A Study on the Utilization of DAO Elements to Enhance the Effectiveness of International Development Cooperation (IDC) Projects

1. Executive Summary

This report examines methods for selectively utilizing specific technologies and principles of Decentralized Autonomous Organizations (DAOs) to enhance the efficiency and effectiveness of International Development Cooperation (IDC) projects. Based on the assessment that the full-scale adoption of a DAO is currently unrealistic and entails significant risks in the IDC environment, this study focuses on the partial application of core elements such as the transparency of blockchain, the automation of smart contracts, and immutable record-keeping. This approach aligns with the recent trend where DAOs are gaining attention for their potential to strengthen social impact and improve the inefficiencies and transparency of existing systems in the development cooperation sector (Aaltonen et al., 2024; Staszczak et al., 2024).

The report introduces the potential of DAO elements to contribute to improving transparency and efficiency in key management areas across the project cycle. Among these, it deeply explores methods for securing data reliability and enhancing traceability in the field of **Monitoring, Evaluation, and Reporting (MER)**. It analyzes how the immutable record-keeping characteristic of blockchain can compensate for the vulnerabilities of existing centralized systems and enhance the integrity of specific types of MER data (inputs, activities, verifiable outputs). The potential for pre-validating data and enabling controlled data dissemination using smart contracts is also presented. While MER can serve as a core verification foundation for Outcome-Based Pricing (OBP) models, the application of DAO elements in this area still faces significant challenges, including the oracle problem, data quality limitations, and difficulties in measuring outcomes and impacts. Although blockchain can contribute to recording M&E data in a tamper-proof manner and enhancing transparency and traceability (Everconnect, 2024), ensuring the reliability of oracles that bring real-world performance data onto the blockchain remains a key challenge (GoLab, BSG, University of Oxford, 2023).

Furthermore, this report explores the use of **tokenomics for the specific purpose of project resource mobilization**. While this holds the potential to increase the transparency of fundraising and financial management, the report discusses in depth that in the existing IDC project environment, it faces much higher and more complex challenges. These include legal and regulatory uncertainties, market volatility and speculative risks, the difficulty of designing complex tokenomics, the risk of governance conflicts, and the potential to deepen the digital divide. In particular, if an outcome-linked token model is conceived by combining Outcome-Based Pricing (OBP) with tokenomics, it is highly likely to have the nature of profit distribution, making the issue of its classification as a security severe. Moreover, as seen in the case of the Central African Republic's meme coin (CAR Meme), even tokens issued under the pretext of development goals can exhibit extreme market volatility and be exposed to

speculative risks despite disclaimers of intrinsic value, supporting a cautious approach to using tokenomics. While tokenomics for development finance can be linked to achieving SDGs or financing regenerative projects (Staszczak et al., 2024), poorly designed tokenomics can lead to project failure (Kivilo et al., 2025), requiring careful design to prevent speculation and ensure long-term utility. Therefore, the use of tokenomics for resource mobilization currently warrants an extremely cautious and limited approach, suitable for research and small-scale experimental stages.

The successful introduction of DAO elements depends less on the technology itself and more on a deep analysis of each project's specific context and a problem-solving-oriented approach. A strategy is needed that starts with relatively low-risk areas, such as enhancing data reliability in the MER field, to learn incrementally. For high-risk areas like tokenomics, a strategy of responsible exploration with the utmost priority on legal and ethical considerations is necessary. This report presents strategic considerations and recommendations for development cooperation agencies like KOICA to utilize the potential of these DAO elements responsibly and effectively.

2. Introduction: The Need for Innovation in Implementing International Development Cooperation Projects

2.1 The Imperative to Enhance the Effectiveness of IDC Projects

International Development Cooperation (IDC) is a core activity that supports developing countries in achieving the Sustainable Development Goals (SDGs), primarily executed through 'project' units with clear objectives and timelines. However, as of 2025, amidst a global polycrisis—including the escalating threat of climate change, a surge in humanitarian aid demand due to geopolitical conflicts, and widening development gaps between nations post-pandemic—the effective and accountable use of limited development resources is more critical than ever. An inherent tension exists between the 'temporary' nature of projects and the long-term goal of 'sustainable development' that IDC ultimately pursues. It is particularly common for project outcomes not to be sustained after completion due to the partner country's lack of financial and technical self-reliance. Therefore, exploring innovative approaches and operational systems to maximize project effectiveness within limited resources and timeframes, and to ensure that these outcomes lead to real and sustainable development, is a significant and immediate task for the IDC sector.

2.2 Persistent Challenges in Traditional IDC Project Management

Traditional IDC project management faces persistent challenges on various fronts. Chronic issues include a lack of transparency in processes and results, high transaction costs due to complex and inefficient administrative procedures, insufficient meaningful participation from various stakeholders, especially local residents and end-beneficiaries, and difficulties in

objective and reliable performance measurement. For instance, a lack of transparency increases the potential for misuse of funds and undermines mutual trust between donor agencies and partner countries. Insufficient stakeholder participation weakens project ownership, severely compromising long-term sustainability. KOICA also faces similar problems, encountering difficulties in achieving project goals due to various on-the-ground bottlenecks such as differing institutional environments in partner countries, lack of capacity in partner organizations, and unforeseen political instability. These challenges are interconnected, complicating problem-solving and serving as major impediments to the overall effectiveness of IDC projects.

2.3 Introducing DAO Elements as a Potential Solution

In the search for alternatives to overcome the limitations of traditional IDC project management, the concept of Decentralized Autonomous Organizations (DAOs) and their underlying technologies have recently emerged as a new possibility. A DAO is an organization that operates transparently and autonomously based on predefined rules (codified smart contracts) without a central manager, built upon blockchain technology. The core features of a DAO—decentralization, transparency, immutability of records, and automated rule-based operations—hold the potential to offer novel solutions to the chronic problems of IDC project management, such as lack of transparency, inefficient procedures, and difficulties in ensuring accountability. However, the immediate introduction of a full-fledged DAO into the special environment of IDC projects entails many practical constraints and risks. This calls for a more cautious approach, especially considering that successful DAO initiatives must start with a clearly defined mission, vision, and long-term goals. Therefore, rather than advocating for complete DAO adoption, this study focuses on selectively utilizing specific technologies and principles that constitute a DAO—such as the transparent and tamper-proof recording function of blockchain, the conditional automatic execution function of smart contracts, and incentive mechanisms using tokens—to complement and enhance the effectiveness of existing IDC project management systems. This report provides an overview of the various application possibilities of these elements, and explores in-depth application methods and challenges, particularly in the areas of Monitoring, Evaluation, and Reporting (MER) and project resource mobilization using tokenomics.
Accordingly, this study seeks to answer the following key questions:

1. Which specific elements of a DAO can be selectively utilized to enhance the effectiveness of IDC projects, and what are the concrete application methods?
2. What are the expected effects and key challenges when applying DAO elements, particularly in the core project management areas of Monitoring, Evaluation, and Reporting (MER) and project resource mobilization using tokenomics?
3. What are the strategic considerations and specific recommendations for a development cooperation agency like KOICA to responsibly and effectively harness the potential of these DAO elements?

2.4 Purpose and Structure of the Study

To answer these research questions, this report is structured as follows. Chapter 3 examines the core technological elements and principles of DAOs and discusses how they can be linked to IDC project objectives and international development principles. It also further reviews the importance of defining a clear purpose, vision, and strategic roadmap for building a successful DAO foundation (Decentraland, 2023; Colony Blog, 2023b) and key considerations for each phase of the DAO lifecycle (Pre-TGE, TGE, Post-TGE, Maturity) (The Accountant Quits, 2025). Chapter 4 provides a general overview of the possibilities for applying DAO elements in key management areas at each stage of the IDC project cycle. Subsequently, Chapters 5 and 6 conduct in-depth analyses of the application methods, potential benefits, and realistic challenges and risks in the fields of MER and project resource mobilization using tokenomics, respectively. Chapter 7 explores the key project-level challenges (technical, governance, legal, social, ethical, etc.) that may arise during the actual implementation of DAO elements and strategies to mitigate them, also discussing solutions to the oracle problem (Webisoft, 2025). Chapter 8 synthesizes these analyses to present specific strategic recommendations for development cooperation agencies like KOICA to pilot and utilize DAO elements, emphasizing the importance of a pilot project design and execution framework (Intrac.org, 2021; Frontiers, 2025) and the establishment of a long-term vision (PixelPlex, n.d.; Blog.shib.io, 2022). Finally, Chapter 9 summarizes the overall research findings, draws conclusions, and concludes with suggestions for future research and practical application.

3. Understanding DAO Elements and Their Alignment with IDC Project Objectives

3.1 Core Technological Elements and Principles

The core technological elements of a DAO and their underlying principles applicable to IDC projects are as follows:

- **Blockchain/Distributed Ledger Technology (DLT):** Provides immutability, transparency, and traceability of data records.
- **Smart Contracts:** Code that automatically executes when predefined conditions are met.
- **Tokens:** Can be used in various forms, such as representing assets, rights, or proof of participation. However, the direct use of tokens as financial assets in IDC projects involves complexity and risk, which will be explored in-depth in the context of resource mobilization. The design of tokens is central to tokenomics, reflecting the project's goals and incentive structure (Staszczak et al., 2024; GrowthChain, 2024).
- **Principles of Decentralized Governance:** Ideally aims for community consensus-based operation, but in the IDC project environment, the adoption of permissioned or hybrid models that harmonize with existing structures and consider

practical constraints is more likely. The complexities and risks of token-based governance will be discussed in-depth in the resource mobilization section. Effective DAO governance involves alignment with purpose, appropriate complexity adjustment, clear function definition, and an initial structure designed for change (Colony Blog, 2023b).

3.1.1 The Strategic Foundation of a DAO: The Importance of Purpose, Vision, Roadmap, and Lifecycle Management

To successfully integrate DAO elements into IDC projects, it is crucial to build a solid strategic foundation that goes beyond technical understanding.

- **Defining a Clear Purpose, Vision, and Strategic Roadmap:** The success of any DAO initiative begins with a clearly defined mission, vision, and long-term goals. This acts as a compass, ensuring the efficient use of resources, goal alignment, risk mitigation, and opportunity capitalization. For example, a DAO for a renewable energy project should start by setting a clear vision of combating climate change (Colony Blog, 2023b), and this specificity helps attract appropriate participants and resources. The strategic plan should detail governance, financial, and operational aspects, and also align with the mission of the parent organization (e.g., a development agency). To prevent "strategic drift," which can occur in a decentralized environment, the strategic plan should be a "living document" that is continuously improved through community feedback and performance data, supported by dynamic governance tools.
- **Key Considerations for Each DAO Lifecycle Stage:** A DAO's lifecycle is generally divided into Pre-Token Generation Event (Pre-TGE), Token Generation Event (TGE), Post-TGE, and Maturity stages, with proactive planning and resource allocation at each stage being crucial (The Accountant Quits, 2025).
    - **Pre-TGE Stage:** Establishing a robust legal structure (e.g., a Cayman Islands foundation) and operational framework (governance rules, operational policies, banking/custody accounts, multi-sig setup), developing a core team, and building strategic partnerships are essential (The Accountant Quits, 2025). Legal and financial expert consultation is vital at this stage.
    - **TGE Stage:** This involves the DAO token launch, establishment of an initial governance structure (e.g., off-chain voting systems), execution of the token issuance and distribution strategy, and compliance and documentation work (The Accountant Quits, 2025).
    - **Post-TGE Stage:** Evolving the governance structure (e.g., on-chain mechanisms, grant programs), scaling operations (managing token liquidity, exchange listings), and fostering community engagement and growth are important (The Accountant Quits, 2025).
    - **Maturity Stage:** Securing long-term financial health, improving governance (enhancing efficiency, reducing voter fatigue), expanding ecosystem partnerships, nurturing community leadership, and optimizing operations and future planning are key. Governance is not static but should evolve with the DAO's maturity, and

this evolutionary path should be explicitly planned in the initial design (The Accountant Quits, 2025).

3.2 Aligning DAO Elements with Project Objectives and IDC Principles

The DAO elements and strategic foundations described in Sections 3.1 and 3.1.1 have the potential to contribute to achieving IDC project objectives and implementing internationally agreed-upon aid effectiveness principles as follows:

- **Enhancing Transparency and Accountability:** A blockchain ledger enables real-time tracking and transparent disclosure of project fund flows and procurement processes. This directly aligns with the 'Transparency and Mutual Accountability' principle emphasized in the Paris Declaration and the transparency/accountability principle stressed in KOICA's Program-Based Approach (PBA). Tamper-proof records can facilitate post-project audit trails, thereby strengthening accountability.
- **Increasing Efficiency and Supporting Results-Based Management:** Smart contracts can automate fund disbursement upon the satisfaction of specific conditions (e.g., verification of milestone achievement) and streamline payment procedures for procurement. This helps reduce unnecessary administrative procedures and transaction costs, contributing to increased operational efficiency and technically supporting the 'Focus on Results' principle and KOICA's results-based approach.
- **Promoting Participation and Ownership:** In theory, transparent information sharing channels based on blockchain can enhance stakeholders' awareness of project progress, fostering 'informed' participation. However, directly applying DAO voting mechanisms to major project decisions requires caution due to the risk of exclusion caused by the digital divide, potential conflicts with existing power structures (e.g., respecting the role of partner institutions), and the potential inequality of '1-token-1-vote' systems (PRISM Sustainability Directory, 2025). Therefore, in the project context, enhancing participation using DAO elements should realistically focus on improving information accessibility and strengthening opinion-gathering within a limited scope, rather than a complete transfer of decision-making authority. This should be carefully designed to support the principles of 'Ownership' and 'Inclusive Partnerships', requiring a holistic approach that integrates social design, such as community building and communication strategies, with technical design (Colony Blog, 2023a).
- **Improving Coordination and Harmonization:** Blockchain technology can serve as a 'single source of truth' for various stakeholders involved in a project, allowing them to share the same information on specific data (e.g., budget execution status, activity records). This reduces information asymmetry and promotes coordination among stakeholders, potentially contributing to the achievement of KOICA PBA's principle of Harmonization/Coordination.

A crucial point here is that while the fundamental principles of a DAO (decentralization, community governance, etc.) may seem conceptually similar to IDC principles (ownership, participation, etc.), standard mechanisms commonly used in DAOs (e.g., weighting votes by token holdings) can directly contradict the equity and inclusivity goals pursued by IDC.

Therefore, when applying DAO elements to IDC projects, the technology (blockchain, smart contracts) should be strategically used to achieve IDC goals (transparency, efficiency, etc.), while the standard DAO governance models must be critically reviewed and substantially modified to fit the realities and values of IDC projects (e.g., reputation-based, modified 1-person-1-vote, or utilizing a phased governance process like Decentraland's). Alternatively, a permissioned or hybrid approach that supplements the existing governance structure should be adopted. In short, the key is not the technology itself, but how it is designed and utilized to align with development objectives.

4. Application of DAO Elements by IDC Project Cycle Stage

DAO elements can be applied in various areas throughout the IDC project cycle (planning, implementation, evaluation, closure). This section outlines the applicability in key domains, describing each approach along with real-world examples, anticipated key challenges, and the potential applicability and expected effects for IDC projects.

4.1 Enhancing Transparency in Project Planning and Financial Management

DAO elements can be used to enhance transparency in the project planning phase and to transparently record the execution details of specific budget items on a DLT like blockchain, thereby improving the transparency of fund usage and preventing or detecting misuse and inefficiency. Furthermore, smart contracts can be utilized to automate the disbursement of funds upon the achievement of pre-agreed project milestones, enhancing efficiency. However, this requires the prior design of a reliable verification (oracle) method.

- **Real-world Case Analysis:**
    - **Start Network's Blockchain-based Aid Tracking System:** The UK-based humanitarian network, Start Network, is developing and testing a system that records the flow of aid funds, such as disaster response funds, on a blockchain. This system aims to increase the transparency of fund usage, prevent potential corruption, and track the efficient delivery of funds to actual beneficiaries. This could be applied to IDC projects to transparently record budget execution and automate payments via smart contracts as each stage of a school construction project (design, construction, equipment delivery, completion) is independently verified.
    - **MakerDAO's DAO-based Financial Management:** MakerDAO, a leading DeFi protocol, issues and operates the DAI stablecoin on the Ethereum blockchain. All financial transactions and major system parameter changes are transparently recorded on the blockchain. MKR governance token holders participate in decision-making on key proposals related to financial management and protocol operation through on-chain voting. While this can inspire models for IDC projects where various stakeholders participate in or at least transparently access key financial information, direct application of its governance model requires careful

consideration. A DAO-controlled treasury can ensure funds are only allocated through approved proposals (Rock'n'Block, 2024).

- **Key Challenges:** A core challenge for applying this approach to IDC projects is the design and reliability of oracles that accurately and trustworthily connect off-chain activities (e.g., actual completion of a construction phase, number of training program graduates) to on-chain data. (The oracle problem is discussed further in sections 5.4 and 7.7, and Webisoft, 2025). Additionally, the lack of digital literacy and technological access among local partner institutions and beneficiaries can be a major barrier to system adoption and utilization. Complex systems like MakerDAO are also difficult to apply directly to general stakeholders with low technical understanding.
- **Applicability and Expected Effects for IDC Projects:** Nevertheless, selectively using blockchain technology in IDC projects can significantly enhance the transparency of fund usage and contribute to preventing the misuse and diversion of funds. This is expected to be particularly useful in building mutual trust and strengthening accountability in complex projects involving multiple donors, partner institutions, and numerous implementing agencies.

4.2 Optimizing Transparency in Procurement and Supply Chains

The entire procurement process of an IDC project (bidding, contracting, delivery, etc.) can be transparently disclosed on a blockchain, and the supply chain for critical goods or services can be tracked to optimize transparency. Furthermore, automating payments via smart contracts after delivery verification can increase procedural efficiency and reduce potential disputes.

- **Real-world Case Analysis:**
    - **Decapolis Project (UN Innovation Network):** The Decapolis project, supported by the UN Innovation Network, uses blockchain technology to guarantee the quality and safety of agricultural products produced by small-scale farmers in Jordan. By recording the entire process from production to distribution on the blockchain, the project ensures supply chain transparency and allows consumers to directly verify compliance with food safety standards. This could be applied in IDC projects to enhance the transparency of procurement and distribution of specific relief items or medical supplies and to track their safe delivery to end-beneficiaries.
    - **Fair Food and Provenance:** Companies like the Netherlands-based Fair Food program and the UK-based Provenance demonstrate cases of using blockchain to increase transparency in food and consumer goods supply chains, build trust between producers and consumers, and automate related transactions. These provide ideas that could be applied to increase the efficiency and fairness of resource procurement and distribution in IDC projects. Walmart's food traceability system or Maersk's (failed, but instructive) TradeLens could also be cited as relevant examples (Leangroup.com, 2025; Frontiers, 2025).
- **Key Challenges:** Securing the active participation and technological readiness of all

participants along the entire supply chain (producers, processors, transporters, distributors, etc.) is crucial. If data is not accurately entered and quality-controlled at each stage, the reliability of the blockchain record can be compromised. For large-scale supply chains, system complexity and operational costs may increase. As seen in the TradeLens failure, lack of stakeholder participation, unclear governance, and confidentiality issues are also major challenges (Frontiers, 2025).

- **Applicability and Expected Effects for IDC Projects:** In IDC projects, increasing procurement transparency through blockchain and automating payments post-delivery verification with smart contracts can reduce disputes and improve administrative efficiency. It is particularly expected to be useful in ensuring data reliability and clarifying accountability in tracking the delivery of internationally procured aid supplies, quality control (Leangroup.com, 2025), and final delivery verification.

4.3 Improving Monitoring, Evaluation, and Reporting (MER)

By recording specific activity logs or evidence of key performance indicator achievement on a blockchain, its immutability can be secured, thereby contributing to higher reliability of M&E data. This helps reduce the risk of data manipulation and strengthens the objectivity of evaluations. Detailed application methods and challenges are discussed in-depth in Chapter 5, but this section presents an overview of relevant trends.

- **Real-world Case Analysis:** While extensive cases of building an entire MER system on a blockchain are still limited, there are numerous attempts to use the immutability and transparency of blockchain to securely store and share specific project activity records or performance data (Everconnect, 2024). For example, some UN agencies (e.g., WFP's Building Blocks) and international NGOs are exploring the potential to record information such as beneficiary registration, aid payment details, and goods distribution records on a blockchain to enhance the transparency and reliability of monitoring and evaluation data, prevent data manipulation, and improve audit efficiency. This shows the potential to complement the limitations of traditional M&E data collection and verification processes.
- **Key Challenges:** Ensuring the accuracy of data at the initial entry stage onto the blockchain (related to the oracle problem (Webisoft, 2025)) is critically important. Additionally, the lack of technical capacity and digital infrastructure among local partners and practitioners can hinder the timely input and utilization of the system. Issues of data storage capacity, processing speed (scalability), and cost that may arise from recording all MER data of a large-scale project on a blockchain must also be considered.
- **Applicability and Expected Effects for IDC Projects:** By selectively using blockchain technology in IDC projects, the reliability and integrity of certain types of MER data (e.g., beneficiary registration, resource inputs, activity implementation, output verification) can be enhanced. This can promote data sharing among stakeholders and strengthen the objectivity and transparency of evaluations. It is expected to be particularly useful for tracking the performance of long-term projects and for joint

monitoring of complex programs involving multiple stakeholders.

4.4 Fostering Goal-Oriented Stakeholder Participation and Decision-Making

By establishing a transparent, blockchain-based information sharing channel to increase access to project-related information, and by experimentally using DAO voting mechanisms (e.g., token-based or reputation-based voting (PRISM Sustainability Directory, 2025; RapidInnovation.io, 2024)) for specific, low-risk issues, it is possible to consider ways to enhance stakeholder engagement and ownership. However, efforts to bridge the digital divide and ensure harmonious integration with existing authority structures are essential.

- **Real-world Case Analysis:**
    - **MakerDAO's DAO-based Decision-Making:** The aforementioned MakerDAO allows MKR governance token holders to participate in important decisions, such as changing key protocol parameters, adding new collateral assets, and using the budget, through on-chain voting. This provides inspiration for a model in IDC projects where key stakeholder groups (e.g., community representatives, partner CSOs, partner institution officials) can express opinions or participate in decisions on relatively low-risk and clearly defined issues, such as specific operational policies or activity priorities.
    - **Aragon and Colony:** Platforms like Aragon and Colony provide tools that support the creation and operation of decentralized organizations (Colony Blog, 2023b; Aragon Resource Library, 2023). These platforms support global collaborative projects or community-based organizations in pursuing common goals and making decisions under transparent rules, presenting a technological foundation that could foster collaboration and participation among diverse stakeholder groups in IDC projects.
- **Key Challenges:** In developing country contexts where the digital divide is severe, using token-based voting or online platforms for decision-making can deepen the exclusion of vulnerable groups with low technological access (Lustenberger et al., 2024; National Digital Inclusion Alliance, 2022). Furthermore, conflicts may arise between existing formal decision-making structures or the authority of the partner country government and new DAO-based governance mechanisms. The '1-token-1-vote' model can lead to an imbalance of influence based on capital (plutocracy) (PRISM Sustainability Directory, 2025). Contributor fatigue or information overload can also hinder participation (MIDAO.org).
- **Applicability and Expected Effects for IDC Projects:** Establishing a transparent, blockchain-based information channel that allows all stakeholders to easily access project progress and key information is a fundamental prerequisite for participation. Furthermore, if carefully designed DAO voting mechanisms are used as a supplementary tool (e.g., for gathering feedback after disclosing key information, or for surveying preferences for certain activities), they can contribute to encouraging stakeholder participation and strengthening project ownership. This could be particularly helpful in gathering the opinions of local residents and reflecting them in

project plans to enhance project effectiveness and sustainability.

4.5 Streamlining Sub-Grant Management within Projects

For sub-grants provided to local small and medium-sized civil society organizations (CSOs) or community-based organizations (CBOs), the entire process—application, review, fund disbursement, activity reporting, and settlement—can be transparently recorded on a blockchain. By using smart contracts to automatically disburse the next stage of funding upon the fulfillment of specific conditions (e.g., submission and verification of an activity report), management efficiency can be increased and transparency secured. The digital capacity level of partner organizations must be sufficiently considered.

- **Real-world Case Analysis:**
    - **AID:Tech's Blockchain-based Cash Disbursement System:** The Irish company AID:Tech, in collaboration with the International Red Cross, has experience in transparently and efficiently managing Cash-Based Assistance in Syrian refugee camps in Lebanon using blockchain technology. The system provides beneficiaries with digital vouchers, records their usage on the blockchain, and can include smart contracts that automatically disburse the next round of aid upon meeting certain conditions. This could be applied to manage the disbursement and usage of sub-grants provided to numerous small local organizations in IDC projects.
    - **UNOPS's Moldova Micro-loan Pilot:** The United Nations Office for Project Services (UNOPS), in partnership with the Estonian government, piloted a blockchain-based management system for micro-loans for women entrepreneurs in Moldova. The aim was to increase efficiency by automating and transparently managing the loan application, review, disbursement, repayment, and reporting processes on the blockchain. This offers a similar approach for managing conditional grants or microfinance support provided to local small organizations or individuals.
- **Key Challenges:** If local partner organizations receiving sub-grants have low digital capacity or lack the necessary infrastructure, the introduction and use of a blockchain-based system can be difficult. Defining the conditions of a smart contract (e.g., performance achievement criteria, reporting requirements) clearly and objectively can be complex, and a dispute resolution mechanism for cases of non-fulfillment is also necessary.
- **Applicability and Expected Effects for IDC Projects:** Using blockchain in IDC projects to transparently record the entire sub-grant process from application to settlement, and implementing conditional automatic payments through smart contracts, can significantly increase management efficiency and reduce administrative costs. Moreover, ensuring the transparency of fund flows reduces corruption risks and contributes to building trust between the donor agency and local partners. This seems particularly useful when working with numerous local NGOs or CBOs to implement grassroots-level projects.

4.6 Project Resource Mobilization

DAO elements can be used to build trust and encourage participation from various stakeholders (donor agencies, partner institutions, investors, the general public) by transparently recording and disclosing information on how diverse resources for an IDC project (e.g., traditional donor funds, corporate social responsibility funds, impact investments, public donations via crowdfunding) are raised and planned for allocation in the project's initial phase. (Active resource mobilization through tokenomics is discussed in-depth in Chapter 6).

- **Real-world Case Analysis:**
    - **Blockchain for Remittances (UNCDF):** The UN Capital Development Fund, in partnership with Laxmi Bank in Nepal and others, supported a project using blockchain technology to make migrant workers' international remittances more efficient, cheaper, and transparent, and to link these remitted funds with savings and loan products (UNCDF, 2018). This serves as an example of ensuring transparent fund flows and allocation, and can be referenced for showing how IDC project resources are transparently managed and allocated for specific purposes.
    - **Fundraising through DAO Token Issuance:** Many DAOs raise operational and development funds by issuing and selling their own utility or governance tokens (GrowthChain, 2024). For example, MakerDAO secured part of its initial development funds through a token sale. This suggests the potential for IDC projects to use a new mechanism to attract private donations or social impact investments based on innovative ideas, but it requires a very cautious approach.
- **Key Challenges:** Moving beyond simply recording financial flows on a blockchain to actively mobilizing new types of resources using tokenomics involves extremely high legal and regulatory uncertainty (DAObox, 2022; Onesefe.io, 2025), exposure to the volatility and speculative risks of the token market (Lustenberger et al., 2024), and the inherent complexity and difficulty of designing a sound token economy system (Staszczak et al., 2024; Kivilo et al., 2025). These issues and risks will be discussed in great depth in Chapter 6 of this report.
- **Applicability and Expected Effects for IDC Projects:** In the short term, recording the inflow paths, initial allocation plans, and major execution details of conventionally secured funds on a blockchain can contribute to building trust among donors, partner institutions, and the public, and to increasing project transparency. In the long term, under the premise that strict regulatory compliance and risk management measures are in place, there is a possibility of experimentally testing token issuance models (e.g., ReFi models (Staszczak et al., 2024)) on a limited basis for attracting impact investments for specific development goals or for designing innovative results-based resource mobilization mechanisms. However, this requires extreme caution.

DAO elements cannot be applied uniformly to all projects. For actual application, in-depth analysis and customized design that fully consider the specific goals and activities of each

project, the characteristics of the participating stakeholders, and the local conditions are essential. The most important starting point is to answer the questions: "What is the specific problem this particular project (or a specific process within it) is trying to solve with DAO elements?" and "Does the use of DAO elements offer a clear comparative advantage over other existing technological alternatives for solving that problem?"

5. In-depth Exploration 1: Improving Monitoring, Evaluation, and Reporting (MER)

Monitoring, Evaluation, and Reporting (MER) is a core process for understanding the performance and progress of International Development Cooperation projects and ensuring accountability. Furthermore, MER is an essential activity for continuously improving development effectiveness by learning from trials and errors during project implementation and by feeding back evaluation results into subsequent project planning and execution (Feedback). A recent study on improving Korea's ODA performance management system emphasizes understanding feedback not merely as the final stage of evaluation, but as a key element of a comprehensive performance management system throughout the project cycle, and highlights its role in securing public accountability and strengthening organizational and individual learning. This is also a crucial principle when building an M&E system for DAO implementation, which should aim to track progress, provide information for decision-making, facilitate learning, demonstrate impact, and improve effectiveness (PracticalM&E, n.d.).
The importance of MER is particularly pronounced in approaches like **Outcome-Based Pricing (OBP) or Results-Based Aid (RBA)**. These models disburse funds based on the achievement of specific, pre-defined development outcomes, rather than on inputs or activities, providing a strong incentive for implementing agencies to achieve results (e.g., local development support projects in Ghana, urban and local government strengthening programs in Tanzania, World Bank OBP projects in Morocco/Cameroon). In OBP models, the reliability and verification of performance data become the key condition for fund disbursement, making the accuracy and transparency of the MER system paramount. However, traditional MER systems face systemic limitations such as difficulties in data collection, issues with data reliability and transparency, reporting delays, and the ineffective feedback of evaluation results and lessons learned into actual project implementation and policy-making. In particular, centralized data management systems can have inherent vulnerabilities like a single point of failure, the possibility of data manipulation, and restricted information access, which can also affect the credibility of performance-based models like OBP. The current ODA M&E (performance management and evaluation) system for South Korean international development cooperation also has several limitations, which must be considered as a realistic context when discussing MER improvement through technology adoption.
Key limitations include the absence of systematic role division and frequent personnel changes, a lack of awareness of the need for feedback, a lack of specificity and applicability in recommendations, budget and manpower shortages, a lack of regulations and incentives

for feedback implementation, a lack of formal feedback and learning opportunities, limited information disclosure, a fragmented system and lack of consistency, annual budget and evaluation cycles, differing perceptions among stakeholders, and the risk that accountability and transparency may be undermined by selecting only easily implementable tasks when monitoring feedback implementation. DAO elements have the potential to contribute to establishing a technical foundation for effective feedback and performance-based funding verification by enhancing the **integrity** and **traceability** of MER data, complementing the limitations of existing centralized systems, and supporting the timely and transparent dissemination of data. Blockchain can improve reliability by ensuring M&E data is recorded in a tamper-proof manner, allow stakeholders to independently verify and track data through a public blockchain, and reduce the single point of failure for data storage (Everconnect, 2024).

5.1 Utilizing Blockchain's Immutable Records and Distributed Nature:

- **Data Integrity and Anti-Manipulation:** On a blockchain, all transactions or records are distributed and stored among network participants and are cryptographically linked, making it extremely difficult to arbitrarily modify or delete once recorded (immutability). This significantly lowers the risk of hacking, unauthorized modification, or intentional data manipulation by personnel (e.g., 'p-hacking' to make evaluation results look favorable) compared to centralized databases. While highly secure centralized databases can also provide strong access control and audit trail functions, the value of blockchain becomes more pronounced when multiple independent stakeholders need to participate in data verification and no single entity can unilaterally control the data. Some researchers, including those in the recent study on improving Korea's ODA performance management system, point to the risk of census data being politically manipulated or evaluation data being p-hacked in opaque centralized systems, and suggest that the distributed and transparent records of blockchain can prevent such data manipulation and increase trust in the data that forms the basis for feedback and performance-based funding. This could help mitigate the 'limited information disclosure' and 'insufficient accountability and transparency' limitations of the current Korean ODA MER system. Technologies like 'hashing' can automatically manage data versioning and make it easy to verify tampering, as even a small change in the data results in a completely different unique value.
- **Tracking Activities and Inputs:** Key activity and input data such as training attendance lists, equipment delivery records, expert field activity logs, and meeting minute approval records can be recorded on a blockchain ledger to prevent tampering and secure a transparent audit trail. This can be used as objective evidence for activities and resource inputs during the feedback process.
- **Recording Verifiable Outputs:** For physical outputs at a specific point in time (e.g., photos of completed facilities, lists of distributed goods), timestamping and related data (geographic information, responsible person's signature) can be recorded on the blockchain to increase the reliability of the output's existence and status. This is useful for objectively confirming 'what was delivered or built' and can support output-based

feedback and reporting, as well as the verification for performance-based models like **Output-Based Aid**.

- **Transparency in Data Management:** The main stages of the MER data collection, processing, and storage process can be recorded to ensure transparency of the data flow and to track data provenance and modification history. This enhances the reliability of the data utilization and feedback process.

5.2 Supporting the MER Process with Smart Contracts:

- **Pre-validation Before Data Upload:** Smart contracts can be designed to automatically verify whether specific data meets predefined rules (e.g., absence of missing required fields, compliance with data format, removal of sensitive information) before it is recorded on the blockchain. If the requirements specified in the smart contract are not met, the data upload can be rejected, providing a primary safeguard against incorrect or incomplete data being recorded on the immutable ledger. This can be a crucial safety feature for data quality management and contributes to enhancing the basic reliability of data used for feedback and OBP verification. Furthermore, an automated verification process based on smart contracts could help improve some of the consistency issues in data processing/verification that arise from the 'lack of systematic role division' or 'fragmented and inconsistent systems' in the current Korean ODA MER framework. Data validation rules embedded in smart contracts can perform this function (Everconnect, 2024).
- **Automating Repetitive Processes:** Smart contracts can support the management of simple, repetitive processes to increase MER efficiency. For example, they can signal the start of the next MER step (e.g., data analysis) conditioned on the completion of a specific activity (recorded on the blockchain), or automate notifications when a reporting deadline approaches. Recent research in engineering project management has proposed specific ways to innovate project progress monitoring and risk management using blockchain and smart contracts, which offer important insights for improving IDC project MER. For example, Bahnas et al. (2024) proposed a framework that integrates blockchain technology with the Critical Chain Project Management (CCPM) methodology. CCPM uses safety time called 'buffers' to prevent project schedule delays. Bahnas designed a system that securely stores this buffer data using blockchain's transparency, security, and immutability, tracks buffer consumption in real-time with smart contracts, and automatically sends notifications to relevant stakeholders when defined conditions are met (e.g., excessive buffer consumption). They validated the framework by deploying a smart contract (developed with Remix IDE) on a local Ethereum network (Ganache) and confirmed through quantitative analysis (regression analysis) and industry expert surveys that blockchain-based CCPM buffer monitoring is positive for project status updates, early identification of risks and delays, and providing visibility into buffer consumption. This approach has the following implications for the MER aspect of IDC projects:
    - **Objective Progress Monitoring and Early Risk Warning:** The 'buffer' concept

can be applied to IDC project performance indicators or key activity completion schedules and managed transparently by recording it on the blockchain. Smart contracts can automatically calculate the buffer consumption rate due to activity delays and, if a certain threshold is exceeded, send immediate alerts to project managers and key stakeholders, enabling the early identification of potential risks and proactive responses. This supports much more rapid and objective monitoring than traditional manual reporting systems.

- **Enhanced Real-time Information Sharing and Collaboration among Stakeholders:** With all relevant stakeholders able to access the same project progress data (including buffer consumption status) in real-time through the blockchain network, information asymmetry is resolved, fostering more effective collaboration and decision-making.
- **Data-driven Corrective Actions and Resource Allocation Optimization:** Reliable data on buffer consumption patterns and causes can help project managers identify deviations in advance, take immediate corrective actions, and optimize resource allocation based on accurate and up-to-date information.
- **Automated Performance-Based Payments (Potential):** It is theoretically possible to design a system where payments are automatically made to implementing agencies via smart contracts if the achievement of predefined Outcome Indicators is verified on-chain through MER data, or if the achievement of specific milestones (such as completing key activities without consuming the buffer, as in the CCPM case) is objectively confirmed by a smart contract. This has the potential to maximize efficiency and transparency by automating the performance verification and fund disbursement procedures in OBP/RBA models, but as discussed later, the reliability of performance measurement becomes an extremely critical and difficult challenge due to the 'oracle problem'. Blockchain can facilitate performance-based payments and enhance transparency in Outcome-Based Contracts (OBCs) through verifiable records (GoLab, BSG, University of Oxford, 2023).

5.3 Fostering Feedback through Timely and Controlled Data Dissemination:

A blockchain-based distributed ledger mitigates the information access bottlenecks or control issues that can arise when data is centrally managed, improving access to information needed for feedback.

- **Timely Data Sharing:** Since data can be recorded on the ledger and shared with network participants as soon as it is collected/verified (or according to defined rules), it can reduce the data consolidation and reporting delays that occur in traditional centralized systems. This allows decision-makers and feedback officers to access data more promptly for learning and decision-making. This could be useful for tracking and sharing performance data in near real-time in OBP models. Additionally, a transparent data sharing channel can help address the 'limited information disclosure' limitation of the current Korean ODA MER system.

- **Flexible and Controlled Access:** Through smart contracts and access permission settings, it is possible to finely control who can access and utilize what data. For example, a donor agency official could be set up to view all data immediately, a partner country government official could view only country-related data after a certain verification process, and only anonymized summary data could be disclosed to the general public. This helps increase the utility of data for feedback while managing security and privacy, and it could technically support the proposal from a domestic study (Han et al., 2023) for 'building a feedback-oriented evaluation result sharing platform'. This could also contribute to mitigating the 'lack of formal feedback and learning opportunities' limitation.

5.4 Deepening the Challenges of Applying DAO Elements in MER:

- **Fundamental Limitations of Measuring Outcomes and Impact:** Blockchain is fundamentally strong in 'transactions (records)' and cannot directly perform or replace the outcome or impact evaluations that analyze the causal relationships of complex socio-economic changes. Metrics like resident income growth or contribution to policy improvement still require traditional M&E methods like qualitative/quantitative surveys and comparative analysis. Blockchain can only serve as a 'reliable source of data' for such analyses. Particularly in OBP models, the 'performance' that serves as the basis for fund disbursement often involves complex causal relationships or long-term changes, which are difficult to capture as simple data. Therefore, blockchain data alone cannot provide all the information needed for comprehensive feedback and complex performance-based funding verification. A DAO's M&E system must develop new metrics and qualitative methods to assess not just outcomes but also the "softer" aspects of a DAO's health and effectiveness (e.g., true decentralization, community engagement, equitable governance) (PRISM Sustainability Directory, 2025; PracticalM&E, n.d.).
- **Data Quality (Accuracy) vs. Integrity:** Blockchain guarantees the integrity of recorded data, but it does not guarantee the accuracy of the data being entered initially. If an incorrect attendance record or a false report is entered, that error is immutably recorded. The 'Garbage In, Garbage Out' problem remains valid. In OBP models, inaccurate data can lead directly to incorrect fund disbursements, so ensuring the accuracy of data at the collection and entry stages before recording it on-chain is key. This requires robust process design and ensuring oracle reliability, which are crucial factors determining the reliability of the data to be used for feedback. OBP case studies also mention the complexity and subjectivity of outcome measurement as a challenge.
- **Severity of the Oracle Problem:** Securing the reliability of the 'oracle' that brings off-chain (real-world) MER data on-chain (to the blockchain) is the core and biggest challenge (GoLab, BSG, University of Oxford, 2023; Webisoft, 2025). Various types of oracles exist, such as manual input by field staff, IoT sensors, and links to existing databases. Designing trust mechanisms like multi-signature, independent verification, and reputation systems is essential to prevent these oracles from being manipulated or

producing errors. Strategies to solve the oracle problem include decentralized oracle networks (DONs), data validation and aggregation, oracle reputation systems, staking and slashing, cryptographic proofs (e.g., zero-knowledge proofs), and trusted execution environments (TEEs) (GoLab, BSG, University of Oxford, 2023; Webisoft, 2025). The "last mile" data entry problem in developing countries is particularly important, and hybrid oracle solutions that combine technical data feeds with community-based verification mechanisms may be necessary (Webisoft, 2025). A lack of oracle reliability diminishes the value of the feedback data itself, no matter how transparent and immutable it is. In OBP models, the failure of an oracle for performance verification leads to the catastrophic result of erroneous fund disbursement.

- **Integration with Existing M&E Systems and Reporting Frameworks:** The complexity of how to technically and institutionally integrate a newly built blockchain system with existing M&E systems and the reporting formats/frameworks of KOICA or partner countries. Issues of data standards and interoperability. A failure in technical integration hinders the smooth flow of data, the feedback system, and ultimately, the application of an OBP verification system. Since OBP models are often linked to strengthening the partner country's existing systems, consideration of how a blockchain system will interact with them is necessary.
- **Practical Difficulties of Field Data Collection:** Poor internet/power infrastructure and the lack of access to and proficiency with digital devices among field staff and beneficiaries make the timely and accurate input of on-chain data itself difficult. This is a factor that hinders the practical operation of a blockchain-based MER system. (See solutions for the digital divide (Lustenberger et al., 2024)).
- **Data Privacy and Security:** Who has the right to access which MER data? The handling of personal information that may be included in activity records or attendance lists. The transparency of blockchain can conflict with the need to protect beneficiaries' personal information or sensitive project information (Frontiers, 2025). How to resolve conflicts when the principle of immutability clashes with the right to data correction/erasure (right to be forgotten)? The risk of privacy infringement can undermine the trust of participants in the feedback process and OBP. The choice of blockchain type (public, private, consortium) or the implementation of privacy-preserving technologies (e.g., zero-knowledge proofs (GoLab, BSG, University of Oxford, 2023)) is necessary.
- **Technology Alone is Insufficient (Deepening Non-Technical Limitations of the Korean ODA MER System):** A blockchain-based MER system has the potential to contribute to providing reliable data, securing some consistency in data management, and improving information accessibility. However, many non-technical limitations of the Korean ODA MER system cannot be solved by technology alone. Issues like 'lack of systematic role division and frequent personnel changes', 'lack of awareness of the need for feedback' (at individual and institutional levels), 'lack of specificity and applicability of recommendations' (problem of data use/interpretation/recommendation), 'budget and manpower shortages' (technology adoption and operation costs, personnel for feedback analysis/utilization), 'lack of

regulations and incentives for feedback implementation', 'fragmented systems and lack of consistency' (systems and guidelines across institutions), 'annual budget and evaluation cycles' (difficulty of long-term outcome/impact evaluation), and 'differing perceptions among stakeholders' are areas that absolutely require non-technical efforts such as institutional reform, governance building, organizational culture change, and human capacity development. If technology is introduced without efforts to address these systemic challenges, there is a risk of it remaining as 'transparency theater,' where only easily implementable feedback tasks are selectively accepted or it ends with simple data disclosure. Even with OBP application, non-technical difficulties like the subjectivity of performance indicator definition and contract negotiations remain.

- **Contextualization and Scalability Issues of New Approaches:** The blockchain-based CCPM framework presented in the study by Bahnas et al. (2024) focused on the specific field of engineering and the specific methodology of CCPM, and was validated as a prototype on a local Ethereum network. To apply this to a wide range of IDC projects, a deep contextualization process that considers the unique characteristics of each project (e.g., diversity of performance indicators, importance of qualitative data, complexity of participating stakeholders) and the local context (e.g., level of technological infrastructure, digital literacy gaps) is essential. Furthermore, the study had limitations in that it only focused on the project buffer and did not consider feeding or resource buffers, and the geographical diversity and number of survey participants were limited. Issues like scalability, cost-effectiveness, and integration with existing systems on public blockchain networks will be even more critical considerations for IDC project application.

5.5 Considerations and Recommendations for Application in the MER Field:

- **Clear Problem Definition:** Clearly define the specific MER-related problem to be solved with blockchain (e.g., suspicion of tampering with specific data, delays in data consolidation). Examine whether blockchain is an effective means to solve that problem and whether it has a clear comparative advantage over other technological alternatives (e.g., an enhanced centralized system). At this stage, specify whether the problem to be solved is a lack of data reliability or accessibility in the feedback process, or a verification mechanism for an OBP model, and how the technology adoption can contribute to mitigating specific limitations of the Korean ODA MER system.
- **Limit Data Scope:** Focus blockchain recording primarily on inputs, activities, and specific, objectively verifiable output levels. Conduct outcome/impact evaluations in parallel with traditional methods. Clarify how blockchain data can contribute to the feedback system and OBP verification. If targeting OBP, careful definition of which performance indicators can be technically verified is necessary.
- **Robust Oracle Design and Management:** Prioritize the design of a reliable and tamper-proof oracle system. Consider multi-signature, use of independent verifiers, decentralized oracle networks (DONs), staking and slashing, and cryptographic proofs (Webisoft, 2025). This is essential for enhancing the initial accuracy of data for

feedback and OBP performance verification.

- **Data Standardization and Input Protocols:** Define a standard format for data to be recorded on-chain and establish clear protocols and validation procedures to increase the accuracy of the data input process. Consider introducing pre-validation using smart contracts before data upload.
- **Integration Strategy with Existing Systems:** Pre-plan an integration strategy to ensure the new system complements existing M&E systems and reporting frameworks and that data flows smoothly. This should be linked to system improvement efforts like 'building a feedback-oriented evaluation result sharing platform' and OBP's goal of strengthening partner country systems.
- **Data Privacy and Access Control:** Thoroughly manage access rights and reflect privacy protection measures in the design, such as not recording sensitive information directly on-chain or encrypting it (e.g., using zero-knowledge proofs (GoLab, BSG, University of Oxford, 2023)). Establish exception handling procedures (e.g., based on multi-party consensus) for cases where data modification/deletion is necessary, while maintaining transparency.
- **Field Capacity Building and Support:** Provide training and technical support to enhance the digital literacy and system utilization capacity of field staff and partners responsible for data input/use. This is part of strengthening the capacity for feedback processes and OBP performance data production and should be paralleled with efforts to 'raise awareness of the need for feedback'. (See digital navigator models (National Digital Inclusion Alliance, 2022)).
- **Include a Data Dissemination Strategy:** Clearly plan who will be shared with what data, when, and how, and design a technical mechanism (such as smart contract-based access control) to support this. Link the information sharing plan for activating feedback and the OBP performance data sharing plan with the technical design. Design specifically to mitigate the 'limited information disclosure' limitation.
- **Combine with System Improvement Efforts Beyond Technology:** Recognize that introducing a blockchain-based MER system is only part of improving the feedback system. Pursue it in parallel with non-technical efforts to activate feedback, such as legal/institutional reform, governance building, organizational culture change, capacity building, and establishing feedback implementation duties/incentives. For OBP application, non-technical processes and institutional arrangements, such as performance indicator definition, contract negotiation, and dispute resolution, are also essential. The effectiveness of technology adoption largely depends on how well this systemic foundation is laid. It is important to integrate M&E results with governance proposal and voting systems to lead to actual corrective actions.
- **Strengthen Case Studies and Lesson Learning:** Although mature cases of DAO-based MER systems in the IDC sector are still rare, it is necessary to actively identify and analyze early pilot project cases (both successful and failed) from other public or non-profit sectors with similar goals, such as the CCPM application case in the engineering field (Bahnas et al., 2024). For example, by closely examining the experience of using DLT in relief delivery and cash assistance programs like the World

Food Programme's 'Building Blocks' project, or other attempts to introduce blockchain to enhance transparency in public service delivery, insights can be gained for MER system design and operation, especially regarding oracle problem solutions and field applicability. Such external case learning will contribute to reducing trial and error and formulating effective strategies when designing an MER system.

6. In-depth Exploration 2: Utilization of Tokenomics for Resource Mobilization

Exploring new fundraising and attraction channels beyond traditional development finance mobilization methods is a continuous task in the IDC sector. In theory, tokenomics has the potential to be used for project fundraising, incentivizing participants, and enhancing the transparency of asset management (Staszczak et al., 2024). However, directly applying it in the current IDC project environment entails extremely high risks and complexities from legal, regulatory, market, and ethical standpoints. In particular, combining tokenomics with Outcome-Based Pricing (OBP) or Results-Based Aid (RBA) models can amplify existing complexities. OBP/RBA is an existing development finance technique that promotes performance achievement by linking funding to results rather than inputs, with successful cases reported in Ghana, Tanzania, Morocco, and Cameroon.

6.1 Basic Concepts of Tokenomics and Potential for Resource Mobilization:

Tokenomics is short for Token Economy, and it refers to the design of how a token is issued, distributed, utilized, and burned, and how it generates/transfers value within an ecosystem. Well-designed tokenomics is crucial for long-term success, user retention, network growth, and aligning project goals with individual actions (Staszczak et al., 2024).

- **Potential Utilization Models:**
    - **Outcome/Impact Tokens:** Token value is generated or benefits are provided to token holders upon the achievement of specific project outcomes. Investors are rewarded through the token or can exercise certain rights upon outcome achievement. This can manifest as a tokenized form of existing OBP/RBA models. For instance, one could imagine a project issuing its own token, where the project's payment is determined on a performance basis (OBP), and this payment is distributed to token holders in proportion to their holdings. In this case, investors would decide to purchase tokens based on the project's expected performance. Regenerative Finance (ReFi) projects based on DeFi focus on promoting SDGs, financing regenerative impact, and tokenizing ecological assets (Staszczak et al., 2024).
    - **Participation/Activity-based Tokens:** Tokens that certify and reward contributions to project activities (e.g., attending community meetings, participating in environmental protection activities). Intended for limited utility

within a local community or for providing participation incentives (e.g., Plastiks, a work token for plastic recovery (Staszczak et al., 2024)).
    - **Project Crowdfunding Tokens:** Issued to raise funds for a specific project. May grant token holders limited information access rights or symbolic value.
    - **Transparent Donation/Investment Tokens:** Transparently record and track the inflow/disbursement process of donations or investment funds within a project in the form of tokens. (Lower tokenomics complexity, but linked to enhancing the transparency of existing fund tracking).
- **Key Elements of Tokenomics Design (Staszczak et al., 2024; GrowthChain, 2024):**
    - **Define Token Type and Utility:** Clarify the problem to be solved, target audience, incentives, and token use cases (governance, payment, access, staking, work token, asset collateral, etc.). In development finance, link to SDG achievement or financing regenerative projects.
    - **Total Token Supply and Issuance Plan:** Define the total supply, future generation plan (mining/staking), supply/demand rules, and burn mechanisms for inflation/deflation management.
    - **Token Distribution Plan:** Decide on the distribution method and timing (ICO, IDO, mining, staking, airdrop, bounty, etc.) and the recipients (investors, community, team). Consider lock-up and vesting periods to align stakeholder interests and prevent dumping.
    - **Design Token Mechanisms and Incentives:** Develop rules for token use, trading, buy/sell mechanisms, incentive systems (rewards/penalties), economic policies, and launch strategy. Incentives should encourage desirable behaviors (active participation, data provision, performance achievement).
    - **Grant Governance Rights:** Define how the token grants voting rights and influence over project development.
    - **Design Process:** Follows stages of discovery (problem definition, stakeholder identification, incentive design) → design (mathematical modeling) → testing (simulation, e.g., cadCAD).

6.2 Challenges of Using Tokenomics for Resource Mobilization:

- **Legal and Regulatory Uncertainty and Risks:**
    - **Legal Nature of the Token:** If an issued token is classified as a 'security' under the laws of the relevant countries (donor and partner country), it must comply with complex securities issuance and trading regulations, which may not align with the nature of a non-profit development project. An outcome-based token model, especially one that distributes OBP payments to token holders, could have the nature of profit-sharing, making it highly likely to be considered a security. Even if not, being treated as a financial asset would subject it to strict regulation. (In South Korea, security tokens are distinguished from virtual assets, and the Virtual Asset User Protection Act will be enforced from July 2024).
    - **AML/CFT Regulation:** Compliance with Anti-Money Laundering and Combating

the Financing of Terrorism (AML/CFT) regulations is mandatory. This entails the burden of establishing Know Your Customer (KYC) and transaction monitoring systems (Onesefe.io, 2025).
    - **Divergence of National Laws:** The complexity of simultaneously complying with the different cryptocurrency-related laws and regulations of various countries involved in an IDC project.
- **Market Volatility and Speculative Risks:** The cryptocurrency market is extremely volatile (Staszczak et al., 2024). There is a risk that project funds could be directly exposed to market volatility, and that the token could be perverted into a speculative object unrelated to its original development purpose. This could cause project instability and inflict losses on vulnerable participants. For example, the "CAR Meme" coin, announced for launch by the president of the Central African Republic under the banner of national development, showed extreme price volatility and speculative patterns immediately after launch, despite officially stating it had no intrinsic value and was not a financial product. This suggests that even tokens issued with development goals are not immune to market influence, and that OBP-based outcome-linked tokens, combining expectations of performance with speculation, could show even greater volatility. The risk of market volatility is added to the inherent complexities of OBP contract negotiation and outcome measurement.
- **Complex and Failure-Prone Tokenomics Design:** Designing a sustainable token economy system that induces the intended incentives requires a high degree of expertise (Staszczak et al., 2024; Kivilo et al., 2025), and its difficulty increases exponentially when combined with the non-market characteristics of development projects. An OBP-based token model is particularly complex as it must link the performance measurement/verification mechanism (discussed in Chapter 5) with token value/distribution. Poorly designed tokenomics can instead cause inefficiency, inequality, and community conflict, and without strong governance, it can lead to unintended consequences (Staszczak et al., 2024; Kivilo et al., 2025).
- **Governance Conflicts and Inclusivity Issues:** A model that grants decision-making power based on token holdings can conflict with the existing accountability framework of donor-partner country-implementing agency and carries the risk of 'plutocracy' (PRISM Sustainability Directory, 2023). The interests of outcome-based token holders (investors) could particularly conflict with the actual needs of the project's target population or traditional development priorities. There is a high risk that vulnerable groups will be excluded from the decision-making process due to a lack of token accessibility and utilization capacity.
- **User Accessibility, Digital Literacy, and Security:** The process of issuing, managing (using a wallet), and transferring tokens requires a significant level of digital competency and security management. Supporting field participants to do this safely and correctly is a huge burden. There are also risks of wallet loss, hacking, etc.
- **Sustainability and Exit Strategy:** An unclear exit strategy regarding who will maintain the token system after the project ends, how operational funds will be secured, how the token's value will be maintained, and how participants (especially token holders) will be

protected if the system is discontinued, poses a great risk. While managing a DAO-controlled treasury and establishing a long-term financial plan are important (The Accountant Quits, 2025; Rock'n'Block, 2024), this is even more difficult in a development project context.

- **Ethical Issues:** Deep consideration of potential exploitation, deepening inequality, and harm from speculation that can arise from using tokens in development projects, and the establishment of safeguards, are essential. Transparency about tokenomics, goals, and team qualifications is vital for trust, and smart contract audits are also required (Onesefe.io, 2025). In an OBP-based token model, where investor profit motives are directly linked to the development project, a thorough review of the ethical dilemmas that may arise in this process is necessary.
- **Deepened Dependence on MER and Oracles:** The success or failure of an OBP-based token model dramatically depends on the definition of performance indicators, the accuracy of measurement, and above all, the reliability of performance verification through oracles, as discussed in Chapter 5. A failure in the MER/oracle system would directly lead to errors in fund disbursement (OBP) and token value/distribution, which could have catastrophic consequences, amplifying technical and procedural risks.

6.3 Considerations and Recommendations for Exploring Tokenomics for Resource Mobilization:

- **Must Remain at the Research and Experimentation Stage:** For now, this should be approached only at the level of proof-of-concept (PoC) research and very limited, controlled, small-scale experiments. In particular, a model combining OBP and tokenomics is judged to have extremely low feasibility and risk controllability at the current stage. In this research process, it is important to closely track and analyze similar resource mobilization models or early attempts at token-based projects that may be tried worldwide (regardless of success) to learn about real-world pitfalls and failure factors.
- **Mandatory Collaboration with Legal and Regulatory Experts:** From the initial project planning stage, a thorough review of relevant laws (especially securities law and financial regulations) and consultation with legal experts are essential. The possibility of using regulatory sandboxes should be explored. Since an OBP-based token model is almost certain to raise securities issues, the role of relevant legal experts is absolutely critical. (See legal wrapper selection and jurisdiction issues (DAObox, 2022)).
- **Prioritize Non-Financial Utility and Limit to Local Communities:** Rather than models with high financial/speculative risks, prioritize the use of tokens for purposes like proof of participation or limited utility within a local community. Investment-type token models combined with OBP are very risky.
- **Strong Participant Protection Measures:** Consider transparent disclosure of potential risks, provision of minimum protection measures in case of loss, and investing significant resources in user education and technical support.

- **Simple and Easy-to-Understand System Design:** Avoid complex tokenomics designs and focus on building a system that participants can intuitively understand and use. The complexity of an OBP-based token model, in particular, makes it very difficult for participants to understand.
- **Respect Existing Governance and Accountability Frameworks:** Design token-based governance so that it does not conflict with existing project management and partner country accountability frameworks. Limit its role in decision-making to a supplementary and advisory capacity. For an OBP-based token model, serious consideration must be given to how to balance investor interests with development goals.
- **Clear Exit Strategy and Risk Management Plan:** Establish a detailed management plan for all possible risks (legal, market, technical, ethical) and a plan for handling the system after the project ends. An OBP-based token system has great uncertainty regarding long-term operation, value maintenance, and participant protection, so a more thorough and realistic plan is needed.
- **Interdisciplinary Expert Team is Essential:** Successful implementation requires collaboration among experts from various fields, including technology (blockchain, tokenomics design), development cooperation, law, sociology, and finance (Daily.dev, 2024).

Ultimately, directly using tokenomics for resource mobilization in most IDC projects is premature at present, and investment-type token models, especially those combined with OBP, are fraught with challenges that are insurmountable at this stage. A much more realistic and safer approach is to use DAO elements to enhance the transparency of financial flows (such as the data traceability enhancements discussed in Chapter 5).

7. Exploring the Implementation Process: Key Project-Level Challenges and Mitigation Strategies

To successfully apply DAO elements to IDC projects, it is essential not only to understand the potential benefits but also to clearly recognize the realistic challenges and risk factors and to prepare mitigation strategies. The complexity and uncertainty of the development cooperation field, in particular, amplify these challenges. Including the in-depth explorations of MER (Chapter 5) and resource mobilization/tokenomics (Chapter 6), the key project-level challenges are not limited to the technical domain but span various dimensions including governance, legal, social, and ethical aspects (Aaltonen et al., 2024). Exploring the challenges in each category and the approaches to mitigate them is a prerequisite for the responsible use of DAO elements.

7.1 The Challenge of Contextual Adaptation and Socio-Technical Fit:

The most fundamental challenge is the need to fully understand the specific context of the project site (technical infrastructure, institutional environment, cultural norms, stakeholder

capacity, etc.) and to finely tune the technological solution accordingly. The successful application of DAO elements is not just a matter of technology deployment but of building a complex socio-technical system where technology, people, processes, and institutions interact. Attempts to indiscriminately replicate models that were successful in other fields into the development context are highly likely to fail. A thorough prior analysis is particularly essential for the local institution's performance management and reporting capacity when applying OBP, and for the local digital literacy and financial comprehension levels when applying tokenomics.

- **Mitigation Approach:** Collaboration between development experts and technical experts for in-depth contextual analysis. Adoption of methodologies that allow for flexible adaptation of technical design to the local environment. Maintaining a problem-solving-oriented approach that focuses on the specific development problem to be solved with the technology, rather than the technology itself. Emphasizing a process of experiential learning and adaptation through gradual pilots to understand how it works on the ground and to identify unexpected problems. (See pilot project design and execution framework (Intrac.org, 2021)).

7.2 The Risk of Deepening the Digital Divide and Ensuring Inclusivity:

When utilizing DAO elements, especially those involving the direct participation of beneficiaries or local communities (e.g., MER data input/verification in Chapters 4.5, 5; participation in a token system in Chapter 6), the digital divide can become the most severe ethical and practical barrier. There is a high risk that vulnerable groups lacking technological access or skills will be marginalized or excluded, thereby deepening existing inequalities. This risk is further amplified in cases like tokenomics-based resource mobilization models (Chapter 6), which require wallet management, transactions, and an understanding of complex mechanisms.

- **Mitigation Approach:** Designing a user interface (UI/UX) that works in low-bandwidth environments and is mobile-friendly is essential. Where necessary, provide offline interfaces or public access points and deploy technical support personnel. Provide customized digital literacy training for target participant groups (e.g., government/NGO-led programs, community-based digital learning hubs, the digital navigator model (Lustenberger et al., 2024; National Digital Inclusion Alliance, 2022)) and continuous technical support. Always ensure alternative, non-digital participation pathways for those who have difficulty using the technology. Initially, prioritize backend-focused applications that minimize direct technological interaction for beneficiaries. Make a conscious design effort to ensure that technology becomes a tool for promoting, not hindering, inclusivity.

7.3 Technical Obstacles and Operational Burdens Specific to the Project Environment:

In the resource-constrained and frequently changing environment of IDC projects, common technical challenges such as unstable infrastructure, scalability and cost issues (which can be

mitigated with Layer 2 solutions, off-chain computation, etc. (Frontiers, 2025)), and security risks (e.g., smart contract vulnerabilities like access control errors, price oracle manipulation, logic errors, re-entrancy attacks, integer overflow/underflow (HackerOne, 2024; QuillAudits, 2023)) become more pronounced. In the MER field (Chapter 5), the technical difficulty of building/operating the MER system and ensuring the reliability of oracle technology are key. In the resource mobilization (tokenomics) field (Chapter 6), the burden of complex smart contract design and security audits, and system maintenance costs, are far more severe. The temporary nature of projects makes the cost-effectiveness of long-term system investment and the issue of post-completion sustainability (exit strategy) even more difficult.

- **Mitigation Approach:** Select technology and design architecture considering local infrastructure constraints. Make technology adoption decisions based on cost-benefit analysis. Conduct thorough smart contract security audits (mandatory before deployment and for continuous updates (The Accountant Quits, 2025)) and regular system checks. Make technical and institutional preparations for integration with existing systems. Establish a clear exit strategy and sustainability plan for system management/transfer/decommissioning after the project ends.

7.4 Complex Governance Issues Arising within Project Boundaries:

Even when only specific elements of a DAO are utilized, new governance questions arise within the limited confines of a project. In addition to technology operation-related governance issues such as the authority to design/change smart contract rules, access control/management, and on-chain/off-chain dispute resolution, there is the problem of harmonizing with existing project agreements and partner country laws, and integrating DAO elements while respecting the existing authority structures among various stakeholders (donor, partner country, implementing agency, beneficiaries, etc.). The risks of unclear accountability and conflict with existing authority structures (Chapter 6), power centralization/plutocracy, voter apathy/fatigue, and inefficient decision-making are very high, especially when introducing token-based governance (PRISM Sustainability Directory, 2023; Zfort Group, 2023). The management of MER data access and use rights (Chapter 5) and the resolution of OBP contract-related disputes are also part of the governance problem.

- **Mitigation Approach:** Establish an explicit governance framework early in the project. Clarify roles and responsibilities related to technology operation. Reflect flexible smart contract design and governance procedures. Introduce a trust-based hybrid governance model such as multi-signature. Prepare on-chain/off-chain dispute resolution procedures and dispute mediation mechanisms (community voting, arbitration, smart contract solutions, etc. (Colony Blog, 2023b)). Attempt gradual integration within the scope of respecting the existing stakeholder structure. Design token-based governance extremely cautiously and on a limited basis, attempting to mitigate bias with quadratic voting, reputation systems, or delegation (PRISM Sustainability Directory, 2023).

7.5 Severe Legal and Regulatory Uncertainty and Risks:

Legal and regulatory uncertainty is one of the biggest systemic barriers to the adoption of DAO elements and is a particularly sensitive issue for a government agency donor. In addition to general issues such as the legal validity of smart contracts (possibility of being recognized as a general contract but controversial (Chambers and Partners, 2024)), compliance with data privacy regulations (like GDPR) (immutability vs. right to be forgotten), compliance with AML/CFT regulations (especially when using tokens), unclear liability, and the divergence of national laws, the issue of determining the securities nature of a token and complying with related financial/cryptocurrency regulations when using tokenomics (Chapter 6) entails an incomparably higher level of legal risk. Legal issues related to MER data processing (personal information protection, etc., Chapter 5) also require careful review. For a DAO to operate in the real world, limit legal liability, and enter into contracts or own intellectual property, a legal wrapper is essential (The Accountant Quits, 2025; DAObox, 2022).

- **Mitigation Approach:** It is essential to consult with legal experts (in international contracts, new technology regulation, data protection law, financial/cryptocurrency law, etc.) from the initial project planning stage to identify potential risks and devise response measures. Choose and establish an appropriate legal wrapper (e.g., foundation, association, DAO LLC, DLT foundation, or a multi-layered wrapper framework) in compliance with procedures (DAObox, 2022). Prioritize application in low-risk areas (internal processes, transparency of public information). Review and comply with laws related to MER data. When using tokens, the inclusion of financial/securities experts is essential, a strict regulatory compliance plan must be established, and the use of regulatory sandboxes should be explored. Initiate a transparent and constructive dialogue with the partner country government about the legal and regulatory implications at an early stage.

7.6 Difficulty of Cost-Benefit Analysis and the Burden of Ensuring Sustainability:

The introduction of new technology entails significant costs for development, implementation, training, operation, maintenance, and auditing. Considering the 'temporary' nature of projects, a sober cost-benefit analysis is needed to determine if these investment costs are outweighed by the expected benefits (efficiency, transparency, data reliability, etc.) that can be obtained within the project period. The construction of complex and expensive systems is not always justified for short-term projects. In particular, complex systems in the MER field and systems in the resource mobilization (tokenomics) field require significant initial/operational costs. If the system or process needs to be sustained after the project ends, a sustainability plan, including measures to secure financial, technical, and human resources, must be prepared in advance. The long-term operation and value maintenance of a tokenomics system are very difficult to predict (The Accountant Quits, 2025).

- **Mitigation Approach:** Track and analyze the total cost of ownership (TCO) rigorously from the pilot stage. Make a realistic assessment of expected benefits. For short-term projects, prioritize simple and cost-effective solutions. Consider developing reusable

modules/standards at the institutional level. Establish and pre-plan a sustainability/exit strategy model for each project type.

7.7 The Need to Manage Risks of On-chain/Off-chain Interaction (Deepening the MER Link):

Ensuring that records on the blockchain accurately reflect the real-world situation and impact is a continuous challenge. Risks include the inaccuracy/manipulation of oracles that bring off-chain data on-chain (the oracle problem (Webisoft, 2025)), the risk of initial data entry errors (GIGO), the problem of discrepancies between on-chain records and reality, and the risk of 'transparency theater' where on-chain activities do not lead to actual positive change. The reliability of oracles is critically important, especially in the MER field (Chapter 5) and, by extension, in OBP performance verification (Chapters 5/6). Blockchain cannot directly solve numerous off-chain risks such as political instability or natural disasters.

- **Mitigation Approach:** Design and manage a strong oracle reliability mechanism (decentralized oracle networks, reputation systems, staking/slashing, cryptographic proofs, TEEs, etc. (Webisoft, 2025)). Cross-verify and integrally analyze on-chain data with existing robust off-chain monitoring and evaluation systems, field verifications, and stakeholder interviews. Ensure flexibility in the on-chain system design to respond to unexpected off-chain situation changes. Strengthen processes and verification procedures to increase the accuracy of the data input process. Continuously monitor and adjust to ensure that technology adoption leads to actual problem-solving and effectiveness enhancement.

8. Strategic Recommendations for Piloting DAO Elements in IDC Projects

A cautious and strategic approach is necessary to responsibly explore the potential of DAO elements at the individual IDC project level and to achieve tangible effects. Based on an understanding of the aforementioned challenges, the in-depth exploration results for MER and resource mobilization (Chapters 5, 6), and recommendations from various studies and reports (UNDP, 2022; World Bank, 2025; Intrac.org, 2021, etc.), the following are key strategic recommendations that a development cooperation agency like KOICA can consider. These recommendations should be applied across the entire spectrum of DAO element utilization, from relatively low-risk efforts to ensure MER data transparency to the extremely cautious exploration of resource mobilization (tokenomics).

8.1 Adopt a Phased, Problem-Solving-Oriented Approach and Consider Risk Levels:

Rather than attempting to build a broad and complex system from the outset, a phased approach that starts small and gradually expands is recommended (see the phased

implementation approach presented in China's national blockchain roadmap (Blockchaintechnology-news.com, 2025)). Pilot projects should focus on using DAO elements to solve clear and specific problems faced by a particular project (e.g., lack of reliability of specific data, inefficiency of a specific payment procedure) ('problem-driven' rather than 'technology-driven'). Initially, areas with relatively low technical complexity or governance risks and clear expected benefits should be prioritized. In particular, areas such as enhancing the transparency and integrity of specific MER data (activity records, inputs/outputs) can serve as a relatively low-risk starting point. On the other hand, areas like using tokenomics for resource mobilization involve extremely high legal, market, governance, and ethical risks, and should therefore be approached on a limited basis for proof-of-concept (PoC) or research purposes only.

- **Practical Implementation Measures:** Establish a process to clearly define the problem to be solved. Develop a framework for assessing the risk level and expected effects for each potential application area. Prepare internal guidelines for starting with low-risk areas.

8.2 Develop and Apply Clear Criteria for Selecting Pilot Projects:

Objective criteria for selecting projects suitable for piloting DAO elements must be established and strictly applied. In addition to general criteria such as a strong willingness to cooperate from the partner, a relatively stable operating environment, a clearly defined problem and the feasibility of solving it with technology, the ease of securing comparable baseline data, a necessary technology infrastructure/building plan, and alignment with project objectives, the specific characteristics of each application area must be considered. Pilot projects are necessary to test innovation, assess desirability, feasibility, viability, and scalability, and to manage unexpected changes and challenges (Intrac.org, 2021; Everconnect, 2022).

- **Pilot Criteria for the MER Field:** Additionally consider the ease of defining data collection/verification processes, the importance and current reliability issues of the relevant data, and the level of local technical/human capacity. When linking with OBP, a prior review of the clarity and technical verifiability of performance indicators is necessary.
- **Pilot Criteria for Resource Mobilization (Tokenomics):** Apply very strict criteria, including an extremely limited scope of participation, the feasibility of a design that minimizes financial/speculative risks, the feasibility of establishing legal/regulatory risk management measures, and the feasibility of forming a sufficient expert group.
- **Practical Implementation Measures:** Establish written pilot project selection criteria and a review process (including clear objective definition, target population/scope setting, stakeholder participation, M&E framework, resource allocation, and timeline setting in the pilot design (Intrac.org, 2021; Frontiers, 2025; PracticalM&E, 2022)). Clarify 'Not yet' or 'Research only' criteria for high-risk areas. Consider the pilot project as a "safe-to-fail learning lab" and include personnel who can act as "translators" between technical experts and field experts (Frontiers, 2025).

8.3 Invest in Comprehensive Capacity Building for Successful Adoption and Utilization:

Capacity building for all relevant stakeholders (KOICA internal staff, partner institutions, field practitioners, end-beneficiaries, etc.) is essential for the successful adoption and utilization of DAO elements. This should not be limited to training on how to use the system but should encompass an understanding of basic blockchain and DAO concepts, awareness of potential benefits and risks, the importance of data security and privacy, and an understanding of new governance methods. In particular, to mitigate the 'lack of awareness of the need for feedback' and 'lack of organizational and individual capacity' issues pointed out as limitations of the Korean ODA MER system, efforts to raise awareness of the importance of feedback and data-driven decision-making should be conducted in parallel with technical training. For participants in the resource mobilization (tokenomics) field, clear disclosure of related risks and technical/security capacity building, such as how to use a wallet, are essential. For OBP-based models, additional training on understanding the performance measurement/verification mechanism is required. (See digital literacy programs and the digital navigator model (Lustenberger et al., 2024; National Digital Inclusion Alliance, 2022)).

- **Practical Implementation Measures:** Develop and provide customized training programs for each stakeholder group. Conduct workshops/training on the importance of feedback and data utilization in parallel with technical training. Institutionalize a process for intensive training and risk disclosure for participants in high-risk areas.

8.4 Establish a Strong MEL Framework for a Learning-Oriented and Adaptive Approach:

To use a pilot project as an organizational learning opportunity rather than just a technology application attempt, a clear Monitoring, Evaluation, and Learning (MEL) framework must be designed and applied from the project planning stage (Intrac.org, 2021). This framework should closely track and evaluate the achievement of expected effects, technical/institutional/social challenges, unintended consequences, user experience, and total cost of ownership. This should be part of the effort to overcome the limitations of the Korean ODA MER system, such as the 'lack of formal feedback and learning opportunities' and 'annual evaluation cycles,' and to foster a culture of continuous learning. When piloting in the MER field, the performance and effectiveness of the blockchain-based system itself, and the reliability of the performance measurement/verification process when linked to OBP, should be intensively evaluated. If piloting in the resource mobilization field, close monitoring of the occurrence and impact of related risks is essential. M&E data must be fed back into the DAO's decision-making process to provide actionable insights.

- **Practical Implementation Measures:** Prepare guidelines for designing a pilot-specific MEL framework (PracticalM&E, n.d.). Institutionalize formal channels/workshops for sharing and learning from MEL results. Make efforts to establish a long-term perspective on evaluation and learning.

8.5 Form Interdisciplinary Teams and Foster Collaboration to Solve Complex Problems:

The successful application of DAO elements is impossible with technical experts alone. An interdisciplinary team composed of personnel with diverse backgrounds and expertise and close collaboration are essential for solving complex problems. Development experts (field experience, development theory), technical experts (blockchain, smart contracts, UI/UX), legal/regulatory experts, social scientists (local context, social impact), project managers, and, if possible, end-user representatives should participate. When piloting in the MER field, close collaboration between M&E experts, data analysts, and blockchain developers is essential, with the addition of performance management experts if linked to OBP. When exploring the resource mobilization (tokenomics) field, an incomparably high level of close and essential collaboration between tokenomics designers, financial/legal experts, blockchain developers, and development experts is required. This can also contribute to overcoming the limitations of the Korean ODA system, such as 'lack of systematic role division,' 'fragmented systems,' and 'differing perceptions among stakeholders,' and to ensuring a consistent approach.

- **Practical Implementation Measures:** Mandate the participation of multi-disciplinary experts from the pilot planning stage. Establish clear role division and communication channels within the team (Daily.dev, 2024). Establish an institutional basis for utilizing external experts (Rock'n'Block, 2024).

8.6 Proactive and Thorough Response to Legal and Regulatory Aspects:

Since legal uncertainty can be a major obstacle to project progress, it is necessary to consult closely with legal experts (in international contracts, new technology regulation, data protection law, etc.) from the initial project planning stage to identify potential risks and devise response measures. Especially for projects with partner country government partners, it is important to start a transparent and constructive dialogue with government officials at an early stage about the implications of applying new technology within the country's legal framework. (See the importance of legal wrappers and regulatory compliance for DAOs (DAObox, 2022; The Accountant Quits, 2025)).

- **MER Field:** Clearly reflect measures for complying with data privacy and security regulations in the design.
- **Resource Mobilization Field:** Conduct a legal review with the highest priority. Establishing measures for complying with financial-related laws, such as the securities nature of tokens, is essential (Chambers and Partners, 2024). Include a plan for AML/CFT regulatory compliance (Onesefe.io, 2025). For OBP-based token models, a thorough legal analysis of the securities issue and a risk management plan are absolutely essential. This legal risk is a major factor currently limiting application in this area.
- **Practical Implementation Measures:** Mandate the inclusion of a legal review process in the pilot planning stage. Secure a pool of financial/cryptocurrency law experts or establish a cooperation system. Standardize legal/regulatory consultation procedures with partner countries.

8.7 Plan for Sustainability and a Clear Exit Strategy:

Keeping in mind the 'temporary' nature of all projects, the pilot plan must explicitly include how the system and data will be handled after the project ends. Consider possible scenarios such as system decommissioning, transfer to a partner, or data migration, and analyze the financial, technical, and human burden of each scenario in advance. It is necessary to consider the realistic constraint that it may be difficult to transfer the burden of continuous technical maintenance or governance of a system using DAO elements to a local partner.

- **MER Field:** Realistically assess the capacity and willingness of the partner for system transfer (to the partner institution) or data migration/preservation, and establish a support plan.
- **Resource Mobilization Field:** The uncertainty regarding the termination of the token system, changes in token value, participant protection, etc., is high, so a more thorough and realistic exit strategy is needed. The long-term operation and value maintenance of an OBP-based token system, and participant protection, are highly uncertain, so a more thorough and realistic plan is needed. Recognize that ensuring sustainability in this area is an extremely difficult challenge and establish a realistic and conservative exit strategy. Consider how to handle performance data after the OBP contract ends. (See long-term financial health and exit strategy for DAOs (The Accountant Quits, 2025)).
- **Practical Implementation Measures:** Mandate the inclusion of an explicit exit strategy section in the pilot plan proposal. Pre-define the responsible entity and necessary resources for implementing the exit strategy.

9. Conclusion: Towards the Responsible and Effective Use of DAO Elements in Development Projects

This report has explored the utilization of DAO elements to enhance the effectiveness of IDC projects. While the full-scale adoption of DAOs is practically difficult, specific elements such as the transparency/immutability of blockchain and the automation of smart contracts hold the potential to improve project management.

In the field of **Monitoring, Evaluation, and Reporting (MER)**, in-depth analysis confirmed that there are concrete opportunities to enhance the integrity and reliability of data through blockchain-based immutable records and tracking functions. This can contribute to improving the efficiency and transparency of managing certain types of MER data and potentially help establish a reliable verification basis for Outcome-Based Pricing (OBP) models. However, it is clear that there are challenges to be solved, such as the oracle problem, data quality limitations, and the fundamental difficulty of measuring outcomes/impact. In particular, the non-technical and institutional limitations of the Korean ODA MER system (lack of feedback awareness, insufficient capacity, inadequate regulations, etc.) are significant barriers that cannot be overcome by technology adoption alone.

On the other hand, the use of **tokenomics for project resource mobilization** was also explored, but this area involves far more complex and severe challenges in the current IDC project environment in terms of legal, regulatory, market, governance, and ethical aspects. It

was confirmed that outcome-linked token models that combine OBP with tokenomics are highly likely to have the nature of profit distribution, which seriously complicates the securities issue, and that there are a host of challenges that are insurmountable at the current stage. Market volatility and speculative risks, regulatory uncertainty, and design difficulties currently limit practical application to an extreme degree, confirming that only research and cautious small-scale experiments are possible at this level. A much more realistic and safer approach at present is to use blockchain technology to increase the transparency of financial flows rather than directly using tokenomics to achieve resource mobilization goals.

In conclusion, to successfully introduce DAO elements into IDC projects, it is essential to guard against 'techno-solutionism' and to adopt a cautious, phased approach based on the unique context of each project and the specific problem to be solved. It is important to start with relatively low-risk areas, such as enhancing MER data reliability, to experientially learn about the practical workings, effects, and unexpected problems (Intrac.org, 2021). Technology adoption can contribute to mitigating the data-related limitations of the Korean ODA MER system, but it must not be forgotten that fundamental improvements at the institutional, organizational, and human levels must be pursued in parallel to activate feedback. For high-risk areas like tokenomics, especially models combined with OBP, while exploration of their transformative potential should continue, an approach that prioritizes responsible research and the establishment of legal and ethical safeguards is required for now. (See the Beeck Center's, 2018, Blockchain Ethical Design Framework).

DAO elements can be a useful tool for innovation in the IDC sector, but their use must be based on the close cooperation, open attitude, and clear awareness of realistic constraints and potential risks of all stakeholders, including the donor agency, the partner country government, the implementing agency, technical experts, and, most importantly, the end-beneficiaries. Development agencies will need to responsibly and strategically embrace innovation to actively harness the opportunities that DAOs offer. This could be an opportunity not just to introduce new technology, but to fundamentally change the way development projects are conducted (PixelPlex, n.d.).

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