Digital Convergence USP2030

LEARNING BRIEF

Talking Interoperability

A dialogue series for advancing interoperability in the social protection sector

Data Exchange Platforms for Interoperability: Country Approaches

This brief summarises key learnings from the dialogue on data exchange platforms for interoperability in social protection delivery systems of Karnataka (India), Uganda, and Chile held on 24 June 2025.

The session was opened by Anita Mittal, Component Lead, GIZ and country approaches presented by Santosh Kadam, Centre for e-Governance, Government of Karnataka, Senior Consultant (Technology Management); Emmanuel Yeka, Ministry of Gender, Labour and Social Development, Uganda, Head of IT; and Juan Carlos Daille, Ministerio Secretaría General de la Presidencia, Technical Leader of the new interoperability network for the state of Chile. The discussions were moderated by Maksim Ovtsinnikov, GovStack Data Lead.

Please CLICK HERE to access the recording and presentation slides.

Overview

This learning brief examines how Karnataka (a state in India), Uganda, and Chile have each advanced the interoperability of digital systems through different data exchange approaches to strengthen the delivery of social protection.

- Karnataka employs an Application Programming Interface (APO) based data exchange model without any separate data exchange platform component, whereas in Kutumba, the state's integrated social registry facilitates data exchange by connecting with multiple departmental systems, each with its own API layer. The API layer performs many of the functions of the data exchange solution (e.g., authentication, access control, encryption, digital signing).

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- Uganda has adopted a centralised architecture with a data exchange platform as the hub connecting the different systems and routing traffic of the different systems through the hub.
- Chile implements a decentralised approach based on its PISEE 2 platform. It relies on a distributed network of secure software "nodes", with one node installed within each participating agency's infrastructure and facilitating direct node-to-node bilateral data exchange among systems without any central hub.

The objective of presenting these three models is to demonstrate that the same interoperability standards can be applied across different data exchange architectures, whether decentralised or centralised. The choice of architecture and corresponding data exchange platform follows — rather than dictates — the implementation of interoperability standards. Each system adheres to these standards when communicating with others, exchanging data by following the protocols and message formats defined by the data exchange platform.

1 Karnataka's Kutumba Platform: A Decentralised Approach to Social Registries

Karnataka, a state in southern India with an estimated population of 67 million, has long been recognised as a leader in e-governance. In recent years, it has made notable strides in the development of integrated digital infrastructure. At the centre of this transformation is the Kutumba platform, a digital system that enables the identification, targeting, benefit delivery, and grievance redress for a wide range of social protection programmes.

Social Protection Landscape in Karnataka

The Government of Karnataka implements several large-scale social protection programmes. Among them are the Public Distribution System (PDS), which provides subsidised food grains to approximately 55 million individuals; Gruha Jyoti, a scheme offering free electricity (up to 200 units) to nearly 15 million people; Gruha Lakshmi, a cash transfer of INR 2,000 per month to around 12 million women; and Ayushman Bharat Arogya Karnataka, a health insurance initiative covering nearly 10 million individuals. The delivery of these programmes requires robust, interoperable digital systems capable of managing large volumes of data and facilitating efficient service provision across sectors.

Kutumba Platform

Kutumba is an integrated digital platform that consolidates data from various administrative sources and enables end-to-end digital service delivery by connecting identification, eligibility determination,

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benefit disbursement, and grievance redressal through a unified platform (Figure 1). Its five core components include:

i. Social Registry: Covering approximately 55 million individuals and 16 million households, the registry contains demographic, socio-economic, and family-level data, linked to India's national ID system, Aadhaar.
ii. Integrated Beneficiary Registry: Maps benefits received by individuals, allowing cross-verification with the social registry to monitor programme coverage and duplication.
iii. Entitlement Based Eligibility Engine: A user-facing application that computes a "need score" based on individuals' profiles and government databases (e.g., age, land ownership, and income) to prioritise applicants and thereby recommends schemes that match their eligibility criteria.
iv. Direct Benefit Transfer (DBT) Platform: Supports the Aadhaar-Enabled Payment System, using the national ID as a financial address to streamline transactions, reduce processing times, and eliminate manual intervention in benefit disbursement.
v. Integrated Public Grievance Redressal System (iPGRS): A centralised mechanism for registering and resolving complaints across departments and programmes.

Objectives and Design Principles

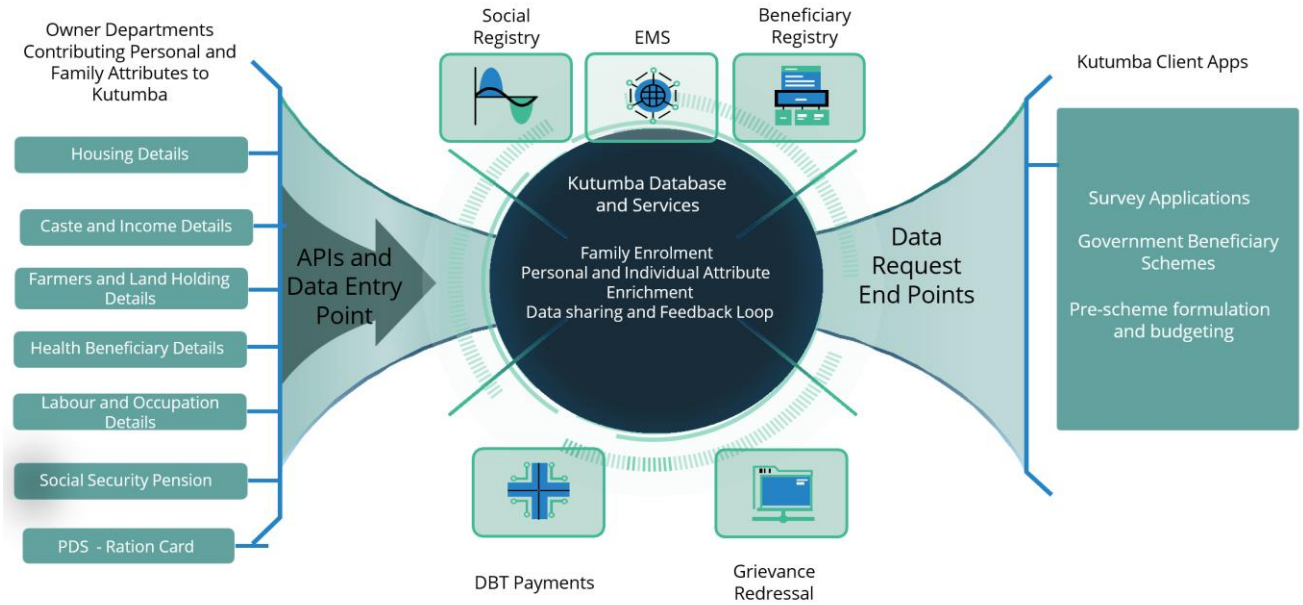

Figure 1: Kutumba's Ecosystem. Source: Talking Interoperability #20: Data Exchange Platforms for Interoperability: Country Approaches.

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The Kutumba platform was designed to improve the efficiency, inclusiveness, and responsiveness of Karnataka's social protection system. Its core objectives include simplifying access to social protection for vulnerable groups, prioritising beneficiaries based on need scores, automating processes, enabling rapid shock response, supporting data-driven planning, enforcing the "ask once" principle (data is collected once and reused across services), and promoting proactive enrolment (pre-identifying and enrolling eligible individuals).

System Architecture and Data Interoperability

At the heart of the Kutumba digital ecosystem lies a robust interoperability framework that links more than 50 departmental applications without relying on a data exchange platform. Instead, each participating system or database maintains its own APIs to handle specific data exchange functions, such as forward (asking for data) and reverse (updating data to the registry) pulls, as well as other queries. Additional ad hoc APIs enable services such as name matching and transliteration, enhancing the accuracy and usability of the data exchanged. Karnataka's technology stack is developed largely in-house. The Kutumba platform coordinates these data exchanges through its overarching framework, which lays down the guidelines for ensuring security, privacy during data exchange through authentication, authorisation, encryption, digital signing and other security controls like IP whitelisting, etc.

Real-time data is pulled from various registries and administrative databases — including pension, health services, education databases, income and caste certification systems (Nadakacheri), and farmer registries (FRUITS) — and integrated into the Kutumba Social Registry. This ensures that the Kutumba registry reflects the most current and comprehensive view of residents' data and hence computes the poverty score and determines their eligibility to programmes. Daily updates from the social registry to programme management information systems support scheme enrolment, budgeting, and monitoring. Applications such as student scholarships, health insurance enrolment, and caste verification have consequently become more efficient and transparent.

Security is ensured through a layered combination of IT measures, including periodic audits and whitelisting (allowing only pre-approved users, devices, or applications), as well as administrative safeguards, with a governance council overseeing data minimisation and departmental access rights. Policies currently align with Karnataka's state-level frameworks but are set to adapt to India's forthcoming Digital Personal Data Protection rules.

Lessons and Implications

Since its launch, Kutumba has processed over 250 million API calls, with more than 50 government departments actively using the platform. The most frequently accessed services include the student

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scholarship services (62 million hits), caste and income services (40 million), and the national health authority services (26 million).

Karnataka's experience demonstrates the value of building an interoperable digital platform for social protection. The system's "ask-once" principle and emphasis on real-time data sharing present a scalable model for other regions seeking to enhance their social protection systems through digital transformation.

2 Uganda's National Single Registry: A Centralised Approach

Uganda has made significant progress in recent years towards building an integrated and interoperable digital foundation for social protection. At the heart of this effort lies the National Single Registry (NSR) for social protection, housed within the Ministry of Gender, Labour and Social Development. The NSR has emerged as a critical instrument for consolidating beneficiary data, enabling evidence-based decision-making, and strengthening the coordination of social protection interventions across government and non-government actors.

Uganda's Social Protection Landscape

Uganda's social protection system is governed by a national policy framework that rests on two primary pillars: social security (direct income support and social insurance), along with social care and support services. Programmes under these pillars are implemented by both the public and private sectors. Notably, the majority of ongoing interventions fall under the direct income support sub-domain, including cash transfers and public works. The NSR has been designed to support all components of Uganda's social protection system, offering a unified digital platform for data management, programme oversight, and policy analysis.

The country's demographic profile highlights the urgency and relevance of such a system. With a population of nearly 46 million, of which half are children and nearly a quarter are youth aged 18 to 30, Uganda is a young nation facing substantial socio-economic vulnerabilities. Poverty affects approximately one-fifth of the population, and a significant proportion of households remain engaged in subsistence agriculture. In this context, social protection plays a vital role in addressing deprivation, mitigating risk, and enhancing resilience, particularly among the poor and vulnerable.

Social protection information systems architecture

At the foundation of Uganda's social protection information architecture are programme-level MISs, which are responsible for intake, registration, and eligibility determination as well as beneficiary management, including provisioning benefits (Figure 2). These MISs currently repeat the processes of registration and needs assessment, reflecting the absence of a centralised social registry. However, Uganda is in the process of establishing such a registry, which will serve as a comprehensive repository of socio-economic data on poor and vulnerable households.

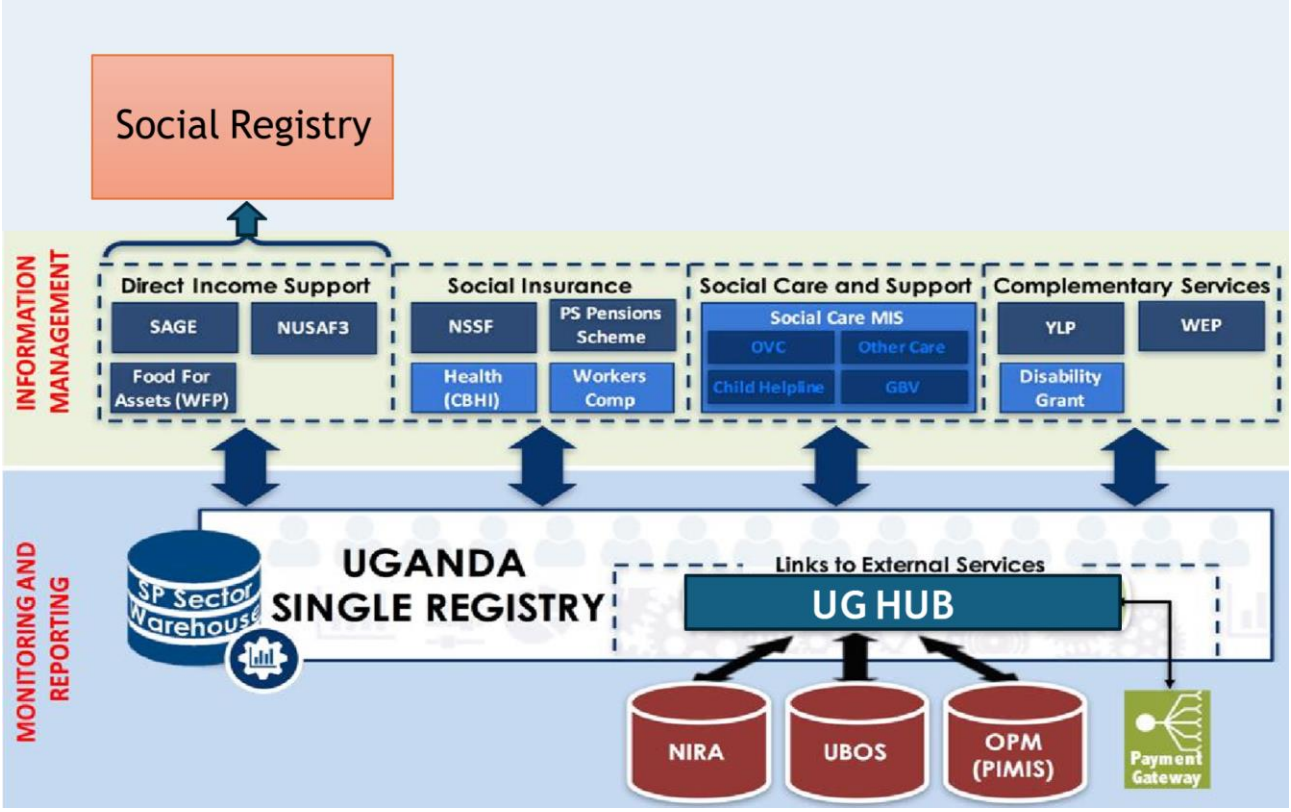

Figure 2: Uganda's social protection Ecosystem. NSR functions primarily at the monitoring and reporting level and is linked to external services via UGHuB, whereas information management takes place at the programme level. Source: Talking Interoperability #20: Data Exchange Platforms for Interoperability: Country Approaches.

Uganda's National Single Registry (NSR) serves as the central platform for aggregating programme data, verifying beneficiary identity, managing grievances, and enabling cross-programme reporting. It is a unified portal that consolidates essential information on beneficiaries/potential beneficiaries of social protection programmes through the establishment of linkages with programme Management Information Systems (MISs) and the National ID Database. The use of common identifiers and harmonised data standards facilitates data exchange and contributes to a more coherent, equitable, and effective social protection system. The NSR contributes to broader goals of transparency,

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accountability, and strategic coordination, allowing for public reporting, monitoring of duplication and fraud, and informed budget planning.

Uganda's Data Exchange platform - UGHub

NSR linkages to external databases occur through UGHub—a centralised enterprise service bus (ESB) for digital integration managed by the National Information Technology Authority (NITA-U). Built on the WSO2, an open-source ESB technology stack, and hosted on government-owned infrastructure, UGHub acts as a middleware that facilitates secure, standardised, and real-time data exchange between over 120 public and private institutions. Through UGHub, the NSR can connect with a wide range of external databases and systems, including the National ID registry, land registry, tax authority, business registration, and payment gateway. This infrastructure has significantly enhanced the government's capacity to validate beneficiary data, detect duplications, and cross-check targeting criteria across multiple sources.

Lessons in Integration

The introduction of UGHub has addressed long-standing interoperability challenges that had constrained the early development of the NSR, which was dependent on direct, one-to-one system connections between ministries and agencies at its initial stages. These arrangements were slow, resource-intensive, and complicated due to inconsistent data standards, outdated digital infrastructure, limited API readiness, administrative misalignments, and institutional hesitancy around data sharing.

The rollout of UGHub addressed these challenges by replacing fragmented, bilateral exchanges with a unified, centralised, service-oriented integration model. Once a system is onboarded, further linkages can be established efficiently without maintaining multiple direct connections. The UGHub supports secure, standardised data exchange through API management, role-based access control (restricting access by user role), semantic alignment (shared definitions and formats), and transaction-level monitoring (tracking who accessed what, when, and why). These functions are essential in social protection, where sensitive data must be handled responsibly and in line with national data protection standards.

Looking forward through the lens of the NSR integration through UGHub, there is a strong foundation for Uganda's planned transition to a dynamic, continuously updated social registry. The ability to validate information from multiple external sources—such as the land registry, pensions database, and civil registration systems—enhances the robustness of targeting mechanisms, including the application of proxy means tests. It also enables greater responsiveness to shocks, such as pandemics or climate-related events, by providing real-time data on affected populations and supporting rapid deployment of assistance.

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3 Chile's Interoperability Network (PISEE): A Secure Direct Data Exchange Model

Chile's evolving experience with interoperability demonstrates how clear legal foundations, technical flexibility, and effective governance can break down institutional silos and bring the state closer to its people. Over the past fifteen years, Chile has shifted from an underused, centralised model to a dynamic, secure and distributed network that enables public agencies to exchange information efficiently, securely, and in the best interest of those they serve.

This transformation has not been without its challenges. The journey reveals how recognising failure, building consensus, and aligning legal, technical and human factors can lay the groundwork for more inclusive and responsive public administration.

A Journey of Learning and Renewal

Chile's initial effort in 2009 relied on a centralised ESB with strict semantic standards, called Plataforma Integrada de Servicios Electrónicos del Estado (PISEE). After a decade, the network had connected only 100 organisations, highlighting issues of limited adoption, rigid formats, lack of security, and maybe lack of trust. In response, an open discussion was launched in 2019 with major public institutions responsible for managing critical data to rethink the interoperability approach. This consultative process encouraged frank reflection on past shortcomings, shared challenges, and international experience. The outcome was a collective commitment to design a new model from scratch— PISEE 2 — inspired by the Estonian X-Road model and grounded in enhanced security and legal legitimacy. This renewed system is more than just a new technical platform, as it entailed regulatory changes too.

Legal Foundations and Technical Architecture

A key enabler of this renewed approach was Chile's 2019 Digital Transformation Law (Law 21.180), which defines interoperability as a core principle of modern public administration. The law is supported by detailed technical regulations, implementation guidelines, and clear legal definitions that give equal validity to digital documents and exchanges. This legal certainty removes a major barrier that previously limited digital collaboration between agencies.

PISEE 2 is the new interoperability platform that enables the secure exchange of data, documents, and electronic files among public institutions (Figure 3). Its technical backbone rests on a distributed network of secure software "nodes" installed within each participating agency's infrastructure, supporting direct node-to-node communication. These nodes act as protected transport layers that allow data to flow directly between organisations while safeguarding privacy and ensuring message

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integrity. Agencies are authenticated and authorised before any exchange occurs, with encryption and digital signatures maintaining trust throughout the process.

Unlike the earlier PISEE system, this architecture enables agencies to exchange data with minimal friction by providing flexible arrangements for how information goes through the system. Agencies are free to use their existing formats, systems, and workflows, as the platform does not enforce a single data standard or centralised routing path. This flexibility has proved critical in attracting more participants — from major ministries to small municipalities — and ensuring that the network is adaptable to the diverse realities of Chile's public institutions.

Building Trust, Simplicity, and Effective Governance

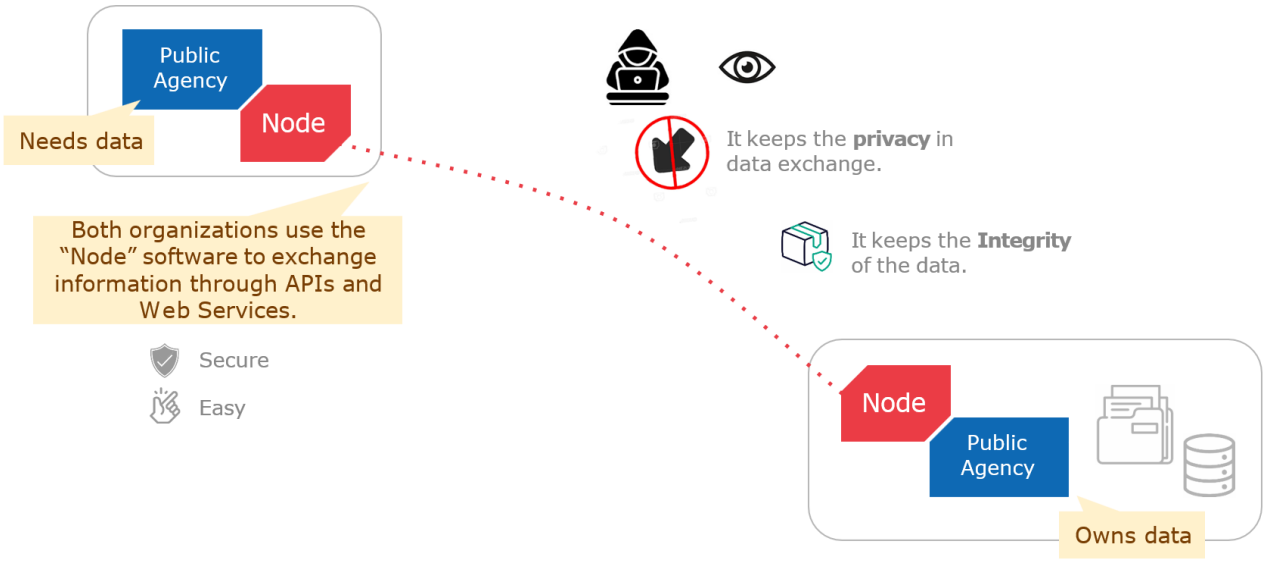

Figure 3: Functions of PISEE 2 Operated via a Secure and Flexible Node-to-Node Network with Nodes Deployed by Participating Agencies. Source: Talking Interoperability #20: Data Exchange Platforms for Interoperability: Country Approaches.

Trust, simplicity, and good governance have emerged as the defining features of the new system. Agencies are far more willing to connect and share data when they are confident that exchanges are secure and transparent. Simplicity was a deliberate design principle, recognising that the network must be straightforward enough to reach over a thousand organisations without imposing undue technical or administrative burdens.

To address gaps that undermined the earlier system, effective governance structures have been introduced. The network now includes centralised support services that provide crucial oversight and shared resources. For example, the service catalogue gives agencies clear information about

what services and data are available for exchange. The semantic code manager clarifies the meaning of data elements, reducing confusion and errors. A traceability repository, required by law, ensures that all transactions are recorded, audited, and retrievable.

Additionally, a citizen authorisation tool is under development to enable explicit consent when sensitive data is exchanged — reinforcing the principle that individuals should retain control over their personal information wherever appropriate.

Practical Benefits for Citizens and Public Agencies

The renewed interoperability network is already producing real and measurable benefits for both institutions and the people they serve. For example, individuals applying for housing subsidies are no longer required to collect and submit a wide array of documents. Instead, relevant information is automatically gathered from multiple public agencies, streamlining the process and removing administrative burdens from applicants.

The Social Household Registry is another example of the network's value. Managed by the Ministry of Social Development, this registry aggregates comprehensive data — from tax offices, civil registries, indigenous affairs and other sources — to calculate household's poverty level. This information is then made available to other agencies, such as municipalities or ministries responsible for social protection, employment, housing, or education, enabling them to target benefits more effectively.

Expanding Reach and Strengthening Digital Transformation

The scale of the transformation is evident in the growth of the network. In just five years, the number of connected organisations has leaped from fewer than 100 to over 500, and more than 2,000 public servants have received training to use and manage the system effectively. The volume of messages exchanged has soared from negligible levels under the old system to more than 300 million in 2024 alone, with over 360 million already recorded by mid-2025.

These figures are not merely technical indicators; they reflect a fundamental shift in how public institutions collaborate and how citizens experience the state. The new model reduces duplication, shortens waiting times, and ensures that people with social protection needs — who often have the least capacity to navigate complex administrative procedures — are better supported.

Looking Ahead: Lessons for Others

Chile's experience provides valuable insights for any country seeking to modernise its state services through interoperability. The journey illustrates that robust legal backing, flexible technical solutions, and attention to trust are all essential for success. PISEE stands as evidence of learning

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from failure, demonstrating the value of co-designed solutions that secure stakeholder involvement and trust in the system. By continuing to learn and adapt, Chile's interoperability network is helping build a more connected and responsive public sector.

Conclusion

The diverse experiences of Karnataka, Uganda, and Chile illustrate that there is no single pathway to achieving effective interoperability in support of social protection objectives. Each context demonstrates how tailored architectural choices — whether decentralised, centralised, or hybrid — can successfully enable secure, efficient, and inclusive data exchange when grounded in clear legal mandates, robust governance arrangements, and adoption of technical standards for interoperability.

Crucially, these cases reaffirm that interoperability is not solely a technological exercise but a multidimensional endeavour that depends on institutional cooperation, trust, and sustained investment in capacity-building. As governments worldwide seek to strengthen the delivery of social protection, the lessons emerging from these models underscore the importance of designing interoperable systems that respect data privacy, facilitate proactive outreach, and place the needs of individuals and households at the centre.

In doing so, countries can advance towards more resilient, shock-responsive, and equitable social protection systems, better equipped to address the evolving risks and vulnerabilities faced by their populations

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