and AI technology are key to implementing smart cities, battery-dependent devices can face difficulties in maintaining long-term efficiency. Power management in these devices is one of the main challenges in efforts to optimize energy use. Innovations in battery technology and more energy-efficient charging methods are needed to ensure the sustainability and durability of IoT devices used in smart energy management. In addition, the convergence of IoT with cloud computing, known as the Cloud of Things (CoT), also opens up great opportunities in power distribution, especially in the distributed power generation and renewable energy sectors. Arul Rajagopalan et al. (2024) explained that CoT enables more advanced applications in energy management, by providing a platform that allows the integration of data from various sources in an efficient manner. This simplifies the decision-making process in energy distribution, ensuring better efficiency, sustainability, and reliability in the energy system. With these capabilities, CoT plays a vital role in creating a more energy-friendly and technologically advanced system. The use of blockchain further complements the technology by providing a decentralized, transparent, and efficient energy trading system. Blockchain ensures that energy transactions between producers and consumers are recorded clearly and securely, reducing the potential for data manipulation, and increasing trust in the energy system. The use of this technology provides convenience in more energy-efficient transactions, allowing locally produced renewable energy to be traded without relying on a centralized energy grid. By combining AI, IoT, and blockchain, the energy management process becomes not only more efficient but also more transparent and sustainable.

Sustainable Development Through an Inclusive Digital Economy

Intelligence Integration Artificial Intelligence (AI) and the Internet of Things (IoT) are becoming important factors in management source Power more energy efficient . AI takes advantage of predictive algorithms For estimating energy needs in various sectors, which allows scheduling energy distribution more effectively and reduce waste. In addition, AI can also optimize energy use with adapt consumption based on pattern prediction. The IoT platform plays a role as a connector between AI and device production, ensuring that the automation process in industry runs optimally. This system connects device physics with digital technology that enables control and supervision of energy in real-time, so that increases system energy efficiency in a way overall.

IoT technology supported by AI is applied in a wide way in energy management in the smart city. In terms of In this, AI-powered IoT system is used For measurement smart, forecast load, and delivery energy optimally. Xing Li et al. (2024) stated that these technologies repair various aspects of the energy life cycle, including generation, transmission, distribution, and consumption. With the ability to monitor and analyze data in real-time, this system allows more accurate energy management and is responsive to change requests. This is very crucial to reduce energy waste and maximize use of available renewable energy.

However, even though AI and IoT integration offers lots of benefits, there are challenges in energy efficiency, especially on devices that use battery power. Omar El Ghati et al. (2024) revealed that

although IoT based devices visual camera and AI technology become key in smart city applications, battery-dependent devices can face difficulties in maintaining efficiency long term. Management power on the device This is one of the main challenges in optimizing the use of energy. Innovation in battery technology and method of filling more power efficiently required To ensure sustainability and power stand IoT devices used in clever energy management.

In addition, the convergence of IoT with cloud computing, which is known with the term Cloud of Things (CoT), also opens up big opportunities in distributed power, especially in the distributed electricity generator and renewable energy sectors. Arul Rajagopalan et al. (2024) explains that CoT allows more advanced applications in energy management, by providing a platform that enables data integration from various sources in an efficient way. This is simplify the process of making decisions in energy distribution, guarantee greater efficiency, sustainability and reliability Good in the energy system. With this ability, CoT plays an important role in creating a system that is more energy friendly environment and progress in a technological way.

The use of blockchain is increasing complete technologies with a transparent and efficient decentralized energy trading system. Blockchain ensures that the energy transactions that occur between producers and consumers are recorded with clear and safe, reducing potential data manipulation and improving trust in energy systems. Use technology This gives convenience in transactions more energy efficient, enabling renewable energy energy produced in a local way can be traded without network dependent energy central. By combining AI, IoT, and blockchain, the energy management process will not only become more efficient but also more transparent and sustainable.

3. Research Design and Method

Methodology study This uses a qualitative approach with method study library, referring to the guide qualitative analysis through data encoding, identification themes, and thematic interpretations based on relatedness inter-theme (Creswell and Poth, 2017). In this approach, researchers collect and analyze data from relevant research journals to identify challenges and opportunities for digital integration in economic sectors. Researchers use open coding to identify the main thing that appears from the data. Themes found cover the role of blockchain in inclusion economy, environmental impact from agglomeration digital economy, as well as constraints in inclusion finance in developing countries. Identification This is done To understand How digital technologies, such as blockchain and AI, can overcome various challenges that arise in reaching an inclusive digital economy.

Interpretation thematic done with notice relatedness inter-theme For to obtain comprehensive understanding about challenges and opportunities in inclusive digital economy. Researchers to hook each theme based on its suitability with key issues, such as infrastructure, regulation and impact environment, so that produce in-depth analysis about the necessary aspects in implementing sophisticated technology in developing countries. The relationship This gives base For a comprehensive interpretation that takes into account how each theme supports or hinders in the process of adopting digital technology.

4. Results and Discussion

Challenge insfractructure that is still become obstacle in implementation blockchain technology and AI in developing countries.

Digital infrastructure that does not evenly result in digital divide, hinders public access to technology. This is to increase productivity and economic efficiency. International investment and private sector partnerships can offer solutions with speed up development infrastructure technology and strengthen digital skills training for society. Thus, adoption of blockchain technology and AI is expected

to walk more optimally in developing countries to support inclusive economic growth (Diaz Pranita et al., 2023).

Analysis This focuses on infrastructure challenges and strategic development that influences adoption of blockchain technology and AI in developing countries, with a critical approach through data encoding to identify main themes. Analysis This uses open coding To find codes the key that reveals three main themes namely, (1) challenges infrastructure, (2) influence regulation and security, and (3) adoption and inclusion strategies technology. Third theme This shows How integration of blockchain and AI can strengthen inclusive economic growth, but requires a comprehensive thematic approach To overcome existing obstacles.

first theme, namely challenge infrastructure, including issue digital divide in developing countries consequence limitations facility technology. Infrastructure that is inadequate hinders public access to technology, so that limits the opportunity to increase productivity. Diaz Pranita et al. (2023) emphasizes that digital infrastructure limitations worsen the access gap towards blockchain and AI. This theme is related close to obstacles in implementing technology Due to limited access, which ultimately limits opportunities for a wider economy for the public.

Analysis shows that obstacle regulation and security become second significant themes. Obstacles This includes lack of regulatory compliance, lack of knowledge about infrastructure, and security vulnerabilities. Alnahari & Ariaratnam (2022) and Bendiab et al. (2023) show that various developing countries face challenge regulations that impact blockchain and AI adoption . Regulations that do not Sync with development technology hinder initiative development, as well as create concerns related necessary security fixed through more effective regulations.

Interpretation from theme security is also related to blockchain potential in increasing data protection in sensitive sectors, such as transaction finance and autonomous vehicles. Bendiab et al. (2023) highlighted the need for further study to overcome security vulnerabilities and maximize the potential combination of blockchain and AI. This shows that security aspects become pressing issues in blockchain integration, which requires attention from the policy makers to push successful implementation of this technology.

Challenge Flowchart Implementation Blockchain Technology and AI in Developing Contries

Adoption and inclusion strategies technology is the third theme one includes various efforts to encourage adaptation technology in social and economic contexts. Singh et al. (2023) explained that

strategic road map involving regulation, incentives economy, and planned implementation strategies will help developing countries adopt blockchain technology in effective. Approach This offers a method to overcome gap regulation and improve financial inclusion as well as economy in society.

Based on inter-theme relatedness, it can be concluded that the theme gap infrastructure is closely related to challenge regulation and security, considering limitations access infrastructure needs flexible regulations so that they can adapt actual conditions in developing countries. Polas et al. (2022) stated that public perception about risk and convenience of use influences reception technology . In the context of SMEs, blockchain adoption requires a targeted education approach so that the community can see its benefits. comprehensive strategies, such as development of regulatory and security roadmaps, can help overcome challenges more infrastructure wide. This tiered approach can also increase public trust to blockchain security in everyday transactions. Through collaboration across sectors, this strategy becomes important in creating a conducive system for developing countries to optimally adopt blockchain and AI.

Thematic interpretation shows that international collaboration and public-private partnerships own big role in supporting technology adoption in developing countries. Investment from the private sector can help build infrastructure and strengthen digital skills, as suggested by Diaz Pranita et al. (2023). Collaboration This needs to support progressive regulation, which does not only protect users but also facilitates technology development in an inclusive way.

In general overall, relatedness inter-theme This shows that adoption of blockchain technology and AI requires Handling from side infrastructure, regulation, and security are interconnected support. Without a comprehensive strategy, the potential for blockchain and AI to increase inclusive economy in developing countries will be difficult to realize. Maker policies and private sectors are expected to play a role in overcoming this gap with a focused and sustainable approach.

Impact environment from improvement agglomeration digital economy

Environmental impact from improving digital economy agglomeration, which is No direct increase in energy consumption and carbon emissions in the middle of development digitalization. Although digitalization supports economic inclusion, improving activity technology tends to have a negative impact on the environment (Ren et al., 2022). The use of AI and blockchain in intelligent energy management becomes an effective solution to mitigate this impact. AI models can predict energy needs, optimize its use, and reduce waste. On the other hand, blockchain ensures transparency in transaction energy. With this management, digital economic development can still be sustainable without sacrificing environmental sustainability.

Analysis This highlights environmental impact from agglomeration digital economy (DEAGG) and use of technology such as AI and blockchain to manage energy consumption and carbon emissions. With the open data encoding method, several main themes were successfully identified: (1) Ecological Impact from DEAGG, (2) The Role of Technology in Energy and Emissions Management, and (3) Regional Differences in Effect of Digital Economy Agglomeration. Analysis This disclosure related close inter-theme , which shows the importance of specific strategies For face impact environment from digital agglomeration .

first theme, ecological impact from DEAGG, focusing on the non-linear effects of DEAGG on energy consumption and carbon emissions. Wang & Chen (2023) show that DEAGG can help reduce carbon emissions with lower energy intensity, even though only applicable if agglomeration is on a certain threshold. Interpretation This highlights how DEAGG at a certain level has the potential to have a positive impact on the environment. This theme shows that even though DEAGG supports economic inclusion, potential impact on the environment requires careful management. To guard environmental sustainability in the digital era.

The role of technology in energy and emissions management becomes a theme both are relevant. Technology like AI and blockchain are proven to mitigate the impact of emerging environments from digitalization. Ren et al. (2022) emphasized that AI is capable of predicting and managing energy needs optimally . Blockchain adds a layer of transparency in energy transactions, helping monitor energy consumption in a more effective way. This theme shows that technology can play an important role in ensuring that digital economic growth remains sustainable, by reducing energy waste and managing consumption with more Good.

Analysis theme second This highlights the relatedness between smart energy management and DEAGG in reducing carbon emissions. Although DEAGG encourages improvement in energy consumption, the use of AI and blockchain can help control this impact. Accurate AI model allows predictions need more energy right, while blockchain provides a transparent and accountable reporting system For energy consumption. Interpretation This shows that implementation of intelligent technology in digital economy can become the main solution in facing challenges in emerging environments due to DEAGG.

Third theme, namely regional differences in effect agglomeration digital economy, showing that the impact of DEAGG on carbon and energy emissions is different in each region. Cheng et al. (2023) and Yu et al. (2023) showed that spatial overflow effect enables DEAGG in an area to influence energy conservation in the area around . Jiang et al. (2024) added that digital economy drives subtraction emissions with different intensities between urban and rural areas. Analysis This discloses the importance of considering variations spatial moment to design environmental policy based on technology.

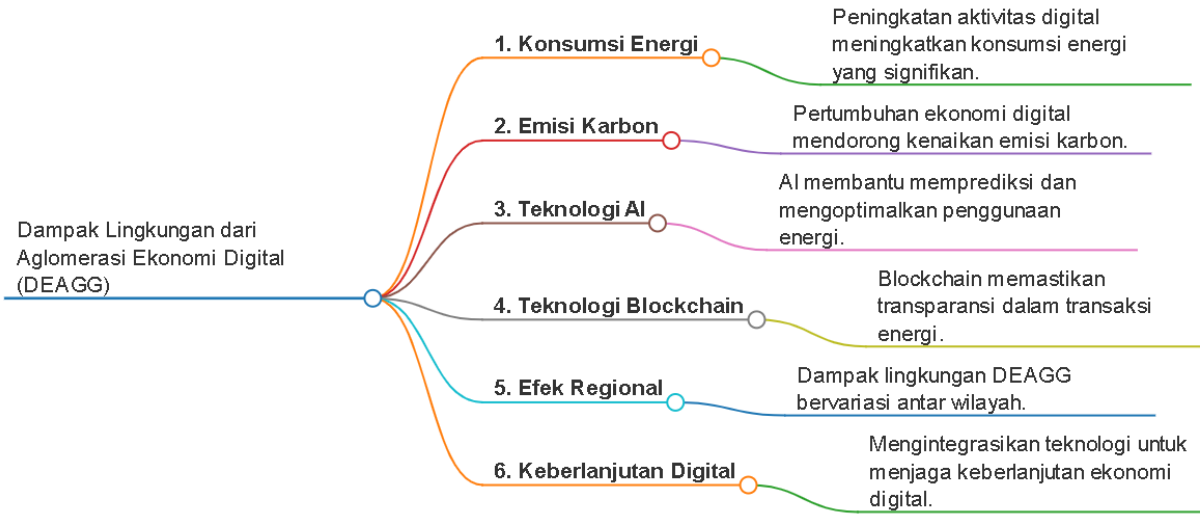

Figure 2. Impact Flowchart Environment from Digital Economic Agglomeration

Thematic interpretation shows that these regional differences emphasize the need for adaptive policy to local conditions. Each region has its own management threshold different energies, so that mitigation policy needs to be customized to achieve optimal results. Approach This shows that environmental impact management from DEAGG requires a data-driven strategy that takes into account spatial differences and energy intensity in each area.

Relatedness inter-theme This shows that DEAGG's success in reducing environmental impacts depends on the implementation of smart technology, adaptable policies, and understanding will regional variations. Policies that integrate use technologies, such as AI and blockchain, together with the exact DEAGG threshold will help reduce ecological impact and encourage the sustainability of the digital economy. Interpretation This shows the importance of an approach based on evidence in facing

DEAGG's challenge to stay in harmony with sustainable development objectives.
Analysis This states that energy management through AI and blockchain can become an integral component of a sustainability strategy environment. By building supporting digital infrastructure technology smart and considering overflow effects spatially, countries can optimize the benefits of DEAGG without sacrificing environmental sustainability.

Problem inclusion finance Not yet own access to service formal banking.

Difficulty in accessing financial services hinders them from participating in the rapidly growing digital economy. Blockchain plays an important role in providing more affordable and decentralized access to financial services. Through blockchain, society can carry out transactions with low costs, expanding access to financial services without geographical limitations or high costs. Increase digital literacy is also needed so that society can utilize technology This optimally and involved in digital economy in general more inclusive (Li et al., 2022).

Analysis This highlights the role of blockchain technology in increasing financial inclusion, especially for societies that have not been accessible by formal banking services, as well as a challenge in realizing fair access to finance in the digital age. Based on open data coding, three main themes identified: (1) Accessibility of Financial Services Through Blockchain, (2) Relationships of Financial Inclusion with Economic Growth, and (3) Structural Obstacles towards Digital Financial Access. The Relation inter-theme This describes complexity existing challenges and opportunities in inclusive finance based on digital technology.

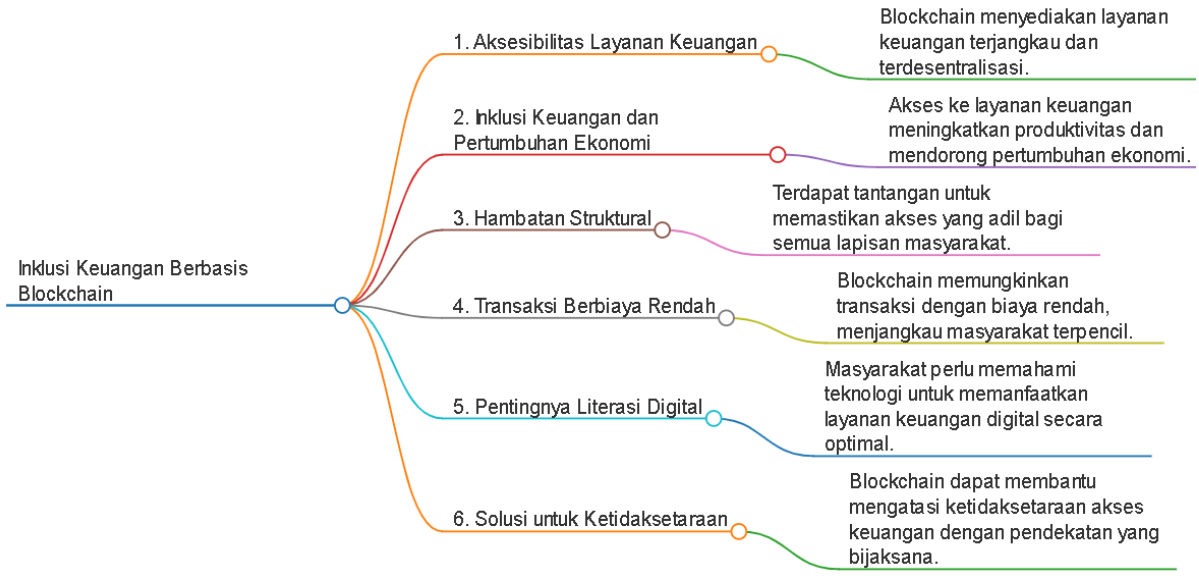

Figure 3. Inclusion Flowchart Finance Blockchain Based

First theme, accessibility of service finance through blockchain, focusing on blockchain capabilities in providing more affordable and decentralized access to service finance. Li et al. (2022) explained that blockchain enables low costly transactions without geographical limitations, so that reach societies that do not have access to conventional banking services. Interpretation theme this shows that blockchain can function as an alternative solution in overcoming geographical and economic obstacles, providing opportunities for public remote for involved in digital economy in general inclusive.

Analysis theme first this underlines the importance of blockchain technology in expanding financial inclusion, especially in developing countries. Blockchain enables safe and cheap financial transactions, providing more easy access to the community that was previously not yet served. Gupta & kanungo (2022) identified that digital technology is capable of helping segments of society at the bottom of the pyramid economy (bop) to be involved more actively in the formal economy. Thus, the implementation

of blockchain in the finance sector can increase accessibility and encourage public participation in an inclusive digital economy.

Second theme, relationship inclusion finance with growth economy, shows that inclusion digital finance can push productivity and growth economy. Babilla (2023) stated that small and medium business enterprises (smes) can increase their productivity through access to services more finances easily. Inclusion of digital finance expands opportunities for msmes to access loans and other financial services, reducing frequent financial obstacles that become constraints for small business development. Interpretation this underlines that inclusion finance based on digital technology does not only benefit public individuals, but also contributes to economic growth in an overall way.

Connection between access digital finance and economic growth shows the importance of technology in driving economic development. Daud & ahmad (2022) show that improving access to financial services through digital technology is positively related to economic growth. Analysis this indicates that inclusion of technology driven finance like blockchain can strengthen local economic sectors, improve power compete, and encourage financial independence. Interpretation this highlights that inclusion finance itself impacts areas that can cover economic growth at the macro level.

Third theme, structural obstacles to access digital finance, shows the existence of challenges in ensuring that access to digital finance services is truly inclusive. Ravnbøl (2022) emphasizes that without real and fair access to digital finance services has the potential to worsen social exclusion for the most vulnerable communities. Imbalance access this indicates that transformation service finance must consider need of public vulnerable to technology no in a way no on purpose to aggravate social inequality. Interpretation theme this highlights the importance of a comprehensive approach for overcoming structural obstacles, so that inclusion of digital finance can truly provide benefits for all layers of the public.

Relatedness inter-theme this shows that blockchain technology, although its own potential is big, requires a wise approach to the benefits can be felt in a way evenly. Without comprehensive consideration to structural obstacles, potential inclusion of digital finance could instead worsen inequality. Thus, the implementation of blockchain technology in finance must be accompanied by improved digital literacy, so that the most vulnerable communities can take advantage of it in an effective way. Interpretation this shows that inclusion finance based on technology requires a balanced strategy between innovation and empowering the public.

In general overall, this analysis concludes that although blockchain technology and digitalization service finance offer a solution to overcome inequality in access to finance, structural challenges need attention specifically for inclusion finance can walk in a fair way.

5. Conclusions

The application of blockchain and AI in digital economy requires support strong infrastructure as well as flexible regulations so that they can overcome the challenges of existing technical and social technologies. Technology This own role is important in inclusive finance through convenient access to affordable finance services, but structural challenges such as regulation and security must become main attention. To minimize risk. Thus, digital technology can support inclusive fair finances, but its implementation requires close collaboration between the public and private sectors so that the impact can be felt in a way evenly distributed throughout layers of society. In optimizing the positive impact of blockchain and AI in inclusive finance, investment needs to be made in more digital infrastructure evenly distributed, especially in developing countries. The increase in people's digital skills also needs to be strengthened through adequate training so that this technology can be utilized in an effective way. Collaboration between government and the private sector must be expanded to use create supporting

regulations adoption of technology in a way that is inclusive, ensures security, and minimizes access gaps. This approach will help create a digital economy ecosystem that supports inclusive growth and empowers community groups that were previously marginalized from formal finance services.

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