From Suspicion to Trust: ICP Blockchain's Role in PNG Aid Accountability

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Abstract: This paper is written to combat corruption, the ministerial slowness, and the overall lack of real-time control within Papua New Guinea's (PNG's) current centralized Charity aid system in distributing aid throughout the country. These problems concerning the structure of how Papua New Guinea (PNG) aids distribution, they are big cause of widespread mishandling of resources resulting to a big decline in donor trust, which has drastically impacted development process at the ground level (local Level) and up with a high decreased in external support. In contrast, there is hope through blockchain platforms such as Internet Computer Protocol (ICP). Ethereum and etc. ICP is one of the current top tiers in Public Blockchain technology in operation today. The purpose of the study is to see the benefits of ICP in PNG aid distribution in terms of its function's accountability and transparency. The study will also be examining the possibility of deploying such a system into Papua New Guinea's technological ecosystem especially its possibility, advantage, and any draw backs that comes with deploying this workable blockchain based solution, a thorough analysis of academic papers and research papers having ICP or block chain based solution used around the world on aid system or aid distribution will be examined. Given the thorough analysis and overview of PNG,s economy in terms of corruption and blockchain application of several papers, it is seen that blockchain may greatly impose an increase in transparency by offering immutable ledger capabilities that build donors confidence with real time fund tracking, this will revolutionize and reduce the number of administrative workloads through the use of automated smart contracts. Moreover, there are still underlying issues regarding the country's inadequate infrastructure, level of digital literacy and the necessary framework needed to guide implementation of this blockchain technology to successful adaptation. Despite the country's status as a third world country and still developing, PNG has the capacity to turn things around if proper studies is carried out to pinpoint the weakness in our economy and focus the solution on technological innovations to change it, by doing so improving its economy and country's state in general. So, in order to promote blockchain as one revolutionary tool that may restore faith in the humanitarian sector of Papua New Guinea, the study ends with strategic policy proposals for the incorporation into the assistance management frameworks.

Keywords: Blockchain, Internet Computer Protocol (ICP), Charity and aid distribution, Realtime Monitoring, Decentralized

Author Biography:

Daniel Yatukoman is a Final Year Bachelor of Computer Science Student at the PNG University of Technology; he's a Papua New Guinea native and reigns from the province of East Sepik. He has a desire for academic works and leadership experience, he has served key student representative roles, such as chairman of East Sepik Student and Staff Association of PNG UOT and Class representative for the Mathematics and Computer Science School. Daniel as a keen interest for technological innovations by using blockchains as a means of solutions to problems, due to its decentralized nature and chain structure for enhancing transparency, security and accountability in aid distribution. His recent studies were focused on a new blockchain technology called Internet Computer protocol and its ability to transform charity systems in Papua New Guinea. In addition, Daniel is currently working on this this project both theoretically and practically, in practical he's trying to deploy the system as his final year project. The system will enable real time monitoring allowing donors to know how their money is being used. This system will help bring trust back into charity and aid in Papua New Guinea.

1. INTRODUCTION

Over the years, humanitarian relief aid groups with charitable foundations and originations have been a life line to people in need worldwide. In Papua New Guinea (PNG) aid distribution plays a crucial role in solving many of PNG's developing needs in terms of poverty, health inequalities, natural catastrophes and the overall restricted access to basic infrastructures and educations. Papua New Guinea being the second largest island in the world faces a lot of socioeconomic difficulties as a result of it being a developing country. Most of the development that occurs to better life in the county comes from aid year in and year out, but even with the increasing amount of aid coming into the nation from both foreign and domestic sources, the performance of the current distributing system is declining over the years. The continuous misappropriation of funds, the secretive nature of finical transactions, and the high level of corruption throughout the different sectors are major issues facing Papua New Guinea in its assistance environment. These issues diminish the trust among donors and the public, when reports of money being embezzled hold up in payments, and a lack of oversight of the financial transactions. Furthermore, these issues are the direct result of the current centralized management system of charitable resources, this system does not cater for oversight or gives everyone hands on experience. Since the creation of blockchain technology, it has opened up many new avenues for redefining the traditional ways in how financial and governance institutions can impose accountability and transparency in the way it operates. Blockchain presents a source of fascination by providing solutions on how to track the source, flow, and use of charity funds because of its decentralized, immutable, and tamper-proof ledger characteristic. Through the use of smart contracts, it reduces reliance on any go between, by ensuring adherence to funding requirements, and enables donors and stakeholders to track transactions in real time. These developments could significantly influence an increase in data integrity, operational effectiveness, and trust during aid distribution procedures.

2. Charity and aid Problems in PNG compared to the pacific

Charity and aid problems is not just a problem PNG faces rather it's a problem where pacific island sisters are also facing it. The same issues as well were together, the Pacific islands depend on aid highly to maintain a healthy economy. Together all the pacific islanders depend on aid highly to maintain a healthy economy due to their landmasses and how scattered they are to each other. This is seen by the graph of "ODA-to-GNI ratio in Pacific Island Nations (2022)", reveals the degree of dependency on aid or assistance, where ODA assess the Official Development Assistance (ODA) as percentage to the Gross National Income (GNI). ODA measures how much assistance is given by donor countries and GNI is the measure of how much a person or residents of a country earns in a year.

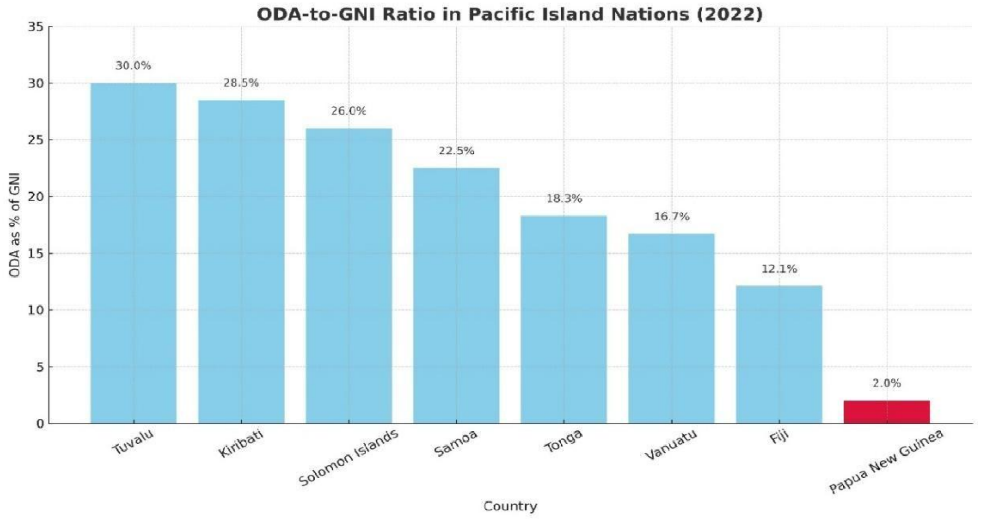

Figure 1 Shows a ratio between ODA and GNI in 2022

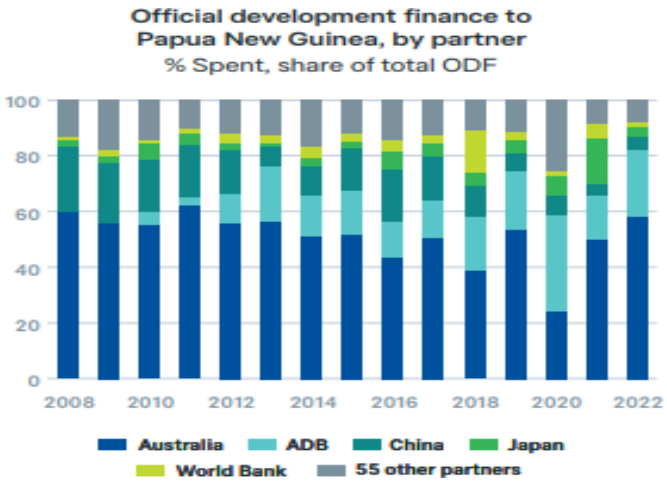

Figure 2 Shows the ODF up to 2022 from outsiders to PNG

PNG unlike its Pacific family has a low percentage of ODA to GNI Indicating a problem on the way it does its managing, the same is also seen in its Official development Finance (ODF). The inefficiencies and confusion involved in the nation's aid distribution operations are closely tied to its vast geographic area, spread out population, and lack of modern infrastructure. Take for example in 2024 a severe landslide in Enga Province up in the Highlands Of Papua New Guinea, that left thousands of people homeless and killed at least over another 2,000. During that time there were a lot of issues faced in bringing aid to the people, a lot of groundwork has to be down on how to roll out the aid due to the lack of trusted sources, we need a system that will ensure check and balances so we can ensure aid cane be given without disturbances . In PNG, the usual traditional aid distribution networks have faced a lot of challenges that made it hard to carry out aid distribution such as infrastructure constraints, logistical challenges, and worries about financial misuse. Additionally, the implementation of blockchain technology is not only advantageous but also required to guarantee that the limited aid reaches people most in need without loss, delay, or manipulation.

3. LITERATURE REVIEW

Ongoing studies being carried out by researchers and professionals alike are looking into blockchain implications and how blockchain technology might be used in varies ecosystems, the need to implement blockchain technology into systems worldwide is increasing in systems such as aid distribution and charity. There is a severe need for more open and accountable aid processes by implementing a decentralized system, especially it is very critical in the context of Papua New Guinea (PNG), where the institutional and administerial ineffectiveness frequently occurs and disrupt governance systems. The current issues facing PNG's aid system are seen in this literature study, along with the possibilities of blockchain being a solution, in particularly the Internet Computer Protocol (ICP) being the new kid in the block in terms of blockchain technologies.

3.1 Existing Studies and theories

The occurring flaws in PNG's aid management systems or how it operates on service delivery are called to attention in a number of reports. PNG has a high amount of development needs as a result of its towering corruption as seen in the study done in 2025 by businesses and investors saying that we rate 30/100 on the corruption perception index where 0 is most corrupt and 100 is least corrupt (Transparency International Papua New Guiana,2025 Feb 12).

Jackson (2020), who look into the vulnerability generated by emergency food aid programs among Indigenous people of Western Province in PNG, offers extra analysis of a serious need of help in aid delivery. Jackson said when aid is not received properly it steers into intransparency and adaption, leading to an increase dependency leading to a weakened resilience. The results being portrayed concerning are the reasons why we need a tool for aid organizations to help facilitate and improve the current system.

Blockchain-build solutions are becoming more famous as a solution to these issues. A study by IJRASET talks about a blockchain-based fundraising platform that operates on Internet Computer (ICP) and Ethereum. The paper points out the benefits of ICP, including its ability to make cheap transaction costs, decentralized governance, high scalability because of its Chain Key Technology, and a high support for real-time money tracking through smart contracts (2024 IJRASET). These characteristics under take the three main obstacles that was mentioned by Jackson: inefficiency, a need of local accountability, and absence of flexibility. Additionally, IJRASET study also talks about how to set up technologies that enable donors to confirm the validity of charities, such as the blockchain's affiliation of government-issued tax exemption certificates. This greatly improves institutional openness and donor confidence, two things that traditional platforms do not offer at hand.

PNG continues to be at a disadvantage especially when it's approaching its silver jubilee independence, in terms of factual and implementation-oriented research, despite the wide spread of achievements in blockchain-driven transparency in other countries worldwide. (Pennington, 2024) found fault with how Australia's aid to PNG and the operations involved in it especially its lack for procedures and policies to introduce an open public-private delivery with a all-inclusive beneficiary accountability. In spite of the fact that aid initiatives commonly require a number of parties, right now there is currently no proper centralized technology infrastructure to monitor and validate the course of funds at each stage, this is where blockchain can provide a solution to that problem.

To mitigate and provide a solution to PNG's crisis in charity and aid the need for technologies like blockchain need to be used. Many of the operational issues that are faced in PNG regarding charity and aid are with its centralized nature where there is only a main point of monitoring, now can be resolved with the intervention of blockchain technology, which is decentralized, transparent, and impenetrable in nature and structure. Having said that about its potential, there is still a severe inadequacy about the best way to apply blockchain technology in the particular social, economic, and policy landscape of PNG. Aid distribution is more likely to continue to suffer from the inefficiencies and a lack of accountability in the absence of a systematic and evidence-driven approach as a result of not enough technology integration. In addition, this study will be integrating a blockchain system into one of Papua New Guineas (PNG) key sectors for development, which is the aid and charity distribution sector. Blockchain in non-profit or NGO creates a system where everything is open and permanent, this makes it easy to see where donation are going(webisoft, 2025 Feb 22).The study will hope to provide insight into blockchain and its effect on parts of the world and how applicable it can be to PNG by comparing the results of its application worldwide. Blockchain is an untapped technology in PNG's Tech Industries, hence by analyzing the different types of blockchain out there a evidence driven approach of integration can occur.

Major systems like Ethereum and Bitcoin are usually the first thing that pops to mind when the term blockchain is mentioned and are usually the subject of current blockchain write ups and studies. Internet Computer Protocol (ICP) was released by Dfinity in 2021 now offers an entirely new alternative architecture and it has received little to no attention at all about its possibilities since most platforms are sticking to other blockchain technologies. In a short span of time the Internet Computer Protocol (ICP) outperforms its other counter parts in resolving the issues faced by its predecessors, which involves proper distinctive balance between scalability, security, and speed. Due to the use of Chain Key Technology as one of the fundamental technologies behind ICP, with chain key technologies, web apps may be created without depending on external cloud infrastructure with proper threshold cryptography.

4. INTERNET COMPUTER VS OTHER BLOCKCHAINS

Blockchain is a distributed ledger made up of a list of entries, or blocks, that are dispersed among the nodes in a peer-to-peer (P2P) network. In essence, blockchain is a type of data storage. The information in the blockchain is organized into a series of blocks, each of which has a distinct cryptographic hash that represents the information it contains. It is therefore endowed with the characteristics of decentralization, immutability, security, efficiency, and transparency. There are four types of blockchains out there namely Public, Private, Consortium and Hybrid blockchain. We will be looking at the different types of public blockchains.

Table 1 *below shows the comparison among all the other Public blockchains*

Blockchain **Finality)**	**Consensus Mechanism**	**Speed (Block)**	**Scalability**	**Transaction Fee**
Internet Computer	Threshold Relay (PoS variant)	1-2 seconds (update calls),	Unlimited subnets, infinite scalability	Fixed (0.0001 ICP)
		milliseconds (query calls)		
Ethereum	Currently PoW, transitioning to PoS	Variable block time, high transaction finality time	Limited, improving with Ethereum 2.0 (64 shards)	Dynamic (gasbased)
Cardano	Ouroboros (PoS)	Not specified	Limited, awaiting Hydra Layer 2 solution	Not specified
Solana	Proof of Stake with Proof of History	Fast block time, 13 seconds transaction finality	Sacrifices decentralization, data stored offchain	Not specified
Binance Smart Chain	Proof of Authority	Fast block time	Sacrifices decentralization	Similar to Ethereum (gas-based)
Zilliqa	PBFT with PoW	Not specified	Limited	Not specified
Algorand	Pure Proof of Stake	Fast transaction finality	Limited, uses IPFS for data storage	Fixed (0.001 ALGO)
Avalanche	Avalanche Consensus (PoS variant)	Fast transaction finality	Scalable with subnets, uses decentralized storage	Not specified
Polkadot	NPoS (Nomination Proof of Stake)	Not specified	Limited to about 100 parachains	Not specified

Consensus Mechanism-The way in which the confirmation and the accuracy of the data being entered into a ledger is called consensus. By doing this, all network transactions are updated and the next block to be added is accurately reflected. Invalid data or double-spending are avoided as a result.

Speed- is the time taken to do transaction of money from one account to another is directly tied to the speed of the blockchain.

Scalability- The power of how blockchain can be used for future expansion ang the increase in transaction. This means that scalability depends on how a blockchain performance is tied to its adaptation and speed, if it undergoes adaptation and picks up speed its an increase in scalability.

Transaction Fee- it's how Miners do Proof of Work and validators do Proof of Stake in doing so this can assist in confirming the amount of transactions that are being compensated with transaction fees.

In figure 3 ICP ranks highest in terms of Consensus Mechanism, Speed, Scalability and Transaction Fee when compared to its predecessors.

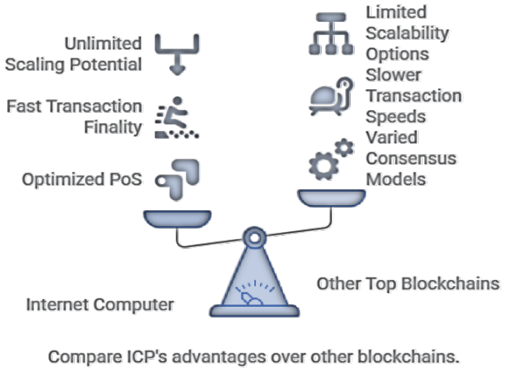

Figure 3 Gives a summary of ICP among all the other Public blockchains1

Figure 4 shows how powerful Internet Computer Protocol (ICP) reigns supreme over the other blockchain technology making it a suitable candidate technology to use for the platform as mentioned by its characters such as.

- *Decreased Transaction Costs:* ICP paves a way forward for digital purchases by allowing for minimal transactions to take place, by doing so it helps to make sure aid delivery is paramount without too much overhead costs to run the platform itself.
- *Enhanced Scalability:* The parameters on how to do aid delivery varies depending on needs so ICP's scalability nature allows to meet the changing humanitarian initiatives.
- *Advanced Smart Contract Capabilities:* ICP's smart contracts stand out from the other conventional blockchain technology, making it a suitable feature for the charity and aid platforms.
- *Decentralized Governance:* ICP's decentralized nature makes transparency a key component needed for aid distribution by ensuring stake holder's trust.
- *Smooth Integration:* ICP can operate in new environments given its compatibility with current systems, making it suitable for integration with any new system.

These results imply that ICP has a great deal of promise to increase the effectiveness and openness of PNG's aid distribution system.

5. INTERNET COMPUTER PROTOCOL ADAPTATION ON FINANCE SYSTEM

ICP can be adapted into PNG's current system given it follows the financial regulations and polices that are in place by Bank of PNG. The Bank of PNG already has an online system already in place called KATS commonly known as Kina Automated Transfer System, used by the commercial banks operating within PNG (Bank of Papua New Guinea. KATS allows for this bank to have online monetary transactions so ICP's adaptation is possible with this system in play.

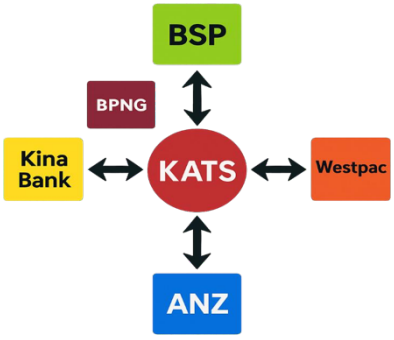

Figure 4 Shows a relationship between different banks and KATS

The three main payment options that KATS operate on are;

1. **Real Time Gross Settlement (RTGS):** It's a method for settling payments separately in a real time fashion, this means it facilitates not just high value but rather time sensitive transactions as well, by doing so RTGS can make sure that resources that are available right away by allocating money to partner groups or disaster relief efforts in a charity platform

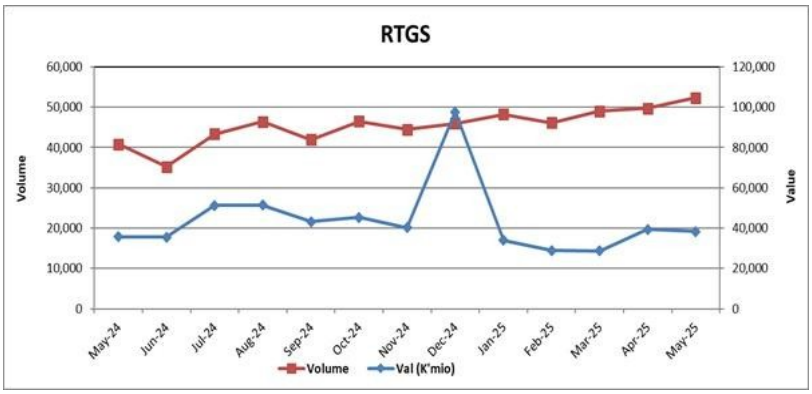

Figure 5 RTGS Chart. 1: Values & Volumes by Real Time Gross Settlement (RTGS) Payments (Bank of PNG, n.d)

2. *Straight Credits:* Straight credits emerge as a quiet hero, it's a technology that focuses on low transactions, it allows for support payments to flow effortlessly landing into bank accounts by allowing transmission of funds to recipients concurrently.

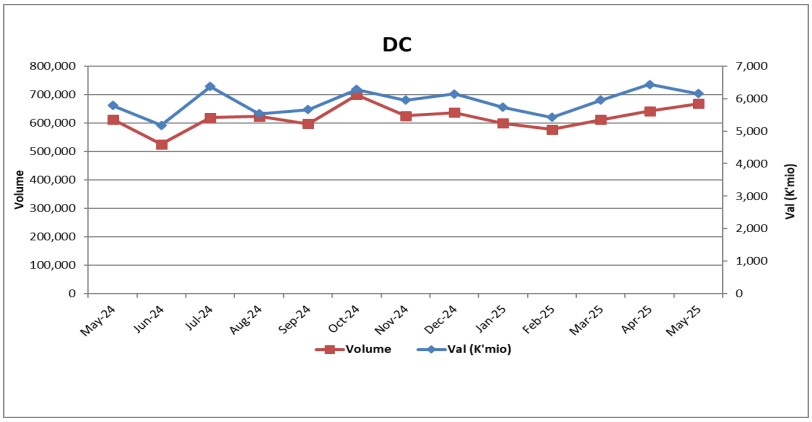

Figure 6 Chart. 3: Values & Volumes by Direct Credit (DC) Payments

3. *Processing of Checks:* Checks are currently not used as much as before in the country, as a result of technology such as electronic payment methods. However, KATS allows for check processing nonetheless, due to the need for access to banks without digital banking.

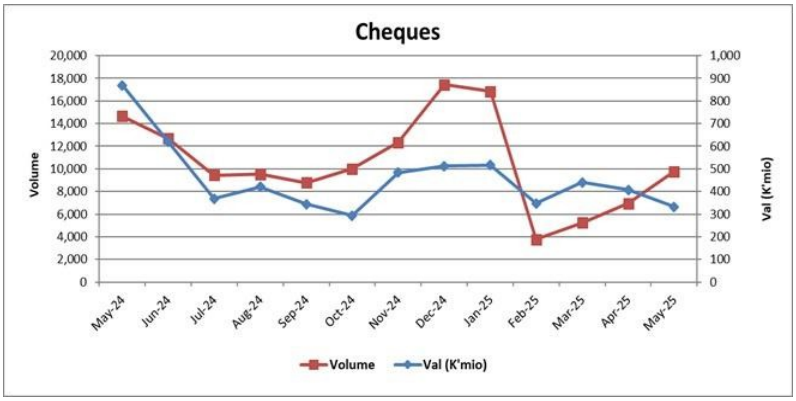

Figure 7 Chart. 3: Values & Volumes by Cheques Payments (Bank of PNG. N.d)

The charity platform can guarantee endorsement by following PNG's financial guidelines, in doing so it increases the rate of transparency, and fast track and strengthens the dependability of aid distribution by connecting with Kina Automated Transfer System (KATS).This allows for better fund tracking and overall reporting, will make it possible for integration, which would be in line with top standards for accountability in non-profit operations.

6. CONCLUSION/ RECOMMENDATION

In this Study ICP was thoroughly studied for its implications on its usage and how that can be beneficial to PNG aid distribution system. By proving that with every transaction that takes place it is unchangeable and traceable, this is possible with ICP's immutable ledger system improving accountability and transparency by lowering the chances of corruption and malpractice. On top of that, with a country identifying as a third world country with limited infrastructure and poor economy, ICP is financially a practical choice for assistance distribution because of its minimal transaction fees, basically meaning that a huge portion of money reach targeted beneficiaries with less administrative cost. ICP's built environment makes it possible for high scalability that may be adjusted to fit into PNG's vast landmass and regions that are isolated, given the level of connectivity and infrastructure. Furthermore, having real time transaction tracking will help to identify wrong doings and bring trust to humanitarian efforts. These results portray a great trust to PNG's aid distribution through the means of transparency.

This study is also vital as a result of influencing aid distribution through the policies in place and bypassing the traditional way of aid delivery. The study creates strong standing points about introducing blockchain into PNG's aid systems by showcasing the benefits of ICP as a game changer. Since it's a game changer it adds to the larger research talks about using cutting-edge technologies to improve the way in which humanitarian aid operations are organize, especially in conditions where negligence of governance and logistics are major issues.

A range of applicable suggestions was brought forward in spite of how the results of ICP can be put into action driven initiatives. First, viability, efficiency, and scalability of ICP driven aid distribution might be measured by doing a pilot project in a chosen area of PNG. Secondly, to make sure the integration of the system follows policies and regulations of all parties involved such as, NGOs, Local communities and government agencies is critical. Thirdly, increasing of funds for training efforts to technical staffs and local staff will increase the sustainable effectiveness of the blockchain based system. Finally, it is of dire importance to work out any ethical or legal issues by following a governance framework that supports the incorporation of a blockchain technology into the current centralized system.

By carrying follow up studies in the near future would share more light into the ongoing benefits of blockchain system specifically ICP in the long run, this will help with future works and development on assistance distribution sector to make it more efficient and transparent in nature. Basically, to get the best out of aid distribution system and refine it, it's better to do comparison of ICP's efficiency with other top tier blockchain systems that are in the field of humanitarian outreach to see their potential as well. Experimenting with how other cutting-edge technology can be integrated with ICP such as mobile platforms, biometric identification system

could drastically improve the accessibility and the inclusiveness of aid distribution. When implementing the system several key factors regarding PNG's infrastructure, population density, and the regional governance structures will be considered with ICP's scalability and how ICP uses its scalability to navigate these factors. Stakeholders may use ICP has a way forward to revolutionize aid distribution in PNG and guarantee more efficient and fair humanitarian relief delivery by following these suggestions and area for further studies.

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