BLOCKCHAINS
FOR A SUSTAINABLE POSTAL FUTURE

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STUDY ON THE USE OF **DISTRIBUTED LEDGER TECHNOLOGIES (DLTs) AND BLOCKCHAIN** FOR THE POSTAL SECTOR

FOREWORD

I believe that blockchain-based solutions will be integral to the future of the postal sector.

To explore this topic of recent interest, the UPU has prepared a forward-looking study to help member countries innovate their postal logistics and financial services using distributed ledger technologies (DLTs), including blockchains. At its core, this study explores a wide range of use cases for DLTs across the postal sector, assessing their potential to improve the transparency, efficiency and security of postal services.

As the United Nations specialized agency for international postal cooperation, the Universal Postal Union (UPU) acts as the primary forum and knowledge centre for the sector. It actively supports its 192 member countries to ensure that Posts around the world can provide market-responsive products and services with the ultimate objective of improving the socio-economic development of the communities they serve. By sharing best practices and use cases, we hope that Posts can identify mechanisms through which DLTs could become an integral part of their postal services strategy.

It is clear that – through research, experimentation and innovations driven by DLTs – Posts could offer services that would better meet the needs of their customers and better serve societies. We also hope that this study will encourage policymakers and regulators to empower Posts to develop more innovative, inclusive services that will bring benefit to all members of society.

Finally, I wish to extend my sincere gratitude to all the member countries that participated in making this study a success and to the Ministry of Internal Affairs and Communications of Japan for its generous grant that made it possible.

MASAHIKO METOKI

Director General of the International Bureau
Universal Postal Union

Abbreviations

AI	Artificial intelligence
ACI	Advance cargo information
AML	Anti-money laundering
API	Application programming interface
DLT	Distributed ledger technology
DO	Designated operator
B2B	Business-to-business
BaaS	Blockchain as a service
CAGR	Compound annual growth rate
CBDC	Central bank digital currency
DeFi	Decentralized finance
DFS	Digital financial services
EU	European Union
FAO	Food and Agriculture Organization
FBI	Federal Bureau of Investigation
G2P	Government-to-person
GDP	Gross domestic product
GDPR	General Data Protection Regulation
GPI	Global Payment Innovation
IATA	International Air Transportation Association
ICC	International Chamber of Commerce
ITU	International Telecommunication Union
JIU	Joint Inspection Unit
KYC	Know your customer
NFC	Near field communication
NFT	Non-fungible token
NGO	Non-governmental organization
P2G	People-to-government
PASS	Postal account settlement system
SaaS	Software as a service
SDG	Sustainable development goal
SSI	Self-sovereign identity
SWIFT	Society for Worldwide Interbank Financial Telecommunication
UN	United Nations
UNDP	United Nations Development Programme
UNHCR	United Nations High Commissioner for Refugees
UNICC	United Nations International Computing Centre
UNICEF	United Nations Children's Fund
UNJSPF	Unite Nations Joint Staff Pension Fund
UPU	Universal Postal Union
USO	Universal service obligation
USPS	United States Postal Service
UX/UI	User experience and user interface
WFP	World Food Programme

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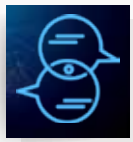

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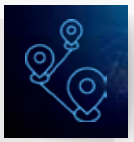

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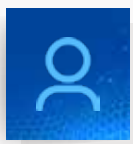

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EXECUTIVE SUMMARY

As part of the fourth industrial revolution, distributed ledger technologies (DLTs) have caused excitement owing to their ability to connect the biological, digital, and physical worlds through the decentralized storage of data. Transparency and efficiency are two words often associated with this technology and several organizations have investigated ways of harnessing the benefits of DLTs for customer- and human-centric solutions.

Recent developments and increased attention to cryptos and blockchain have drawn increased attention to DLTs. Although still young, the potential impact of this innovative technology has been recognized by many and has incited conversations about its use in different sectors, such as the public sector, finance, and logistics.

Many have been more wary on exploring the potential of DLTs, which has hindered its widespread adoption. This can be attributed to the increase in media attention and coverage of DLT solutions with special attention on the risks associated with its different use cases. One noteworthy example is that of cryptocurrencies, especially bitcoin, which has showcased the relative uncertainty that surrounds the use of DLTs in the financial environment.

The Post, as a worldwide network of postal offices, would benefit from utilizing a decentralized solution to promote low cost and competitive solutions in postal logistics. The Post, as a trusted entity, can leverage its network to bring about positive impact for the unbanked and underbanked populations that have not been included in the formal financial system through postal financial inclusion products.

According to research and primary postal stakeholder interviews, there is an increasing interest for Posts in exploring the use of DLTs. This is especially true in postal logistics for its ability to increase the levels of transparency of data shared between stakeholders and because of the layers of cybersecurity it adds to prevent fraud.

When it comes to the provision of postal financial services, DLTs can potentially accelerate financial inclusion for unbanked and underbanked populations by providing them with high quality, affordable services. This is especially true for cross-border and inter-organizational services.

This study investigates how Posts can make use of DLTs in two domain areas: postal logistics and postal financial inclusion.

Prior work done by various United Nations (UN) entities, Posts and private sector organizations was identified to consolidate a long list of use cases relevant for the Post. The study then identifies and examines how DLTs and blockchain can be used to bring benefit to these use cases in the two domain areas.

A recent study found that the savings potential associated with the use of blockchain and other DLTs in postal logistics is more than 30 percent in companies' middle- and back-office operations (Accenture Post and Parcel, 2018).

Based on research and primary insights, this study finds that the potential use cases for DLTs in postal logistics are:

Potential use cases of DLTs in postal logistics

Use case	Objective	Main value
Certificates of origin	Have a common digital platform for the creation and validation of certificates of origin.	Reduce the time required to create certificates of origin and their authentication through a digital platform.
Crypto stamps	Automate bilateral postal settlements and keep reliable track of data regarding shipments and mailing history of post.	Increase efficiency and decrease costs of bilateral postal settlements, ensure privacy of sender and recipient through cryptographic verification.
Customs and handling	Accelerate customs and cross-border flows.	Single source of required documents necessary for international trading and transportation by coordinating with stakeholders.
Digital post office box	Ensure reliability for digital documents and increase convenience in mail delivery and document verification.	Secure an individual's data protection, enable digital document verification service, prevent modification or misplace of official documents and ability to reach a wider population.
Reverse logistics for returns	Decrease the time and effort spent on reverse logistics processes.	Easily find and access information for returned mail and packages for a simple and streamlined return process.
Track and trace	Increase transparency among partners sending and receiving mail.	Stakeholders able to check the status of a parcel by using an auditable and transparent chain of custody.

Detailed analysis of each use case is explored in the study.

Similarly, for postal financial inclusion, the study finds that there are five broad benefits that the use of DLTs could bring:

- Reduce settlement time and enable a trusted network;
- Improve error handling and save time and costs associated with rework;
- Support smart transactions;
- Cost reduction from efficiency gains and lower transaction costs; and
- Secure a decentralized and distributed transaction ledger database.

Considering these broad areas and based on research and primary insights, this study finds that the potential use cases for DLTs in postal financial inclusion are:

Potential use cases of DLTs in inclusive postal financial services

Use case	Objective	Main value
(Collective) insurance	Lower the fees on insurance for a group of people living in the same area and trigger automatic payments.	Increase exposure to insurance for people who would not be able to apply or pay for one otherwise (e.g. small farmers for drought insurance).
Digital wallet	Increase convenience in payments and monitor spending.	Individuals can easily check their funds, open savings accounts and track their spending.
Identity management	Provide individuals with an accessible single digital identity acceptable to a broad range of service providers.	Reduced costs for identification processes, lower identity fraud and better user experience.
Managing direct cash transfer projects	Monitor the proper spending of vouchers given to people participating in cash transfer programmes (both conditional and unconditional).	Quick and easy delivery of (e-)vouchers to recipients while validating their proper and single use in participating stores (unless unconditional in nature).
P2G payments	Ease person-to-government (P2G) payments and/or proof thereof (such as in tax payments and fine settlements).	Enable residents to make payments or provide proof of payment to the government either through a digital wallet or by going to the nearest post office.
Remittances	Lower fees and increase accessibility to remittances by leveraging the Post's network.	Instantaneous domestic and international remittances, even for smaller values.
Transaction information management	Access near real-time information on customer transactions for the monitoring of cash availability.	Reduce operational risk, ensure better customer experience and prevent cash shortages at postal offices offering financial services.

Detailed analysis of each use case is explored in the study.

The study concludes with a set of recommendations focussing on how to enable the exploration, experimentation, and piloting of DLT-based solutions in Posts' respective countries.

Posts are encouraged to form partnerships for the development and upkeep of DLT solutions with a special emphasis on adopting global standards and privacy by design. It is vital for Posts to have a clear business case that is both market responsive and financially sustainable to keep it relevant to its customer base and not depend on third parties in the long term for product-related and strategic decision making.

Regulators and policymakers are first and foremost encouraged to delve deeper into the topics of DLTs and digital financial services. They should promote collaboration and facilitate experimentation in contained environments for innovation in the financial sector. Regulators should encourage the use of open platforms and interconnectivity while also providing postal stakeholders with increased clarity on DLT-specific regulatory frameworks.

Ancillary to this main study, detailed case studies are being published with in-depth, qualitative deep dives and implementation recommendations for the following postal financial inclusion use cases: implementing a digital wallet, facilitating cost-effective remittances; facilitating identity management; and enabling and supporting direct cash transfer programmes.

In addition, three pilot "blockchain blueprints" are also being published that can enable Posts to implement postal financial inclusion solutions using DLTs.

The UPU aims to gain a better understanding of the potential use of blockchain in the postal sector, particularly within two domain areas: improving postal logistics and facilitating inclusive postal financial services.

INTRODUCTION

Background

With this study, the Universal Postal Union (UPU) aims to **gain a better understanding of the potential use of blockchain in the postal sector,** particularly within two domain areas: improving postal logistics and facilitating inclusive postal financial services.

As stated in its Constitution, the UPU's objective is to secure the organization and improvement of the postal services and to promote the development of international collaboration in this sphere.

In today's rapidly changing world, in the light of recent developments such as the introduction of digital technologies in the postal sector, the UPU has decided to further explore the potential benefits of DLTs and blockchain to identify sustainable use cases for the facilitation of international mail processes and the provision of inclusive postal financial services for underbanked and unbanked populations (UPU, 2020b).

The UPU has previously explored the potential use of cryptocurrencies for postal financial inclusion and published a white paper in collaboration with the International Telecommunication Union (ITU): *Potential use of cryptocurrencies by Posts* (Khan, 2019). In this white paper, three use cases are identified:

- Instantaneous remittances;
- Transparency in government-to-person (G2P) payments; and
- Managing direct cash transfer projects.

Moreover, the UPU has been exploring the potential use of DLTs for the issuance of digital IDs and crypto stamps under its .POST Group, a governance group that steers the UPU's .POST sponsored domain name and encourages collaboration among members, sharing of knowledge and services for the digital transformation of the postal sector.

This study will provide insight into other potential use cases for the postal sector, which will support the UPU in providing information and bridge the current knowledge gap on the use of DLT solutions for the postal sector, encourage the use of technology, and guide designated operators (DOs) in designing their own DLT and blockchain strategies.

Context

Introduction to the postal network

Throughout this paper, the term "the Posts" will refer to the network of DOs that form a single, global postal territory. The term "the Post", it will refer to the national DO of an individual country.

The UPU is kept separate from the Posts as its role is to act as an advisor, mediator and a liaison for improving interoperability, ensuring sustainability and fostering effective communication in the sector.

The Post has one of the largest physical networks in the world, with over 668,000 postal offices employing nearly 5.2 million people worldwide (Khan, 2019). The Post is an important sector in both logistics and financial inclusion as it handles over 300 billion postal items a year and provides financial services to over a billion customers (UPU, n.d.). By providing a point of contact for people in both urban and rural areas for centuries, the Post and its employees have been able to create a bond of trust that is unmatched by any other company, government, or bank (UPU, 2019b).

As part of its social mission, the Post not only play a major role in delivering letter-post and parcels to those living in close proximity to cities or other major logistics hubs, but additionally in providing minorities and the most vulnerable populations with access to financial services.

Posts are uniquely positioned to support these populations owing to their large physical network, close contact, and because their business model focuses on economies of scale by keeping volumes high and costs low (UPU, 2013). Moreover, **Posts have a societal purpose that enables them to focus on services that have a large societal impact, regardless of economic gain.**

In 2019, almost 90% of Posts provided "some form of financial service, either directly or in partnership with other financial institutions, targeting groups that are typically excluded from the formal financial system" (Khan, 2019). Around the globe, postal offices have become points of contact for individuals to create a bank account, obtain (small) loans, and receive or send payments both domestically and across borders (e.g. transfer funds to other individuals, civil servant salaries).

In 2010, Posts held 1.6 billion savings and deposit accounts, which means that, considering a conservative average of 1.5 accounts per client, more than one billion people were banked through the Post (UPU, 2016).

Thus, as a major strategic player in global logistics and financial inclusion, it is vital for the postal sector to continue to innovate and explore how digital technologies and solutions can help its stakeholders. Increasing awareness on the potential of digital solutions and the still relevant role of the Post in the digital era will help it to keep its competitive advantage and reach more people.

The UPU, as well as other United Nations (UN) entities, has already recognized the need to continue its investments in seeking innovative solutions, including the use of digital technologies. As such, it is exploring the potential use of DLTs, including blockchain.

Introduction to distributed ledger technologies (DLTs)

DLTs have been a topic of interest in academia and in both the public and private sectors since the introduction of the Bitcoin whitepaper in 2009. DLTs, more specifically blockchain, are technologies that are inevitably associated with cryptocurrencies, especially Bitcoin, but research has since shown that they have many other use cases, including outside of financial services.

DLTs refer to a ledger where data is saved in chronological digital records, which are then shared (i.e. distributed) with everyone who has permission to access the ledger in the network (i.e. nodes). This could be described as a network protocol, a set of rules to determine how data will be shared. Alongside this set of data-sharing rules, DLTs use a consensus mechanism that describes ways of achieving mutual agreement in the network as to how updates to the ledger with new transactions are validated. This provides a single source of truth that enables authentication, trustless transactions and transparency in the network.

DLT is an umbrella term for different technologies, one of which is blockchain.

In a blockchain, data is saved in a chain of consecutive chronological blocks where transactions are cryptographically secured and then saved.

In the case of blockchain, more organizations are committed to implementing blockchain-based solutions, with industry leaders acknowledging that this technology may be integral to innovation within the organization (Deloitte, 2020).

Economists have estimated that the overall use of blockchain has the potential of increasing the global gross domestic product (GDP) by 1.76 trillion USD by 2030 (PwC, 2020). As such, there has been an increase in the number of companies that believe that they will lose part of their competitive advantage if they do not start using and experimenting with the technology, as it is understood that it "now represents a true agent of change" (Deloitte 2020).

When looking at the current and emerging use cases of DLTs in other industries and sectors, it is important to understand that **some features that bring value in the private sector may not always match the strategy, mission and values of Posts.**

Proper understanding of the technology and clear strategic guidelines are crucial for the proper piloting of any digital solution, and DLT-based solutions are no exception.

Purpose, objectives, and scope of this study

This study aims to make observations and recommendations to UPU DOs on the use of DLT solutions in the postal sector within the domain areas of postal logistics and postal financial inclusion.

Although more publications on the general use of DLTs in both domain areas are accessible to Posts, **this study seeks to bridge the knowledge gap that exists on the use of DLT and blockchain solutions specific to the postal sector** by creating a consolidated review of existing documentation obtained through thorough desk research and by gathering insights from both industry stakeholders and blockchain specialists.

The three main objectives of this study can be summarized as follows:

Identify current and emerging blockchain use cases in the postal sector and other relevant industries in the domain areas of postal logistic services and inclusive postal financial services;

Present a short list of prioritized use cases in both domain areas and conduct a qualitative study on those related to postal inclusive finance, which have the potential of becoming sustainable solutions adopted by Posts in their efforts to secure future-proof postal operations; and

Propose policy recommendations, best practices and enhancements for the benefit of DOs of UPU member countries.

To ensure a holistic view of use cases relevant to the Post, this study will consider current and emerging use cases in both the postal sector and in acquainted industries such as freight and logistics, finance and the supply chain.

Defining postal logistics

The Post is first and foremost a channel for individuals to receive and send packages in the form of letter- or parcels-post. Regardless of whether a postal office offers financial services, postal logistics services are always present and play an increasingly important role in the development and success of e-commerce strategies for businesses.

The global parcels market has grown from just under 450 billion USD in 2018 to over 500 billion USD in 2020, with Asia-Pacific accounting for around 42% of the global market and North America and Europe combined for over 50% (Proud & Chapman, 2021).

The COVID-19 pandemic has been responsible for a high growth rate in this market for the past two years, as there has been an increase in demand for postal services with the increase of e-commerce. This trend of continuous growth is expected to continue, albeit not at the same rate as it has during the pandemic.

With under 287 billion domestic and international letter-post deliveries and over 21 billion parcels dispatched globally in 2019 (UPU, 2019a), postal operators play an important role in postal logistics services. Posts account for around 25 percent of the global market share, just below global integrators and private sector carriers, which account for 36 and 39 percent, respectively (Proud & Chapman, 2021).

However, mail volumes have been declining for postal operators, as global integrators (e.g. FedEx, UPS) keep on innovating and offering cheaper prices for their postal and logistics services. Some Posts, such as Deutsche Post, China Post and Japan Post, have been able to offset the decline in mail services and extend their services to remain competitive.

As has become clear, postal operators have many different logistics services and facets. In this study, **the postal logistics domain area** is defined as the process by which both individuals and organizations utilize the postal network to send and receive letter-post and parcels between each other. These are not limited to domestic postal logistic services and include international partnerships between Posts and private sector carriers or global integrators.

Defining postal inclusive finance

The second domain area reviewed in this study is postal inclusive financial services. In its ability to connect with communities such as unbanked and underbanked populations, the Post has been offering financial services to those who are normally excluded from the financial system and institutions such as banks.

Although the number of adults with a financial account has been steadily increasing, around 1.7 billion adults remain unbanked (Demirgüç-Kunt et al., 2017). Moreover, "almost half of the world's population does not have access to affordable, quality financial services like loans, savings accounts, insurance and payment services" (UPU, 2013).

The lack of access to financial services is a matter of concern owing to the effect it has on a person's quality of life in terms of planning for the future and having savings and a safeguard in case of unforeseen circumstances such as unemployment or sickness.

Additionally, vulnerability from financial exclusion has been shown to contribute to poverty and hamper national economic growth and development (Ventura, 2021). Access to financial services can help individuals emerge from poverty and financial inclusion has been recognized by the UN as essential to improving the living conditions of those who are marginalized. It is promoted in seven of the UN's 17 Sustainable Development Goals (SDGs) for 2030.

Access to financial services goes hand-in-hand with other inclusion and equality goals. High-income countries have more adults (94%) with a financial account in comparison to developing countries (63%). Globally, more men tend to own an account (72%) than women (64%), and about half of the unbanked adult population come from the poorest 40% of households, located in just seven developing countries (Demirgüç-Kunt et al., 2017).

In addition, a study by Ernst & Young in 2018 showed that financial inclusion could help boost GDP in developing countries by 14 to 30% while also increasing financial institution revenues by 200 billion USD in 60 countries (Bellens, 2018).

As of 2016, 28% of the global population had access to financial services through Posts (around 1.5 billion people), which provided various financial services including remittances, savings, financial accounts and government payments. Around 91 % of Posts already provide financial services, both independently and by partnering with financial institutions (UPU, 2016). Posts play a crucial role in reaching out to the unbanked and underbanked populations to offer financial services they would not otherwise have access to owing to cost, distance or a lack of trust in other financial systems and institutions (Demirgüç-Kunt et al., 2017).

Postal financial services play an essential role in the financial wellbeing of people and the development of countries. In this study, the same **definition of postal financial inclusion** is used as that introduced in the UPU's *Global Panorama on Postal Financial Inclusion* (UPU, 2016), which defines postal financial inclusion *"as the process by which people and enterprises excluded from the formal financial system are provided with access thereto through the postal network"*.

PREVIOUS WORK ON DLTs BY UN ENTITIES

The topics of DLTs and blockchain have previously been explored by several UN entities in the form of research and project pilots since 2017 (JIU, 2020). A number of steps have since been taken to identify use cases that could help organizations and countries achieve the SDGs by 2030 and in promoting international cooperation.

This study assessed reports and articles written by various UN entities to understand the risks and challenges identified as well as the benefits derived from pilots and proof-of-concept projects using DLTs.

In addition, by reviewing and assessing lessons learned from different UN entities, areas of opportunity are identified.

These hold the potential to bring value to Posts in advancing sustainable development.

Across the UN system, we identified 11 entities that have used DLT solutions in different areas, most notably for the traceability of commodities and transactions.

These entities have worked both individually and in collaboration with each other in at least 14 independent projects to look into the traceability of commodities and livestock, land registry, digitization of agreements, digital payments/donations, supply chain, digital identities and digital marketplaces (a non-exhaustive list is presented in table 1).

Table 1: **List of DLT pilots and projects previously carried out by UN entities**

Organization	Location	Project summary
FAO and ITU	**Papua New Guinea**	Livestock traceability for pig farmers to record information on the health of pigs, including weight, feed, sickness, breed and pedigree.
Office of Information and Communications Technology and UN-Habitat	**Afghanistan**	Tracking of the ownership of land parcels with an immutable version of land records.
UNDP	**Mongolia**	Track and trace of cashmere from origin to point of sale (POS).
UNDP	**Ecuador**	Track and trace of cocoa from origin to POS. Creation of tokens per product (i.e. chocolate bar) for customers to redeem as a discount on their next purchase or to give back to farmers to reinvest in the production process.
UNDP	**Serbia**	Tracking of food donations given to NGOs by private organizations (i.e. retailers).
UNDP	**India**	Land registry in the city of Panchkula.
UNICC and UNJSPF	**N/A**	Focus on digital certifications where the proof of concept included personal identification through biometrics for "proof of existence".
UNICEF	**Kazakhstan**	Digicus project aimed at digitizing and consolidating UNICEF agreements with its partners as smart contracts for automation of payments after verification of results achieved.

UNICEF	**Various**	Pooled venture fund to invest in early-stage, open-source solutions by supporting business growth and providing access to a network of partners and experts.
UNICEF	**Various**	Uses the structure of the venture fund to provide a platform to receive, hold and disburse donations in the form of cryptocurrencies in ether or bitcoin.
UN Women	**Kenya**	Cash-based transfer test in the Kakuma refugee camp.
UPU	**N/A**	Research on the creation of a unified digital marketplace to track the origin, ownership and authenticity of crypto stamps for all UPU member countries.
WFP	**Ethiopia and Djibouti**	Blocks for Transport is a project that focuses on improving the time spent on validating and looking for shipping docu-ments in cross-border supply chain and logistics processes.
WFP and UN Women	**Jordan and Bangladesh**	Building Blocks, a cloud-based solution, is part of a cash-based transfer programme to assist refugees from Syria and Myanmar.

Source: List compiled from JIU (2020) and Deloitte research

In addition to these projects, various UN entities have focused on conducting research on the topic of DLTs and blockchain. The UN Innovation Network has done work to identify the general use of blockchain for UN entities, including public records, supply chain tracking, digital finance, and smart contracts (UN Innovation Network, 2020).

The UN Innovation Network has partnered with the United Nations Development Programme (UNDP), the United Nations Children's Fund (UNICEF) and the World Food Programme (WFP) to create Atrium. Atrium is a blockchain-based inter-agency collaboration tool via which UN entities can find a curated list of blockchain resources, blockchain-based applications built by other UN entities, a private Ethereum blockchain to quickly test applications, and access to a community forum (UN Innovation Network, 2020).

In addition, there is the Blockchain Learning Group and the Cryptocurrency Working Group where individuals affiliated to the UN can share lessons learned, promote conversations around use cases, and seek collaboration areas on both topics.

In terms of research on potential risks associated with DLTs, the DLT Workstream of the International Telecommunication Union (ITU) has prepared a report on the security aspects of DLTs (Perlman, 2019). In this report, the original "blockchain trilemma" by Vitalik Buterin (founder of the Ethereum blockchain) is discussed, where it is believed that security, decentralization, and scalability cannot be maximized all at once.

Nonetheless, one of the conclusions of the report notes that *"despite the security issues, financial infrastructure based on blockchain technology can potentially reduce compliance costs, increase ease in adapting to changing regulatory requirements and promote more efficient markets"* (Perlman, 2019).

The UN Joint Inspection Unit (JIU) has written a report on the use of blockchain applications in the UN system with the objective of mapping the current use of blockchain by UN entities to compile a list of lessons learned, provide input for developing guidance, and identify some of the main risks and challenges to its use (JIU, 2020). The report provides a list of recommendations to be used as guidance for future actions, including the use of blockchain technology and inter-agency collaboration on the topic.

Recently, the UN Secretary-General and the United Nations System Chief Executives Board for Coordination (CEB) reviewed the JIU's report and recommendations. Following their review, eight recommendations were shared with the UN General Assembly on the use of blockchain innovation and digital technologies within the UN system. These recommendations, which are also addressed to the governing bodies of UN member countries, emphasize the need for inter-organizational harmonized solutions and cooperation using open-source principles.

When considering adopting open-source strategies for blockchain projects, the review points out that **it could "unintentionally cause further fragmentation" as network effects would be lost** (United Nations General Assembly, 2021, p.5).

Moreover, organizations are encouraged to enable agile experimentation environments that allow for the testing and piloting of solutions "at a small scale with acceptable failure parameters" (United Nations General Assembly, 2021, p.3).

In the area of the Post, the UPU has also published a white paper titled *"Potential use cases of cryptocurrencies by Posts"* (Khan, 2019). This white paper includes three use cases, namely: i) low-cost, instantaneous inward remittances; ii) managing direct cash transfer projects; and iii) facilitating G2P payments. In conclusion, the white paper highlights several potential challenges that Posts may encounter when using DLT solutions, such as intra-day volatility for cryptocurrencies as well as challenges with regard to the adoption, acceptability, regulatory frameworks and initial investments of DLTs (Khan, 2019).

The UN as a whole, and the UPU specifically, have carried out multiple (research) projects on the subject of DLTs. The corresponding findings of these projects, white papers and research findings are used as a base layer upon which this research will be further built.

These studies, research, pilots, lessons, and recommendations **have been integrated in this study for the identification of use cases in both of the domain areas.** Special attention has been paid to the potential benefits of the DLT use cases explored, which could bring benefit to the UPU, its member countries, and Posts.

When delving into each identified use case, the lessons learned from other UN entities have been taken into account for the scoring and prioritization of the use cases based on their potential impact on the Post (see appendices).

This input has also been taken into consideration for additional publication of an in-depth, qualitative deep dive for the top four scoring use cases in the domain area of postal financial inclusion.

Since 2016, at least seven Posts have participated in 14 different pilots or projects using DLTs, especially blockchain.

DLT PILOTS, PROJECTS AND RESEARCH DONE BY POSTS

DLTs and the Post

As is the case with organizations within the UN system, Posts have also started looking into and experimenting with DLT-based solutions. Since 2016, at least seven Posts have participated in 14 different pilots or projects using DLTs, especially blockchain (a non-exhaustive list is presented in table 2).

Table 2: **List of DLT pilots, projects and research previously done by Posts**

Organization	Location	Year	Project summary
Australia Post	Australia	2016	Conducted research on how to store identities in a blockchain for the purpose of verifying someone's identity and performing registry accreditation functions.
Australia Post	Australia	2016	Piloted a solution for voting for state elections by giving voters "credits" that could be used in voting for their preferred candidates.
Swiss Post	Switzerland	2018	Implemented, in collaboration with Swisscom, a private Swiss infrastructure for blockchain applications, created to ensure that the data remains completely in Switzerland and meets the security requirements of banks.
Egypt Post	Egypt	2018	Study on how to implement a digital wallet in a mobile app and payment cards, for which the information and transaction data are both linked to a blockchain.
PostAG	Austria	2019	Creation and implementation of crypto stamps with NFC-enabled verification and authenticity, where users can receive a physical stamp that can be used to post letters and packages.
Croatian Post	Croatia	2019	Successful trial of cryptocurrency sales and redemption services for tourists in Zadarooking. Looking into expanding this service to the resident population.

Tunisian Post	Tunisia	2019	Tunisia Post has implemented the eDinar solution, which allows individuals to have a digital wallet backed by a prepaid smart card. This stablecoin, acting almost like a central bank digital currency (CBDC), is pegged to the national currency and the supply is wholly controlled by the Tunisian Post.
Swiss Post	Switzerland	2019	Piloted the use of blockchain and the Internet of Things to ensure compliance with the EU guidelines on good distribution practice for pharmaceutical logistics and cold chain.
Egypt Post	Egypt	2019	Development of a logistics centre at Cairo Airport, designed as a regional consolidation centre in Africa that uses blockchain technology with the goal of speeding up customs procedures and handling.
Croatian Post	Croatia	2020	Created a crypto stamp that is issued along with a digital "Postereum" token on the Ethereum network. Each stamp is accompanied by a Postereum token and a physical stamp worth 50 HRK (or 8 USD) that can be used to pay postage costs.
Tunisian Post	Tunisia	2020	Adoption of the SWIFT Global Payment Innovation (GPI) for international financial transfers to better monitor operations initiated via SWIFT.
USPS	United States of America	2020	Creation of a blockchain mail-in voting system for citizens using Ethereum. A patent was filed for this system in 2020.
Tunisian Post	Tunisia	2021	Pilot for a CBDC payment platform and wallet on a private blockchain using Hyperledger.
USPS	United States of America	n.d.	Exploration effort on the use of DLTs for a distributed identity use case, where individuals have control of their own information. Research included looking into the potential of using DLT identity solutions for postal logistics use cases.

Source: Deloitte research, primary interviews with postal stakeholders (2021)

From research and interviews, we have identified only two Posts that have explored the topic of identity management (Australia Post and USPS), and only one that has experimented with a national digital currency (Tunisian Post).

Most of the use cases for which the Posts have piloted have been in the area of postal logistics. In this connection, three Posts (PostAG, Croatian Post and USPS) have looked into the use of crypto stamps as collectible non-fungible tokens (NFTs). Some Posts have provided a physical stamp that can be used for the postage of packages, as can other non-crypto stamps.

Moreover, two Posts (USPS and Australia Post) have looked into the use case of electoral voting through the mail by recording votes in the blockchain. The USPS has even filed a patent for its mail-in voting system, where oracles are used for voter registry, receiving ballots and information on the state and county (Manivasakan, 2020).

Swiss Post has also made significant steps towards the adoption of blockchain solutions in Switzerland. It offers two blockchain solutions: the Swiss Trust Chain and Blockchain-as-a-Service (BaaS).

In collaboration with Swisscom (a Swiss telecom provider), Swiss Post has created a private hyperledger-based DLT, which is 100% Swiss made and owned. The Swiss Trust Chain infrastructure provides users with the certainty that all the stored data is kept in data centres located nationally, and that the blockchain is regulated and accessible to approved users only. Together with its BaaS solution, Swiss Post offers organizations the opportunity of using previously developed applications on the Swiss Trust Chain and a secure place for testing self-developed applications. Users can then continue to develop, test and integrate their own applications both on- and off-chain (Swiss Post, n.d.).

At the UPU World CEO Forum held in Amsterdam in 2019, the Posts of Egypt, Croatia and Turkey were commended for their progress on the use of blockchain technology in the postal sector, mainly in the area of postal logistics. In the case of Egypt, the Post opened a logistics centre at Cairo Airport designed to function as a consolidation centre for all of Africa, the aim being to speed up customs procedures and handling by using blockchain technology.

Recently, the Egyptian government made news by authorizing CargoX as a blockchain provider for document transfers for the advance cargo information (ACI) system. ACI declarations became mandatory as of July 2021 for all inbound cargo to Egypt and are registered and transferred by using the Ethereum blockchain (Hoffman, 2021).

In the postal sector, the UPU has been working with STAMPSDAQ, a private sector member of its .POST Group since October 2020, to create a digital marketplace for crypto stamps. This project seeks to conduct research on the issue of digital crypto stamps to create a unified marketplace accessible to all UPU members. Participants are able to track the origin, verify the authenticity of, and obtain information on the current ownership of a crypto stamp by using the marketplace expected to go live in the summer of 2021.

Both trust and transparency are considered key values of the Post, which can be advanced through ongoing investment in technologies such as DLTs. In a call to action, Mr Moses Ma, managing partner of FutureLab Blockchain Lab, mentioned that he believes that if Posts leverage this trust and transparency and "take the right steps now, they could find themselves in a stronger position than e-commerce giants such as Amazon, Facebook and Google" (UPU, 2019b).

Posts can learn from each other and share their experiences, lessons learned and routes to innovation using these technologies to foster efficiency and inclusion.

Posts could also work with third parties with experience in using DLTs in order to accelerate their learning curve and develop standardized solutions that could be shared between postal operators.

Strategizing the right path forward

Even though DLT solutions have proven to be of use for the postal sector, it is **important for Posts that are considering investing in new innovations using DLT solutions to assess if a solution is the right choice and the right fit for their digitization strategy.**

The right fit of a solution is of crucial importance in bringing about the desired level of impact instead of experimenting with a new technology for the sake of innovation.

In the case of DLT solutions, there are four assessment categories, anchored in the need to have a centralized or a decentralized approach to DLTs, which can be used to identify fit.

Value refers to the indicators of a use case that will provide measurable parameters according to the use case for the decentralized solution. Posts need to ask themselves if there is a need of transparency for reporting or settlement purposes, and if the information that will be shared is already shared with stakeholders. Is the Post currently using intermediaries or managing contractual relationships where there is a lack of trust and many stakeholders can read or record new data?

In addition, Posts need to question if there is a need for transaction privacy and anonymity, which is currently not the case. DLT solutions are especially valuable when there is a need for high transparency and for immutable (i.e. tamper proof) data shared with multiple stakeholders in an ecosystem.

The **ecosystem** and players category refers to the number of participants that are currently part of the identified use case. An ecosystem is a network of participants who share and access information provided by others.

Decentralized solutions bring value to ecosystems where information needs to be updated and shared, and where stakeholders can keep a record of validated data jointly. DLT solutions work well in environments where there is a high dependence on accurate information with an auditable record of changes or additions to it, especially when more than one stakeholder is updating or requires access to the data.

Technical pointers look into both the digital maturity of Posts and the country they are in, including the feasibility of a decentralized solution in terms of current regulations. Posts should delve into the relevant standards and regulations they would need to comply with before starting to experiment with the solution in order to ensure compliance in all activities.

Posts with a higher level of digitization would avoid higher initial investment costs, but need to check if relevant stakeholders in their value chain share a similar level of digital maturity.

Lastly, regarding the possible hindrances that could be encountered when using DTLs, Posts need to clearly single out the problem they are trying to solve and outline the goals they want to accomplish to define their northern star.

After defining the problem and assessing its **relevancy** to the individual Post or the sector as a whole, it is necessary to assess whether the use case could be better solved by using other technologies. As part of the technological viability assessment, to note if a decentralized solution is worth it, an objective and quantifiable comparison between a DLT solution and current offerings or alternatives is needed to prevent the Post incurring a bigger-than-necessary investment cost for a solution that could create less impact than expected or required.

POTENTIAL DLT USE CASES FOR POSTAL LOGISTICS

Introduction

According to a report by the World Economic Forum, countries could obtain an increase of almost 5% in their GDP and of 15% in their global trade by reducing supply chain barriers to trade. In addition, it is noted that improving on just two key barriers (i.e. customs procedures and handling and communications infrastructure) could lead to an increase of 2.6 trillion USD in global GDP and of 1.6 trillion USD in global trade (World Economic Forum, 2013).

In terms of savings resulting from the use of blockchain and other DLTs, research has shown that savings of more than 30% could be achieved for companies' middle and back offices (Accenture Post and Parcel, 2018). These savings could be achieved owing to some of the main benefits of using DLTs, such as more efficient and streamlined global trade logistics, increased transparency, and traceability in the supply chain, and using smart contracts for the automation of commercial processes. A smart contract is a piece of code that enables programmable and automatic transactions based on a predefined set of conditions and rules for its execution.

In order to obtain a more holistic view for the first domain area (i.e. postal logistics), this study also sheds light on DLT use cases researched or implemented by companies in the logistics and trade sector. A list of six use cases where DLTs could have an impact has been compiled with only those that are deemed relevant for the postal sector (refer to table 3 below).

Details of the selection criteria used to arrive at this long list is presented in Appendix D.

Table 3: **Long list of use cases in the domain area of postal logistics**

Use case	Objective	Main value
Certificates of origin	Have a common digital platform for the creation and validation of certificates of origin.	Reduce the time required to create certificates of origin and their authentication through a digital platform.
Crypto stamps	Automate bilateral postal settlements and keep a reliable track of data regarding shipments and mailing history.	Increase efficiency and decrease costs of bilateral postal settlements; ensure privacy of sender and recipient through cryptographic verification.
Customs and handling	Accelerate customs and cross-border flows.	Single source of documents required for international trading and transportation by coordinating with stakeholders.
Digital post office box	Ensure reliability for digital documents and increase convenience of mail delivery and document verification.	Secure an individual's data protection, enable digital document verification service, prevent modification or misplace of official documents and ability to reach a wider population.

Reverse logistics for returns	Decrease the time and effort spent on reverse logistics processes.	Easily find and access information for returned mail and packages for a simple and streamlined return process.
Track and trace	Increase transparency among partners sending and receiving mail.	Stakeholders would be able to check the status of a parcel by using an auditable and transparent chain of custody.

Source: Deloitte research, UPU focus group discussion, primary interviews (2021)

Certificates of origin

The first postal logistics use case focuses on the documentation and issuance of certificates of origin needed for international trade. Currently, obtaining a certificate of origin is a time-consuming and highly manual process as documents and information need to be collected from various sources before goods can be transported across borders. To standardize the process as much as possible, the International Chamber of Commerce (ICC) has released the International Certificate of Origin Guidelines.

Meanwhile, other countries remain dependent on a highly manual and time-consuming process for the issuance of original certificates. Given the current solution, the demand for a new product might not be considered urgent as significant investment in technological infrastructure is required.

Posts would benefit from exploring a DLT-based solution for certificates of origin in order to:

simplify the process of sending goods abroad by automating it partially by leveraging an increase in information transparency;

record any changes and update information on packages in accordance with physical flow of goods;

reduce counterfeit shipments; and

link packages directly to a digital proof of certification.

Therefore, Posts would be able to reduce the amount of false declaration fraud from the incorrect submission of information regarding the contents and value of a package to circumvent import costs or other tariffs.

Shortening customs processes is possible by having a single platform where the origin of packages can be tracked and verified. Certificates of origin can be easily submitted and shared with the appropriate customs agents, who can be confident that there is almost no chance of forgery in the documents to avoid tariffs as all changes to information needs to be validated and recorded on the ledger.

Certificates of origin are of great importance for Posts as they need to be confident that packages are properly revised and do not pose a threat to security. However, exploring a DLT solution for this use case at this time would prove to be a great initial investment whereas there are other digital technologies that have proven to be beneficial in the area of certificates of origin.

Crypto stamps

The UPU has built on a PPS*Clearing centralized system to help facilitate financial settlement between postal operators; however, only 28 postal operators are using this system (UPU, 2020a). Similarly, the International Air Transport Association (IATA) has created the Postal Accounts Settlement System (PASS), which helps standardize and automate invoices, settlements and payment processes for postal operators that work with the aviation industry (IATA, n.d.).

Crypto stamps have already gained popularity as collectible NFTs by various Posts, such as Post AG and the Croatian Post. NFTs are rare tokens that are not the same in value as another NFT and thus are used to represent assets such as collectibles, art pieces and uniquely identified assets. In addition, the use of crypto stamps has been explored as a possible use case for recording digital data and enabling more efficient bilateral postal settlements.

The review solutions, such as PPS*Clearing and PASS, show that automated bilateral postal settlements require a critical mass of countries to adopt crypto stamps for the proposed system to work, which would require the gaps in the levels of digital maturity and innovation of postal operators and offices in other countries to be reduced.

Today, bilateral postal settlement is a partially automated process using PREDES 2.1[1]. It has high potential for automation and could be enhanced by using crypto stamps. Posts could leverage the use of crypto stamps to explore their potential to:

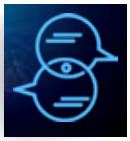
enable the use of near-field-communication (NFC) to eliminate the need for additional scanning apps to verify ownership (NFTrade, 2021);

reduce costs through increased speed in postal sorting and processing; and

verify the origin and ownership transfer from sender to receiver.

Some Posts have already recognized the value of crypto stamps and have paved the way to their exploration (e.g. Austria and Croatia). In Austria, a limited number of crypto stamps have been issued where consumers are given the option of buying a physical stamp that can be used to post packages, but with no explicit use for tracking the movement of the package.

Whilst there is high potential for using DLT-based crypto stamps, the postal industry needs to address a number of fundamental issues, including governance and interoperability to ensure the smooth functioning of such a system.



Customs and handling

All Posts participate in both domestic and global trade activities, where the transfer of accurate information is essential for the timely processing of packages. Customs and handling is a popular use case that is being explored by many organizations, Posts included, with the potential of reducing shipping times and cross-border trade processes.

In operations where information and proper documentation are important, there is a need to decrease manual errors to avoid unnecessary increases in the time spent on a single case and rework. It is estimated that around 10% of freight invoices have inaccurate data, which leads to disputes and inefficiencies in the logistics process (DHL Trend Research, 2018).

One existing solution that has looked into the use of DLTs for supply chain orchestration and minimum data rekeying is Covantis. Covantis is a platform created by several companies in the agricultural sector, which seeks to aid international trade. The solution has shown promising results and has been estimated to increase the speed of transactions by up to 70%, cut error rates by 80%, and reduce data rekeying by 90%. As part of international supply chains and global trade, Posts could use a similar platform to easily share digital documentation and data between each other and with other postal stakeholders to achieve similar results.

Furthermore, there is an opportunity to reduce the costs associated with customs and handling operations, as it has been estimated that the cost related to trade documentation accounts for about a fifth of the physical transportation costs (White, 2018). A decrease in these costs is also associated with the speeding up of international shipments through the possible automation of (part of) the processes.

The WFP has also looked into this matter with its Blocks for Transport project in Djibouti and Ethiopia, where it is estimated that **by using DLTs to share digital shipping documents the shipping process decreased from an average of 10 to 12 days to only five to six** (Deloitte, 2019). In addition to providing participating refugees with the food and resources they need, this decrease in time required for shipping processes allows for a better allocation of resources.

As part of the customs and handling use case, two specific processes have been identified where the use of DLTs would be of value, namely:

CN 22 and CN 23 customs declarations forms; and

Cross-border tax exceptions.

1 Overview of PREDES and RESDES message exchanges can be accessed at: https://www.upu.int/UPU/media/upu/files/postalSolutions/programmesAndServices/postalSupplyChain/Transport/publications/guidePredesResdesTransportEn.pdf

Information management (ITMATT, CN 22 and CN 23 customs declarations forms)

Firstly, there is the digitalization of CN 22 and CN 23 forms that are used for packages sent internationally via the Post. These are mostly conveyed via ITMATT electronic data interchange (EDI) messages to the destination Post as a pre-advise and pre-alert system for border and customs officials. These forms, and their electronic equivalent ITMATT, help determine the import duties to be paid and with the risk assessment process related to the selection of the packages requiring further inspection upon their arrival at the border.

Governments are increasingly tightening security measures related to the international shipment of packages and many now require data from mandatory customs forms to be sent prior to shipment. The forms contain information on the contents of the letter-post or parcel, its value, weight and information on the identity of the sender and recipient.

The responsibility for completing customs declaration is of the sender alone. Further, although the parties planned to be involved in its transportation are communicated from the origin Post via a PREDES EDI message, the actual transport of the item may vary depending on other stakeholders of the supply chain (e.g. air carriers, ground handlers).

In accordance with the UPU Convention Regulations, senders of international postal items / parcels through the Post need to fill in either the CN 22 or CN 23 form for small letter-post items subject to customs control up to two kilogrammes or the CN 23 form for parcels.

The use of DLTs could help Posts to:

provide a common digital platform for the transmission of these forms, and the packages actual transport information, which can then be quickly reviewed by relevant customs authorities;

announce its status on approval or in case of inspection; and

easily link it to a single package upon arrival.

This could lead to a significant reduction of costs and more efficient processing of customs declaration information, which can be made available on demand to the authorized regulators worldwide. Moreover, there are secondary benefits of increased environmental consciousness by digitizing the forms and transport documents, instead of continuing to rely on manual or semi-automated processes.

A DLT-based solution would enable expansion of the metadata available for Posts (i.e. the data contained within the physical label). Posts could verify that the information found within the label is correct and that is has not been tampered with (e.g. change of address, change of country of origin).

Security and trust between sending and receiving parties would be enhanced by ensuring that the label received is the correct one without having to rely on third parties, such as external Posts or other organizations, to validate the information. Being able to share information with regulators, such as customs agencies, would help facilitate decisions at borders on how to treat packages after they have crossed the border.

Primary postal stakeholders mentioned during interviews that it is of high importance for Posts to know more about who the customer is (e.g. from partner Posts in the case of foreign mail).

DLTs would allow Posts to easily access the information shared on the customer to easily identify and recognize them in processes through the use of a common information-sharing platform, which can be enabled by a range of technology solutions already developed by the UPU.

Cross-border tax exemptions

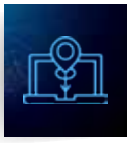
Secondly, there is an opportunity to create a DLT-based solution that would speed up processes regarding cross-border trade tax exemptions. A solution could focus on business-to-business (B2B) cross-border supply chains where there is a heavy administrative burden. This would help regulators, tax and customs authorities to find all the relevant information they need via a single platform and would allow (part of) the process to be automated.

By submitting validated information into the ledger, customs authorities would be able to easily access the information they need to assess if there is an applicable cross-border tax exemption. Moreover, it would be possible to check if the information is properly validated or if it has been tampered with to prevent or easily identify fraud. Part of the process could be automated by providing the option of filling in the forms by using the information already submitted, or to filter out the applications for which a tax exemption would not be applicable.

In this case, **the Post could act as a validator and provider of the service, thus being the point of contact for the submission of information.** Posts would be the providers of the service, which means that they would need to come up with a clear governance for all ecosystem players.

Regardless of the identified benefits and the possible role of the Post in facilitating cross-border tax exemptions, the creation of a DLT solution in this area would not bring benefits to the Post as a whole. As the tax regulatory frameworks of single countries have to be taken into account, it could be hard to create a single solution that could be shared between Posts as different countries and regions have different tax exemption regulations that would need to be accounted for.

Furthermore, a successful product would require the full cooperation of regulators and trading authorities within a country and would not have specific benefits from the consumer's point of view.



Digital post office box

The president of Korea Post, Mr Seong Ju Kang, proposed three use cases where DLTs could be of use for the postal sector, one of which was the creation of a digital post office box.

A digital post office box using DLTs would be accessible to users via a mobile app. An account could be created by linking it to a physical address where users could easily access the delivery status of online and offline letter-post and packages and access digital letters.

A solution in this area would prevent the modification of documents and allow for the online delivery of official mail (Kang, 2019). This is especially important for government documents, announcements and the authentication thereof, especially if a country has a high level of spam and fake mail.

In this way, users would benefit from having all important documentation and official communication bundled in a single rather than multiple platforms and would not need to have physical documents that could be misplaced. Fewer users would also become victims of spamming or phishing owing to the increased layers of cybersecurity.

There is increasing demand for products that ensure the confidentiality of personal information, but there are existing solutions that could tackle this issue. There are government platforms that offer this service without the need to use DLTs.

Therefore, **building a DLT platform would require an investment that is not likely to result in a significant return for Posts to build a viable use case for a decentralized solution.**

Reverse logistics for returns

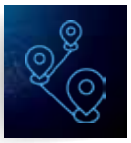
With the increasing use of e-commerce channels, (cross-border) returns are becoming an increasing burden for both private organizations and Posts. It is estimated that around 30 percent of consumers are over-purchasing on purpose and thus return products (Charlton, 2021). The growth of e-commerce, especially in developing countries, is increasing the cost of reverse logistics for companies and the associated costs now stand at around 750 billion USD a year (Donekal, 2019).

Postal stakeholders, from primary interviews, have been looking into how DLTs could be of extensive use for this use case. Posts are expecting the number of returns to continue to riseover the next decade and are even looking into expanding the use case to learn more about the bigger supply chain and increase the transparency of the life cycle of the products they send. Their aim is to understand and assess possible risks at origin.

DLTs could help Posts easily identify where there is a transfer of ownership in the case of e-commerce.

This is important in order to keep track of any changes of custody, as in the case where a company sends a customer's order but includes a pre-filled label for the customer to be able to return the package by post. In this case, it may not always be clear for a Post who is the sender or what the transfer of ownership looks like.

A DLT solution would increase information transparency and reduce the time spent linking a package to a previous order. In turn, costs on reverse logistics and returns would also decrease by streamlining processes and making information accessible throughout the platform.



Track and trace

The market size for track and trace solutions was valued at 2.5 billion USD in 2020 and is expected to continue to grow at a compound annual growth rate (CAGR) of 19% until 2028 (Grand View Research, 2021). Other estimates suggest that the use of DLTs for this purpose could help boost global GDP by 962 billion USD by 2030 (PwC, 2020).

The main benefit in using DLT solutions is transparency, which comes about from enabling a single source of truth that reduces the amount of time, and thus costs, spent on dispute management. Information can be automatically logged by using oracles to further decrease possible keying of incorrect data.

Three UN entities have already created pilots focusing on the traceability of commodities using blockchain. UNDP Ecuador tracked cocoa in the form of chocolate bars from farmer to consumer. A digital token was created per individual bar, which had an associated monetary value that consumers could decide to redeem for a discount on their next purchase or to donate to the original farmer for reinvestment in the production process (JIU, 2020).

FAO and the ITU partnered to track livestock data for pig farmers in Papua New Guinea. This solution was created to provide consumers with the necessary information and transparency to increase their confidence in pig products, thereby increasing consumer trust and allowing farmers to earn a higher return on their breeding and animal welfare investments (JIU, 2020).

In the logistics industry, DHL and Accenture built a proof of concept on pharmaceutical serialization to trace products back to their manufacturers, verify their authenticity to prevent counterfeiting, and ensure the proper handling of pharmaceuticals. It demonstrated "the effectiveness of blockchain technology in product verification", and its usefulness in capturing all relevant logistics activities related to a product (DHL Trend Research, 2018).

As these examples show, many are already exploring the possibility of DLT applications for this use case.

For Posts to stay relevant in this growing sector, it is important for them to incorporate DLT solutions into their current processes. This would not only allow them to continue to be competitive against other organizations in the postal sector but could also allow them to have access to a new revenue stream if they were to make their solution available to others through open platform integration with ecosystem players.

Although an auditable chain of custody could be attractive, functioning solutions already exist, which do not use DLTs and require a lower initial investment for Posts.

The market for track and trace solutions is increasing and there is growing demand for innovative solutions in this area. Products for this use case have become increasingly popular and are paving the way for a long-term market trend that Posts could capitalize on as an additional revenue stream.

POTENTIAL DLT USE CASES FOR INCLUSIVE POSTAL FINANCIAL SERVICES

Introduction

Postal financial inclusion covers the provision of financial services by postal operators to underbanked and unbanked populations. As discussed in the UPU's Global Panorama on Postal Financial Inclusion (2013), Posts play an important role in financial inclusion and have been helping governments progress in this area since the 1960s.

We have identified five broad benefits that the use of DLTs could bring for financial inclusion by:

Reducing the settlement time and enabling a trusted network;

Improving error handling and saving time and costs associated with rework;

Supporting smart transactions;

Reducing costs through efficiency gains and lower transaction costs; and

Securing a decentralized and distributed transaction ledger database (Cognizant, 2016).

Simply by reducing the layers of intermediaries linked to cross-border payments, securities trading and regulatory compliance, companies could potentially save a total of 15 to 20 billion USD per year by 2022 (Santander InnoVentures, 2015).

As financial services continue to innovate and become digitized, it is important for Posts to continue to develop in such a way that they can benefit from providing services at scale while decreasing costs. To remain competitive, postal operators need to continue to work towards digitizing their operations as financial service providers.

In primary stakeholder interviews, postal stakeholders have recognized the need for a digital platform that would help reduce expenses associated with in-person interactions.

DLTs bring about interesting use cases for countries such as the United States of America, where inter-state process transparency and communication play an important role. With states within a federation acting as independent bodies, DLTs could bring value by providing a single standardized platform for information sharing on documentation regarding postal financial services.

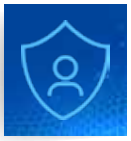
Based on research and primary stakeholder interviews, a total of seven use cases where DLTs could have an impact on inclusive postal financial services have been selected and summarized in table 4 below.

These seven potential use cases (Table 4) are explored in the following pages. Details of the selection criteria used to arrive at this long list is presented in Appendix E.

Table 4: **Long list of use cases in the domain area of postal financial inclusion**

Use case	Objective	Main value
(Collective) insurance	Lower the fees on insurance for a group of people living in the same area and trigger automatic payments.	Increase exposure to insurance for people who would not otherwise be able to apply or pay for one (e.g., small farmers for drought insurance).
Digital wallet	Increase convenience in payments and monitor spending.	Individuals can easily check their funds, open savings accounts and track their spending.
Identity management	Provide individuals with an accessible single digital identity acceptable to a broad range of service providers.	Reduced costs for identification processes, lower identity fraud and better user experience.
Managing direct cash transfer projects	Monitor the proper spending of vouchers given to people participating in cash transfer programmes (both conditional and unconditional).	Quick and easy delivery of (e-)vouchers to recipients while validating their proper and single use in participating stores (unless unconditional in nature).
P2G payments	Ease P2G payments and/or proof thereof such as in tax payments and fine settlements.	Enable residents to make payments or provide proof of payment to the government either through a digital wallet or by going to the nearest post office.
Remittances	Lower fees and more accessibility to remittances by leveraging the Post's network.	Instantaneous domestic and international remittances, even for smaller values.
Transaction information management	Access near real-time information on customer transactions for the monitoring of cash availability.	Reduce operational risk, ensure better customer experience, and prevent cash shortages at postal offices offering financial services.

Source: Deloitte research, UPU focus group discussion, primary interviews (2021)



(Collective) insurance

Both iterations of the Global Panorama for Postal Financial Inclusion (2013 and 2016) recognize that out of five possible business models for postal financial services, insurance could play a big role in three of them. The authors mention how these insurance services could be offered either independently by Posts or through a partnership. In such a partnership, the Post would collect premiums and be the point of contact on disbursement claims and benefit payouts or, through a partnership with an insurance company, offer its own insurance products by being fully responsible for the operations and product development (UPU, 2016).

Posts could leverage DLTs to obtain data from oracles to automatically gather information that is external to the ledger. Oracles provide smart contracts with access to information outside the ledger by sending and verifying external information that could be obtained from, for example, sensors. This would be especially useful if Posts offer automatic insurance services based on occurrences. For example, to offer small farmers the possibility of participating in an insurance scheme that protects them against drought or heavy rainfall.

An example of a solution exploring the provision of insurance based on the amount of rainfall in a (micro) region was provided by Allianz Risk Transfer and Nephila, which successfully piloted with blockchain for catastrophe insurance, placing a focus on the simplification of transactional processing and settlement (Sylvester, 2019).

If Posts decide to focus on insurance with the use of oracles, they need to ensure they are getting the right data and that the devices used cannot be tampered with when using a solution depending on data collected from third parties or devices outside the ledger. Oracles are considered a weak link in the blockchain as they are not completely secure or reliable in that they could provide faulty data owing to malfunctioning or damage (Sylvester, 2019).

In addition to a potential large initial investment to obtain reliable oracles, a pilot on the use of DLTs in agricultural micro-insurance, carried out by ICS, Agrics and EARS, showed that in view of the high investment requirements, there is little opportunity for significant cost reduction (Sylvester, 2019).

Consequently, given the focus on reduction of costs and the fact that the majority of Posts do not offer insurance services, a DLT-based insurance solution would represent a high investment with a small potential for impact.

Digital wallet

In a study carried out in Kenya by Tavneet Suri, an economist at the MIT, showed that access to mobile-money services has increased the per capita consumption levels of 194,000 (or 2%) of households since 2008, enabling them to improve their living conditions and escape extreme poverty. Additionally, this study highlights the side effect on improved gender equality, as consumption increased more in female-led households than in male-led ones (Suri & Jack, 2016).

The increasing use of mobile and smartphones has opened opportunities for the use of mobile financial services provided by Posts to increase accessibility to financial solutions to unbanked and underbanked populations through a digital wallet using a DLT solution.

A digital wallet, also known as an e-wallet, is an online service which provides users with the opportunity to make electronic transactions with another party, often using a digital currency to represent the value of the transaction and store it.

Digital wallets may support digital transactions involving identity data (similar to how physical wallets store identity and membership cards) or grant access to more advanced digital financial products, such as lending, borrowing, stocks, cryptocurrencies or CBDCs[2].

An example of the use of a DLT-based digital wallet by a Post is the eDinar. The Tunisian Post, in partnership with a Swiss FinTech company in 2015, created the eDinar wallet to provide users with mobile and physical prepaid smart cards without the need to open a bank account first. The eDinar is pegged to the national currency and allows for interoperability between various players, including telecom providers; however, this solution is currently mainly used as a notarial mechanism instead of a conventional cryptocurrency (Khan, 2019).

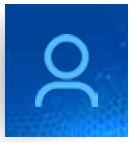
Other Posts could benefit from either creating their own digital wallet or partnering with other FinTechs to do so, as payment services are already one of the most widely offered services by Posts with about 1.5 billion people benefiting from them (UPU, 2016).

There are three main ways Posts could benefit from using a digital wallet:

- Reduce identity fraud in payments;
- Reduce the costs and time needed for international payments; and
- Improve cybersecurity against hackers.

Posts could **explore the use of digital wallets as a bridge for other financial service payments (domestic and international), access to savings accounts and collecting allowances.** By linking each wallet to a single person and their identity, Posts would ensure that identity fraud is prevented, and that know-your-customer (KYC) and anti-money laundering (AML) laws are observed.

Digital wallets also enable mobile payments, which DLTs have proven to facilitate by reducing transfer costs and allowing near-instantaneous transfers between digital wallets.



Identity management

A lack of personal identification documents has been recognized as the main factor hindering financial inclusion (Chidepatil & Sankaran, 2020). According to the World Bank, almost one billion people do not have any form of official proof of identity or a way of showing that they are who they say they are (Metz & Clark, 2019). The lack of a solution for the proper monitoring and verification of official documents results in increased identity theft and identity-related crimes.

In terms of its worldwide impact, PwC economists believe that addressing this challenge by using DLTs could help boost global GDP by up to 224 billion USD (PwC, 2020).

For this use case, DLT solutions have been perceived to bring value in the areas of identity verification and management (Accenture Post and Parcel, 2018), and as a registry that could be used by governments and public institutions (UN Innovation Network, 2020). DLTs could be recognized as an expansion of in-person proofing services, as can be observed in the example of e-Estonia.

2 Central bank digital currencies (CBDCs) are the virtual/digital token form of a fiat currency issued by a sovereign government.

A case in point is the Dublin-based AID:Tech, which partnered with the Irish Red Cross and Lebanese humanitarian experts to focus on providing Syrian refugees in and around Tripoli, Lebanon, with a digital identity in December 2015.

Posts could benefit from using a similar system to the one used in the WFP's Building Blocks programme to provide individuals with no previous identification with a digital identity. By linking a digital identity to an individual's biometric information, other organizations wishing to accept the information from a digital identity would be able to trust the data submitted by Posts. This brings an interesting opportunity to provide unbanked and underbanked populations with proof of existence, which can be used to access financial services from multiple providers.

Two countries leading an exploration on this specific use case are Germany and Spain, which recently announced that they would join forces to develop a cross-border, decentralized digital identity ecosystem by using the principles of SSI with the aim of "setting up a cross-border pilot for a European ecosystem of digital identities" (Die Bundesregierung, 2021). The Netherlands and Finland recently announced that they had decided to join this European Decentralized Identity Alliance, and several other European countries are also considering joining it.

Thus, Posts could consider how the principles used in DLT-based identity management solutions could be transferred to other digital solutions. This could be an alternative to creating a DLT solution from scratch if the investment required is deemed too high.

Posts could play a crucial role in providing individuals, especially those from remote areas, with secure proof of identity. A DLT-based identity management solution would be able to empower people by:

Facilitating the sharing of credentials instead of personal data;

Creating a more robust platform against more sophisticated cyber-attacks;

Reducing the time required for identification and validation processes (thereby also reducing the associated costs for Posts); and

Building a better user experience by providing users with more control.

Posts would then be able to prevent siloed information and double bookkeeping. **As trusted organizations, Posts would be able to verify information and share it with others while providing organizations with a recognized audit trail allowing fraudulent activities to be tracked.**

The benefits of this use case would also extend to the domain area of postal logistics if the platform's functionalities were to be extended to this use. In this way, Posts would be able to quickly identify customers and link packages to an entity.

Managing direct cash transfer projects

The fourth use case is that of managing direct cash transfer projects with DLTs. An increasing number of vulnerable people are benefiting from humanitarian programmes that use cash-based transfer projects in response to humanitarian crises and climate-related disasters, which means that more money is being distributed to mobile wallets, debit cards and bank accounts (Khan, 2019; Oxfam International, 2021).

A record high of 2.1 billion USD was spent on these types of programmes by the WFP alone, assisting over 28 million people in 67 countries during 2020 (WFP, 2021). This use case could be of interest to Posts, some of which (e.g. Nigeria Post) already play a role as a dedicated cash handling and transfer agent.

Other organizations outside the Post have been piloting blockchain-based solutions in this area and have already achieved positive results (e.g. Oxfam International, UN Women, the WFP, and the International Federation of Red Cross and Red Crescent Societies).

A case in point is the UN Women and WFP Building Blocks platform, which was used to assess how blockchain could provide beneficiaries with increased personal choice and control on spending their cash benefits to cater for individual needs. Through this project, blockchain proved to be a safe and efficient technology whose value proposition can be extended to a range of humanitarian services, such as the provision of aid with unrestricted cash distributions and mobile money in refugee camps.

Furthermore, partnering with UN Women, the new Building Blocks initiative will enable women to withdraw cash at supermarkets in Jordanian refugee camps and, using the

platform, validate transactions and facilitate digital identity management.

Posts could benefit from using a DLT solution by having the ability to audit, and thus play a bigger role in the issuance and distribution of conditional and unconditional cash transfers.

Posts, such as the USPS, with the authority to enter into inter-agency agreements, could play a bigger role in this process and work with the government and NGOs to connect with beneficiaries.

Using their last-mile network, Posts **can play a critical role in facilitating and monitoring the delivery of cash transfers for both conditional and unconditional programmes.** Leveraging the Post's network of distribution points would expedite the issuance of cash transfers to unbanked and underbanked populations, as well as to those without an identification.

The Post could also play a role in validating an individual's identity through, for example, the use of biometrics before delivering the funds. The logging of this information would ensure transparency through the DLT and the ecosystem members.

Government-to-person (G2P) payments (focus on social benefits and allowances)

Various initiatives have looked into finding digital solutions for G2P payments across the globe. At least 55% of Posts already provide government payment services. As such, they are in a unique position to drive a solution in this area by leveraging their network and the trust they enjoy among citizens (UPU, 2016). As of 2019, 108 out of 180 Posts had already acted as cash providers for G2P payments (e.g. Nigeria Post), with some already facilitating government payments of civil servant salaries and pensions (e.g. Egypt Post) (Khan, 2019).

The use of DLTs could bring value in connecting residents with the government through a digital wallet or a postal debit or credit card. The government could benefit from the Post's far-reaching network to connect with residents. Posts could monitor and approve spending through the use of a DLT-enabled platform.

Posts could provide the government with the information required to verify that conditional social benefits and allowances are used for approved services or products. Owing to the high levels of trust that people already have in the Post, participants may be more willing to share this information via a postal DLT platform instead of directly with governments.

However, **it is important to note that a single DLT solution for all Posts may not be feasible as it would need to comply with local regulations.** This necessitates a discussion on common standards and the adoption of an open architecture approach enabling a wide range of authorized institutions to engage with a postal platform.

As part of the previous use case on managing cash transfer projects, the services pertaining to G2P payments could include social projects and allowances. As G2P payments include social benefits, allowances such as government pensions could be disbursed by making use of DLTs. This specific use case is also explored in the previous use case (i.e. "Managing direct cash transfer projects").

Person-to-government (P2G) payments

In reverse, DLT solutions could cover P2G payments, such as taxes, fines and social security contributions. In 2016, the P2G payment landscape was estimated to be worth eight trillion USD, with low- and middle-income countries accounting for around 395 billion USD (GSMA, 2019).

A DLT platform could connect citizens to a government portal, which would enable them to easily and securely transfer funds for, for example, taxes, fines, fees for public goods, or utility payments.

There is also the opportunity to enable residents to provide proof of payment digitally. In this way, there would be an auditable record of payments. Part of the process could be automated by using smart contracts. These check that the necessary information is available in the ledger before updating the status of the transaction.

No DLT solution has been explored for a P2G use case thus far, although it is considered a viable product in the long run.

However, in terms of market share and value, it would **require a high initial investment by Posts before it could become viable as a solution.** Moreover, a single standardized solution is not very likely as it would need to comply with local regulations and adapt to the needs of the government. Therefore, we do not find this a particularly useful or compelling use of DLTs for Posts.

Remittances

As part of its financial inclusion programme, the UPU has recognized the use case of remittances as a priority product (Khan, 2019).

Decreasing the cost of remittances is a goal of the SDGs (SDG 10.c.1), where the target is to have an average cost of 3% by 2030. As of 2020, the average cost of remittances was 7.95%. Tanzania (United Rep.) had the highest average cost at 19.73%, and the Russian Federation the lowest with an average cost of 1.94% (World Bank, 2020).

Posts are repeatedly classified as the most affordable channel for international money transfers and an accessible option for many as most of them do not charge customers when processing a cash-out (UPU, 2016). This is also an interesting use case for Posts, as 124 out of 180 of Posts already offer remittance-related products (Khan, 2019).

Even though many Posts offer both domestic and international remittance services, their market share is quickly decreasing as new players, such as FinTechs, enter the market by offering DLT-based remittances. Companies working on this use case include Ripple (in the US and Mexico), Ripio (in Argentina), SureRemit (in Nigeria) and Dash (in Venezuela (Bolivarian Rep.)) (Perlman, 2019).

The main benefits of using a DLT solution in the area of remittances are their ability to make the process more cost and time efficient. A pilot by Ripple showed that by using DLTs costs relating to international remittances decreased. Foreign currency exchange costs dropped by 40 to 70%, and the transfer time decreased to an average time of two minutes (Khan, 2019).

The estimated potential to boost global GDP by using DLTs in remittance services is 433 billion USD by 2030 (PwC, 2020).

Posts could obtain a greater market share in this area and access to higher levels of revenue while providing unbanked and underbanked populations with improved access to remittances. Using a DLT solution would keep Posts competitive and allow them to explore, alongside others, the use of cryptocurrencies for near-real time transactions.

Transaction information management

Lastly, there is the case of transaction information management for the access of near real-time information on customer transactions for the forecasting and monitoring of cash availability for postal financial services.

Using DLT for this use case is not only good for postal operators in a single region or country with a multi-party setup, but also for inter-organizational benefits by allowing the creation of a common platform where beneficiary and entitlement data could be available for all relevant parties.

Such information could provide increased transparency on topics such as accountability on the use of allocated funds (UN Innovation Network, 2020).

As Posts continue their role as cash-in, cash-out (CICO) agents, the availability of cash throughout the network has become a key success factor. It has been recognized that by making post offices part of an electronic network, "cash availability can be monitored, and shortages prevented", which ensures better customer experience and reduces operational risk (UPU, 2016).

Consequently, access to accurate and near-time information that can easily be shared is crucial. **A DLT platform would help increase the levels of transparency within a postal network on the availability of cash and would empower Posts to make better decisions based on forecasts using the same validated data.**

A DLT solution that helps provide near real-time information on customer transactions will avoid double spending of funds and improve forecasts on the required cash availability as, for many Posts, the average time for cash replenishment is too long to ensure customer satisfaction.

Postal stakeholders have recognized the need for a digital platform that would help reduce expenses associated with in-person interactions.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Posts are in a unique position to use digital technologies in the domain areas of postal logistics and postal financial inclusion owing to the reach of their physical network of postal offices and ability to reach out to all levels of the population. In the area of financial inclusion, unlike other financial institutions, Posts can reach the unbanked and underbanked owing to their wide reach and the position of trust they enjoy with society.

In the past five years, Posts have explored the potential use of DLTs in both domain areas to increase transparency, auditability, and efficiency in multi-party processes. Moreover, recent research and pilots carried out by other public and private organizations provide the opportunity to leverage the lessons learned and increase the knowledge available on the use of these technologies.

This study prioritizes four use cases in each domain area. The prioritized use cases were selected based on a score of up to 15 points, five points each for their desirability, viability and feasibility based on desk research and primary postal stakeholder interviews (see appendices).

The four prioritized use cases for the domain area postal logistics include the use of DLT to:

- Increase transparency and security of documentation for Customs and handling;
- Enable better streamlining of information for reverse logistics for returns;
- Improve track and trace solutions with near real-time information; and
- Improve bilateral settlements through crypto stamps.

To achieve the largest impact on financial inclusion, the following four DLT-based use cases are selected in the domain area of postal financial inclusion:

- Implementing a digital wallet;
- Facilitating cost-effective remittances;
- Enabling identity management; and
- Enabling and supporting direct cash transfer programmes.

To stay competitive, Posts need to start exploring how the use of digital technologies, including DLTs, can be leveraged to enable unbanked and underbanked populations to gain access to formal financial services. In addition to the societal purpose of Posts, it is important for them to look into solutions that allow for more cost-efficient processes to create opportunities in new areas and bring about affordable products. This is to maintain product and service costs low and accessible for their customer base while allowing them to increase their revenue and margins and innovate.

DLTs could enable Posts to work together across borders and share information and documentation with other international stakeholders. The value of DLTs lies in their ability to quickly transfer assets and information efficiently. In addition, this technology brings about opportunities for increased transparency while protecting the privacy of individuals.

Although widespread adoption remains to be seen, Posts could play an important role in the exploration and adoption of DLTs for postal logistics and in providing low-cost products for unbanked and underbanked populations.

Alongside technological and process innovations, Posts need to keep a customer-centric focus and account for different levels of digital maturity and literacy within their respective countries and among the populations they serve. To ensure that products are successful and adopted by most of a country's population, Posts need to make sure that a clear and sustainable business case, with a well-defined investment plan, is in place.

To promote innovation for postal logistics and advance financial inclusion and technological innovation, Posts should explore potential partnerships, through which they would be able to share the investment for the development of a solution in the digital financial services space. Posts need to attract and retain strategic talent internally to ensure that the design of the solution takes into consideration the customer and that it is in line with the desired business case. Managerial positions on the product should be filled internally to enable quick decision making and maintain the project on the road envisioned.

In the area of financial inclusion, for Posts to benefit from the full potential that comes from the use of DLTs and stay relevant as providers of financial services, it is important to look into new approaches to providing accessible and suitable products for their customer base. Six key recommendations for Posts and five for regulators are delineated to promote the use of DLTs in the domain area of postal financial logistics.

Key recommendations for Posts

Determine a market-responsive and sustainable business case

Posts need to perform a realistic market assessment to understand what the regulatory constrains are, design a market-responsive solution, and iterate a financially viable business case for a DLT-based solution. To this end, they should focus on solutions that are market responsive while keeping in mind the required investment in order not to depend on external funds. In doing so, Posts can gain an understanding of the estimated impact on core business processes.

The impact can be measured by both progress against the SDG commitments and in terms of how many individuals are affected. Together, these present a strong case for governments and donors to contribute funding and to continue or increase investment in their DOs. A market responsive assessment can present a realistic investment case to governments, donors, and the private sector, including its influence in terms of social impact.

Furthermore, for the case to be considered financially sustainable, Posts should not design products or services that will permanently depend on third parties, external funding, and partnerships in the long term.

Establish an appropriate balance between partnerships and in-house talent

Although it can be challenging to strike the right balance between partnerships and in-house talent, doing so is essential to Posts as many would need to invest a considerable amount to attract and retain the resources required to build a solution on their own. They need to attract the right people to develop and continuously improve DLT solutions, while at the same time making sure that they retain the strategic and decision-making pillars internally.

When prioritizing the necessary in-house skills, strategic capabilities are at the top of the list, especially at the C-suite level. Posts should be able to guide the design of a potential DLT solution based on their vision and talent and have control over the decision-making progress of the solution when working in partnerships.

Moreover, postal employees need to be able to take away user concerns and should be empowered with information and tools to become advocates for the solution. Amongst more vulnerable segments such as the unbanked and underbanked, there is a significantly higher need for personalized customer interaction. Therefore, Posts should invest in internal resources and employee education, both through training and upskilling, to provide services and advice to customers.

DLT solutions are being actively developed and continuously upgraded. Therefore, Posts would need to frequently deal with updates and changes to the system, taking up time from internal talent and resources. This further underscores the lack of local expertise, which has been a major challenge for the ITU in the use of blockchain applications in programme countries. Through partnerships, this challenge may be alleviated by outsourcing the technical capabilities required for the solution.

For developing and emerging countries, finding, and retaining talent capable of developing and upkeeping solutions can be challenging. Therefore, if a Post is either emerging or transitioning, the best way forward is to leverage partnerships with outside organizations or other Posts. However, it remains important to maintain visionaries and strategic talent able to drive vision and make in-house decisions.

Adopt open platforms, encourage interconnectivity and adopt global standards by design

Starting with the design process, Posts need to discuss and incorporate discourse on adopting open platforms, shared standards, interconnectivity, and application programming interfaces (APIs). Especially in the case of DLTs, interoperability is key in designing a successful solution. It is therefore important to partner with the right providers to ensure network effects by offering collective benefits to each partner. Additionally, Posts need to keep in mind all architectural decisions, such as on legacy systems, in order to navigate rapid technological changes and ensure interconnectivity.

For example, Posts should consider tokenization, whereby assets are converted into a token that can be moved, stored, or recorded on a blockchain. To standardize this process, Posts should develop a single token that can be

shared between multiple Posts, streamlining onboarding processes and allowing a single flow of information.

Another method to encourage interconnectivity and standardization can be found in utilizing design principles. For DLT solutions, design principles can be utilized to utilize human-centred design and ensure shared standards.

Especially in the first rollout stages of the product, it may prove useful to be able to connect the DLT product to legacy systems already used by (multiple) postal stakeholders. This could help with the acceptability rates of the products if stakeholders are able to easily use the solution in a "plug and play" format.

Adopt privacy-by-design

Many countries are still trying to figure out how best to regulate DLT-based digital currencies and solutions in terms of user data protection and privacy, which poses challenges for Posts in keeping up with changing regulations. Posts that wish to offer services in the DLT space need to pay attention to current and emerging privacy regulatory frameworks and may require guidance. Often, this might mean building in the agility to respond to regulatory requirements without incurring large capital investments.

Considering the fast-paced developments of new regulations for the use of digital technologies and lack of privacy regulations in many countries, it is pivotal to continuously consider privacy both as an integral part of the project and as a starting point. Instead of waiting on regulations to catch up, Posts should strategize a privacy-by-design approach, which proactively embeds privacy into the design and operation of information systems such as the DLT solutions.

Protecting the user's rights is not only a compliance exercise necessary in countries where privacy regulations such as the GDPR are in place but should be integrated in the design principles of all potential solutions. Additionally, there is a need to account for specific local future regulations to avoid any potential compliancy issues.

When working with DLT solutions, it is important to protect the user's identity in information that is recorded on the ledger. As previously mentioned, the decisions taken on the ownership of private keys could be influenced by the considerations taken for a solution that uses privacy-by-design.

Prioritize user experience and involvement

To avoid creating a solution that is too complicated for most users to understand, Posts need to realize a seamless user experience and ensure high user involvement. This requires in-depth insights into users and their needs, which can be attained by involving them during the planning and development of the solution. Given Posts' omnipresence and trust instated by their users, involvement through constant user testing during the development phase is feasible and assists in creating a market-responsive business case.

However, taking into consideration the specific needs of the unbanked and underbanked, Posts need to account for different levels of literacy and education in the user experience and user interface (UX/UI) design. This can be further supported by supplementing an all-digital experience with a human touch, for instance through the presence of postal workers that can guide users on the use and benefits of the product or service.

Create community awareness to build trust in postal financial services

Posts could encourage the availability of digital and financial literacy education for unbanked and underbanked populations. This can be achieved by supporting financial and digital literacy services for users, for instance by utilizing service centres, where the rural population can access government or NGO programmes.

Posts should advocate research on, and promotion of, digital financial services (DFS) as well as the creation of DLT solutions in financial services. To create community awareness, in-house education for users can help build trust on the different postal services and assist people in their uptake of postal DFS solutions.

Key recommendations for regulators and policymakers

Allow Posts to provide inclusive financial services

For regulators to utilize Posts' potential to reach all levels of the population in the promotion of financial services, especially the unbanked or underbanked, it is critical to allow Posts to perform financial services and facilitate their certification as a financial institution. In doing so, regulators can allow the most vulnerable segments of the population to access financial services by proxy through the Post, which provides those segments with essential financial products and services.

Although there is currently no regulated environment when it comes to providing decentralized finance (DeFi) related services, new regulations could hamper Posts' efforts in exploring and developing products in the DeFi space. For Posts to stay relevant, have a greater impact and continue to investigate how the use of DLTs and other digital technologies can be used to better serve their customer base, new regulatory frameworks should account for the use of decentralized solutions.

The universal service obligation (USO), which ensures that consumers have access to services with a defined minimum quality and accessible prices, is currently only applicable to postal logistics services. **Customers would benefit if the USO were to be extended to the domain area of postal financial services.**

Build DLT-specific frameworks as part of regulations

Many governments are lagging in the integration of DLTs into their regulations and are often sceptical of their capabilities. This is reflected in what was expressed by the UPU in an earlier study, in which it was noted that governments "knew little about the subject" and that it would be difficult to convince governments to embrace the technology (UPU, 2019). To align regulation with the most recent innovations, DLT-specific frameworks should become an integral part of digital and privacy regulations. To do so requires regulators to increase their awareness and understanding of DLT solutions and DLT-specific scenarios with a regional and country focus and special focus on data protection.

Regulators should encourage and integrate the usage of DLT solutions and other technologies in the financial sector by providing timely and relevant regulation in which DLTs are recognized as legally enforceable contracts. For example, allowing a DLT-specific regulatory regime in one country allows token-based financial instruments to be integrated in the financial systems, after which DLT finance can be expanded in other regions.

To make the market more competitive and facilitate the comparison of services for customers, regulators should ensure transparency on transaction and financial service costs. Such cost disclosure principles could play an important role in customer protection regulations and possibly lead to a lower barrier for market entry and increased competition, resulting in lower prices.

Create a sandbox environment for innovation and promote collaboration

Regulatory sandboxes, incubators, and playgrounds can help overcome this scepticism by allowing organizations to experiment in a safe and isolated environment. By providing a secure environment, users can gain confidence, increase understanding, and harmlessly make and learn from mistakes. Such an environment can help establish trust in the first stages of a project, thereby legitimizing DLT solutions, as the impact of rejection is both reduced and made significantly less potent.

Regulators could create an environment and a regulatory regime that allows Posts to create experimentation environments. Collaboration with stakeholders, public and private organizations would enable the providers of the experimentation environment, in this case the government (which is not actively part of the solution), to learn about the technology and its potential benefits.

Encourate open platforms, standards and use of APIs

Regulators could aim to work with open platforms, standards, and APIs, which can assist in eliminating barriers, improving interconnectivity standards, promoting innovation, and streamlining operations.

An interesting example for regulators to follow is that of the JAM trinity, a financial inclusion initiative introduced by the Government of India in 2015. This project uses open API methodology to link various financial accounts and mobile numbers. In this manner, subsidies could be directly transferred to intended beneficiaries, thereby avoiding intermediaries and leakages (Abdalmuttakeb & Al-Sartawi, 2021).

Another example is provided by India Stack, which consists of the largest open API in the world, which allows developers, businesses, and governments to utilize its digital infrastructure to promote remote, paperless and cashless service delivery. Its implementation is deployed in stages, and allows citizens to store and share personal data (e.g. tax filings, bank statements, employment records) (Garret, 2017).

Moreover, regulators need to consider interoperability standards for DLT-based solutions. For DLT solutions to be easily adopted by many organizations, a minimum set of standards should be in place to help guide their design and promote their use.

Encourage research and promote innovation using DLTs

For Posts to succeed, it is essential to facilitate, enhance and promote research in DLT solutions and innovation. To accomplish this, government bodies can provide grants or other incentives for research. Given the potential of DLTs and Posts' unique position to reach all levels of the population, such grants can not only create huge societal benefits for people and businesses, but also introduce regulators to new opportunities in finance utilizing digital technologies.

Other methods of advancing the promotion of DLTs include the organization of hackathons and accelerators. Such events can simultaneously contribute to discovering talent and promoting solutions that focus on serving vulnerable groups within the population.

Customers could greatly benefit if the Universal Service Obligation is extended to include postal financial services.


In the area of financial inclusion, for Posts to benefit from the full potential that comes from the use of DLTs and stay relevant as providers of financial services, it is important to look into new approaches to providing accessible and suitable products for their customer base.

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APPENDICES

Appendix A: List of definitions

51 percent attack: The intentional building of a new longest chain by replacing previous transactions in the blockchain, where the consensus protocol requires the majority to agree on a new block.

Blockchain: Type of DLT, where data is saved in a chain of consecutive and chronological blocks where transactions are cryptographically secured and then saved.

CBDC: A type of stablecoin that is issued and supplied by a country's central bank, most commonly pegged to the national currency as a form of digital cash.

Chain reorganization: When two blocks in a blockchain have created a new block at the same time and the nodes need to agree which information will be included in order to avoid discrepancies between the nodes and the information they have.

Consensus protocol: Pre-determined agreement rules to be followed by nodes to confirm the validity of a transaction.

Cryptos: Digital medium of exchange representing an asset stored in a DLT.

Cryptocurrencies: Digital currencies stored as a token in a DLT.

DLT: Network protocol where data is saved in chronological digital records within a ledger, which is then shared with (i.e. distributed to) everyone who has permission to access it in the network (i.e. nodes).

FinTech: The use of new technologies to create new or enhanced products and services in the financial industry.

Fungible token: Digital assets stored in a DLT, the value and functionality of which are equal to each other and can be fractionalized.

NFC: Process by which devices (e.g. smartphones, sensors) can share information between each other through contactless communication.

NFT: Digital assets that are unique in nature, cannot be fractionalized, and are not compatible with other NFTs.

Oracle: Information source that verifies and sends external occurrences to store relevant data in the ledger and trigger smart contracts.

Postal financial inclusion: Process by which individuals and organizations excluded from the formal financial system are provided with financial services through the Post.

Postal logistics: Process by which both individuals and organizations utilize the postal network to send and receive letter-post and parcels.

Smart contract: Piece of code within the blockchain that enables programmable and automatic transactions based on a predefined set of conditions and rules for its execution.

SSI: Digital movement that seeks to give individuals full control of their digital identities and digital personal information.

Stablecoin: Type of cryptocurrency that offers less volatility in its price by pegging the value of the token to another "stable" and popular currency (e.g. US dollar).

Unbanked population: Individuals who do not use or have access to any form of financial services (e.g. having a savings account, debit card, access to loans or a checking account).

Underbanked population: Individuals who do have a formal bank account but rely on other informal financial services owing to the lack of convenient access and affordability of formal financial services such as traditional loans and credit cards.

Appendix B: **Most promising DLT use cases for the postal sector**

Use case prioritization criteria

The desirability, viability, and feasibility framework is a guide to test the demand, value and fit of a solution in order to investigate whether the selected use cases can and should be pursued. Therefore, this guiding framework can help provide insights based on which use cases should be selected for further analysis and which key success criteria are required for piloting. Each use case has been scored out of 15 points, where five points could be allocated as a maximum for each of the three framework lenses.

The first lens in the framework, desirability, examines the potential demand for a solution by considering its value proposition based on the possible key benefits, the identification of barriers and the problem being addressed. Use cases are scored on how well they meet customer needs according to current available solutions and, on their ability, to generate new opportunities for Posts instead of simply digitizing current processes and activities. Those use cases that bring clear value in the short to medium term and tap into an unmet need for customers scored higher in this category.

The next category to be analysed is viability, which looks into the economic value that a solution can bring in terms of its costs and benefits, taking into account both qualitative and quantitative value drivers. Looking into the competitive advantage that Posts could get over other players in similar industries plays a big role here, as well as the overall market growth and possible development for each use case. Notwithstanding the possibility of a sizeable and addressable market, similar solutions or pilots provided by other organizations in similar industries are considered. Use cases that have more impact on Posts and their stakeholders as well as clear value drivers scored higher.

The third and last lens is feasibility, which focuses on the practicality of a use case. It looks into the technical feasibility of a potential solution, the possible risks according to challenges that have already been faced by others, and some of the success criteria for the future assessment and accomplishment of a pilot.

Moreover, when looking into how feasible a solution would be in terms of a Post's ability to fulfil the pilot by itself in the short and medium term, the number of ecosystem players (e.g. involvement of the government and regulators) as well as the technological maturity of a country were also considered and weighted. In this instance, use cases where Posts would not need to coordinate activities with various stakeholders and where standardized solutions would be a possibility for various Posts have a higher score.

Example questions that guided the research and rationale for each of the use cases according to the three framework lenses and details on each use case's criteria can be found here.

Assessing and prioritizing use cases of DLTs in postal logistics

The top four use cases are considered as priority use cases for this study. After scoring the use cases based on the current maturity of Posts and DLT solutions and listing them in order according to the number of points scored and their impact, the complete list of use cases and their respective scoring can be found in table 5.

Table 5: **Prioritized list of use cases for the domain area of postal logistics**

Use case	Objective	Desirability	Viability	Feasibility	Total
Customs and handling	Accelerate customs and cross-border document and information flows.	5	5	4	14
Reverse logistics for returns	Decrease the time and effort spent on reverse logistics processes, especially e-commerce.	4	3	5	12
Track and trace	Increase transparency between partners sending and receiving mail.	3	5	3	11
Crypto stamps	Automate bilateral postal settlements, keep reliable track of data regarding shipments and mailing history.	3	3	3	9
Certificates of origin	Have a common digital platform for the creation and validation of certificates of origin.	3	2	4	9
Digital post office box	Ensure reliability for digital documents and increase convenience in mail delivery and document verification.	1	2	2	5

Source: Deloitte research, UPU focus groups. For more information for the scoring of each use case, please refer to the Appendix.

The four use cases stand out in terms of their desirability, viability and feasibility, namely: 1) Customs and handling; 2) reverse logistics for returns, 3) track and trace solutions; and 4) crypto stamps.

Assessing and prioritizing use cases of DLTs in postal financial inclusion

As can be seen in table 6, use cases in this domain area tend to score higher than those for postal logistics, mainly owing to higher scores in the desirability category. Just as with the use cases identified for the domain area of postal logistics, the top four use cases are chosen for the short list of prioritized use cases.

Table 6: **Prioritized list of use cases for the domain area of postal financial inclusion**

Use case	Objective	Desirability	Viability	Feasibility	Total
Digital wallet	Increase convenience in payments and monitor spending.	5	4	5	14
Remittances	Lower remittance fees and more accessibility to remittances by leveraging the Post's network.	5	4	5	14
Identity man-agement	Provide individuals with an accessible single digital identity accepted by a broad range of service providers.	5	5	4	14
Managing direct cash transfer projects	Monitor the proper spending of vouchers given to people participating in cash transfer programmes (both conditional and unconditional).	5	5	4	14
Transaction information management	Access near real-time information on customer transactions for the monitoring of cash availability.	4	5	4	9
P2G payments	Ease P2G payments and/or proof thereof such as in tax payments and fine settlements.	4	2	3	9
(Collective) insurance	Lower the insurance fees for a group of people living in the same area and trigger automatic payments.	2	3	2	7

Source: Deloitte research, UPU focus groups. For more information for the scoring of each use case, please refer to the Appendix.

Interestingly, all top four use cases scored a total of 14 points: 1) remittances; 2) identity management; 3) digital wallet; and 4) managing direct cash transfer projects.

Appendix C: **Scoring criteria per use case using the desirability, viability, and feasibility framework**

Criteria	Maximum score	Example questions for rationale
Desirability	5	Are the unmet needs in this area sufficiently important to solve?
		Does this use case solve an existing problem?
		Will this use case increase the current value offering given to the Post's customers?
		To what extent would this use case bring about new opportunities for the Post instead of "blockchaining" existing processes?
		Is the use of DLTs increasing effectiveness, or simply efficiency?
Viability	5	Is there a sizeable, addressable market?
		Are Posts or other organizations in a similar industry already working on a similar solution?
		What is the level of impact in terms of people who would be exposed to the use case?
		Are the value drivers of this use case clear?
Feasibility	5	What infrastructure and technological maturity level do Posts need to have to succeed with this use case?
		How many ecosystem players would need to be onboarded? Would a consortium be created?
		Is the solution technically feasible?

Appendix D: **Scoring criteria per postal logistics use case**

Use case 1: **Customs and handling**

Criteria	Score	Rationale
Desirability	5	The UPU has mentioned that the use case of facilitation of cross-border letter-post and parcel-post exchanges through digital authentication is one of the most pressing use cases.
		The USPS has expressed its interest in exploring blockchain to speed up (international) shipments.
		Many Posts and organizations in similar industries have shown explicit interest in this use case.
Viability	5	Egypt Post's logistics centre at Cairo Airport has looked into blockchain as a way of speeding up Customs and handling.
		Covantis, a blockchain supply chain orchestration platform for international trade, believes that the solution can increase the transaction speed by up to 70%, cut error rates by 80%, and reduce data rekeying by 90% (Kiernan-Stone, 2019).
		"The cost of the required trade documentation is estimated to reach one-fifth of the actual physical transportation costs" (White, 2020).
		The WFP worked on this use case in the supply chain between Djibouti and Ethiopia. It is estimated that the shipping times have decreased from 15–20 days to only 3–5 days as a result.
Feasibility	4	This use case would require a single, standardized platform that can be used by postal offices and countries.
		Storage of certificates and parcel or letter documentation will need to be available to regulators (e.g. border control, Customs) and multiple parties would need to be involved.

Use case 2: **Reverse logistics for returns**

Criteria	Score	Rationale
Desirability	4	This use case would also support warranty management and product authentication.
		With e-commerce, which continues to rise (especially in developed countries), 30% of shoppers over-purchase on purpose and thus return products (Charlton, 2020).
		73% of shoppers would like to return online purchases through post offices as these are seen as being conveniently located (Charlton, 2020).
Viability	3	"Reverse logistics cost companies nearly 750 billion USD a year" (Donekal, 2019), a number that keeps increasing with the growth of e-commerce (especially in developed countries).
		So far, it does not appear that any company or organization has conducted a pilot with this use case.
Feasibility	5	No need to include regulators.
		A standardized solution could be used by multiple Posts and other stakeholders.
		DLT solutions could extract information from the current systems to prevent errors from manual data entry.

Use case 4: **Crypto stamps**

Criteria	Score	Rationale
Desirability	3	Existing bilateral postal settlement solutions mostly comprise manual counting of stamps. The efficiency of this process could be significantly enhanced by using crypto stamps.
		Crypto stamps enable digital integration of data recording of shipments (e.g. mailing history of a package) while ensuring the privacy of the sender and recipient through cryptographic certification (Apex Insights, 2021).
Viability	3	The USPS started using the CaseMail NFT postage labels in 2021, enabling the aforementioned digital data recording (Apex Insights, 2021).
		Crypto stamps have been introduced in several countries (e.g. Austria, Croatia), but mainly as collectibles. There has been no communication between countries for bilateral postal settlements to date (Hrvatska Posta, 2020; Österreichische Ost, 2021).
		Relatively unattractive from a consumer point of view owing to poor familiarity with DLT and bilateral settlements.
Feasibility	3	Automated bilateral postal settlements require a critical mass of countries to adopt crypto stamps for the proposed system to work, which is somewhat unlikely owing to coordination issues and significant gaps in the postal technological progress of different countries.
		Using crypto stamps domestically for data recording purposes is, however, feasible (as shown by the Austrian Post, which carried out this project in collaboration with a blockchain consultancy) (Österreichische Post, 2021).

Use case 5: **Certificates of origin**

Criteria	Score	Rationale
Desirability	3	The UPU has indicated that the issuance of certificates of origin for postal items is a priority use case.
		Obtaining a certificate of origin is currently highly time-consuming as numerous documents and much information need to be collected before goods are transported across borders.
		Given the current solutions, the demand for a new product would not be significant.
Viability	2	Some governments (e.g. India) already have a common digital platform for the issuance of certificates of origin without using blockchain, while in other countries this is still a manual and time-consuming process for original certificates (e.g. the Netherlands). The World Chambers Federation (WCF) of the International Chamber of Commerce (ICC) already has a certificate of origin verification website.
Feasibility	4	The ICC released the International Certificate of Origin Guidelines to encourage standardization.
		Certificates should be accessible and verified by various parties (e.g. Customs, chambers of commerce, banks, traders).
		The ICC WCF Certificate of Origin Accreditation Chain promotes universal certification standards, which would help member countries in developing a standardized solution.

Use case 6: **Certificates of origin**

Criteria	Score	Rationale
Desirability	1	This solution does not seem to bring much value to customers, most of whom already have both physical and virtual channels to receive personal information and mails.
		There is increasing demand for products that ensure the confidentiality of personal information, but solutions to tackle this issue are already in place.
Viability	2	Some government platforms already offer this service without using DLTs.
		Building a DLT platform would require an investment that does not result in a significant return to build a viable use case.
Feasibility	2	Need to align with each country's government in order to allow for the verification of digital documents.
		Would require a higher initial investment if an external blockchain platform was not used (owing to privacy concerns and risks).

Appendix E: **Scoring criteria per postal financial inclusion use case**

Use case 1: **Digital wallet**

Criteria	Score	Rationale
Desirability	5	A digital wallet could be used for stable coins pegged to a country's currency, a CBDC for those countries where they are being piloted, savings accounts, cash transfers, etc.
		El Salvador has authorized bitcoin as an official currency and hopes to achieve higher levels of financial inclusion by providing a digital wallet to all its citizens.
		A digital wallet could be combined with other use cases, making it the most versatile use case (e.g. G2P payments, P2G payments, cash-based transfer programmes, identity management).
Viability	4	The Tunisian Post's eDinar (in partnership with a Swiss FinTech), which provides users with a digital wallet and a physical prepaid smart card without having to open a bank account. However, this is being used more as a notary mechanism rather than as a true cryptocurrency. The EU has announced that it is working on a bloc-wide (non-DLT) digital wallet that would "allow citizens from all 27 countries to log into local government websites or pay utility bills using a single recognized identity" (Irish Times, 2021).
Feasibility	5	Need to comply with local regulations, thus a single solution may not be feasible for multiple Posts.
		A digital wallet may be developed and owned by the Post. There is also the possibility of partnering with other organizations to create a feasible product that would not require a high initial investment.

Use case 2: **Remittances**

Criteria	Score	Rationale
Desirability	5	"The World Bank estimates that the current average cost of remittances is around 7%, which is much higher than the 3% target set in the SDGs for 2030" (Khan, 2019).
		A pilot by the FinTech Ripple on remittances from the US to Mexico showed that the use of cryptocurrencies would finalize the transfer in about two minutes and reduce exchange costs by 40 to 70%.
		"The UPU is focusing on remittances as a priority product as part of its financial inclusion programme, and as part of its priority policy for postal services development" (Khan, 2019).
Viability	4	Various FinTechs (e.g. Ripple, Ripio, SureRemt, Dash) are already looking at the use case of remittances using DLT solutions such as blockchain.
		"Postal operators are repeatedly classified as the most affordable channel for sending money internationally, well in front of banks and slightly ahead of MTOs" (UPU, 2016).
		"80% of Posts provide international remittance services" (UPU, 2016), but their market share is decreasing as new players, such as FinTechs, are also focusing on this use case.
Feasibility	5	Posts could decide to partner with a local start up or FinTechs to use their technology instead of investing in a new one from scratch.
		There is no need to include regulators, at least not for the moment.
		If a solution is created from scratch, it would be possible to share it with, or even rent it out to, other Posts in order to have a standardized solution.

Use case 3: **Identity management**

Criteria	Score	Rationale
Desirability	5	It is estimated that "40% of consumers across the world have been targets of ID theft at least once", that "1.3 million children have their identities stolen every year", and that "the global average cost per data breach incident rose to 3.86 million USD in 2018" (SafeAtLast, 2020).
		In 2018, the World Bank estimated that around one billion people did not have proof of identity (Desai et al., 2018).
Viability	5	Estonia has been working on an e-identity using blockchain that will help people authenticate themselves without physical contact with an ID card, mobile ID, e-residency or smart ID.
		In Australia alone, "by addressing the gaps in the current system, up to 11 billion USD could be saved through reduced fraud costs and improved consumer experience" (Australia Post, 2016).
		Dublin-based AID:Tech partnered with the Irish Red Cross and Lebanese humanitarian experts to focus on providing Syrian war refugees in and around Tripoli with an identity.
Feasibility	4	Posts can partner with external organizations to quickly access a platform and the related technology instead of building it from scratch.
		Close collaboration with governments, which must agree to recognize the relevant data of others without owning it.

Use case 4: **Managing direct cash transfer projects**

Criteria	Score	Rationale
Desirability	5	"Cash-based transfer (CBT) programmes are steadily increasing in the light of humanitarian crises around the world, and transfers are increasingly made to mobile wallets or bank accounts with debit cards" (Khan, 2019).
		"The world's population requiring humanitarian assistance has been growing in recent years due to climate-caused disasters" (Oxfam International, 2021).
		In 2020, 38.4 million people were part of CBT programmes, according to WFP.
		"More than 100 countries have announced plans to scale up social assistance payments".
Viability	5	Some Posts already play a role as a dedicated cash handling and transfer agents (e.g. Nigeria Post).
		Other organizations outside the Post have been piloting blockchain-based solutions in this area (e.g. Oxfam International, UN Women and WFP, and the International Federation of the Red Cross and Red Crescent Societies) with positive results.
		"In 2020, the WFP transferred a record-high 2.1 billion USD of purchasing power to people in 67 countries" (WFP, n.d.).
		Some Posts already collaborate with the government in this sense, as "108 out of the 180 Posts that offer financial services to their clients provide cash agent services for G2P payments" (Khan, 2019).
Feasibility	4	Multiple partners would need to be onboarded.
		Need to consider GDPR and similar regulations when considering storing participants' information or linking it to an external source using identity management (e.g. for biometric authentication, name and date of birth information).

Use case 5: **Transaction information management**

Criteria	Score	Rationale
Desirability	4	"The Post has tried to build on other key success factors, such as good cash availability throughout its network, which has allowed it to become a super-agent for mobile money operators (MMOs)" (UPU, 2016).
		It has been recognized that by making post offices part of an electronic network, "cash availability can be monitored, and shortages prevented" (UPU, 2016), especially in those areas where the replenishment time exceeds one day.
		"Cash availability is not monitored properly, as a result of which cash shortages can be noticed very late" (UPU, 2016).
Viability	5	In order for postal operators to promote financial inclusion, they need to be able to generate profits and have cash available for transactions at their offices.
		According to the UPU's *Global Panorama on Postal Financial Inclusion* (2016), cash management is "of the utmost importance in ensuring customer satisfaction".
Feasibility	4	There are existing automated cash management systems that could be used alongside a blockchain or DLT solution for near real-time accurate data input for forecasts.
		No need to involve any (additional) regulators or the government if the Post is already offering deposit and withdrawal services.

Use case 6: **People-to-government (P2G) payments**

Criteria	Score	Rationale
Desirability	4	P2G payments cover payments from individuals to the government for taxes, fines, fees for public goods, settlements of outstanding amounts, filing of taxes, utility payments and social benefits, which are services offered in most countries and which would thus bring value to many residents.
		This use case would help gain more efficiencies for all of a country's residents, as has been seen from other digitization projects.
Viability	2	In 2016, the P2G payment landscape was estimated to be worth 8 trillion USD, with low- and middle-income countries alone estimated to be a 395 billion USD opportunity (GSMA, 2019).
		No blockchain or DLT solutions have been explored on this use case to date.
		This use case would be viable in the long run but would require a huge investment in order to work.
Feasibility	3	A single solution for all Posts may not be feasible as it would need to conform with local regulations.
		Need to consider GDPR and similar regulations when considering storing participants' information or linking it to an external source (e.g. for biometric authentication, name and date of birth information).
		Close relation with the government would need to be established for Posts to offer this service.

Use case 7: **(Collective) insurance**

Criteria	Score	Rationale
Desirability	2	Insurance offerings are part of three out of five business models identified for Posts for postal financial services.
		Following a pilot by ICS, Agrics and EARS, "it was eventually recognized that the agricultural micro-insurance value chain as well as the cost of risk that comes with insurance leave too little room for cost reduction, even through the use of ICTs such as distributed ledger technology, smart contracts and mobile money" (Sylvester, 2019).
Viability	3	"30% of Posts provide insurance services. Proportionally, more Posts in developed countries provide insurance (39%) than in developing countries (34%)" (UPU, 2016).
		"Allianz Risk Transfer and Nephila have successfully piloted blockchain technology for catastrophe swap" (Sylvester, 2019).
Feasibility	2	Need to possibly invest in oracles for data gathering, which comes with some security risks in terms of "vulnerabilities in oracles and the smart contracts they link to make results in incorrect payments to farmers or other persons" (Perlman, 2019).
		For this use case, Posts would need to either create a partnership with an insurance company or look into becoming either a postal savings bank or a full-fledged postal bank.

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