GUIDE

DESIGN AND IMPLEMENT A REMITTANCE REPORTING AND ANALYSIS SYSTEM (RRAS)

ENABLING POLICY
AND REGULATION

ACKNOWLEDGMENTS

CONTENTS

GLOSSARY

Application Programming Interface (API) is a connection between computers or between computer programs. It is a type of software interface, offering a service to other pieces of software. In contrast to a user interface, which connects a computer to a person, an application programming interface connects computers or pieces of software.[1]

Aggregated data involves volumes and values of transactions aggregated by one or more attributes. For example, if the value of remittances is reported summarized by the country of origin or by the channel (i.e. bank or money transfer operator). This process would provide a central bank with the ability to analyse the data either by country or by channel but not by both.

Highly disaggregated data refers to data aggregated using multiple combined attributes rather than single attributes. For example, if remittance values and volumes were reported summarized by all of the following: country of origin, channel, currency, sex and location of residence of the sender or recipient. This would, for example, enable a central bank to see how many women, in a certain region, received what total value of remittances from the United States, through a transfer via a commercial bank.

Transaction-level data means every transfer has an individual record or entry in a database, the equivalent of a single row in a spreadsheet.

Reporting entities are any business or institution required to report data to the financial regulator.

Transaction data is data expected to be present within the transfer instruction. This information would include country of origin and destination, entity type (i.e. bank or money transfer operator), the transfer currency and the transfer value.

Supplemental data is data that would not generally be in the transfer instruction. This information could include data on sex or location or purpose of remittance.

Use case describes how a central bank that uses technology will accomplish a goal and achieve the outcome. In this reference guide, the use case refers to the use of technology-enabled systems in remittances reporting, monitoring, management and analysis for informed policymaking by central banks.

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[1]   https://en.wikipedia.org/wiki/API

INTRODUCTION AND BACKGROUND

The financial sector generates an ever-increasing volume of data, especially with the rise of new digital financial tools and instruments. This situation provides a huge opportunity for financial regulators to leverage the data to improve and streamline oversight and inform proportionate and supportive regulation.

Remittances are a vital source of value and foreign currency for many developing economies but are often poorly understood. The data reported to regulators is often gathered through systems that do not prioritize or support detailed analysis of the patterns and human behaviours driving remittance markets. New technology offers opportunities to capture, report, store and analyse more granular data. Systems and processes to capture and analyse transaction-level data address the common challenges of incomplete, infrequent and low-quality data, and offer the potential to capture the data at a more disaggregated level. In turn, this disaggregated data may help create new insights, which can then inform and support:

- more appropriate financial policies and regulations

- wider governmental policymaking in areas such as migration, development, economic sectors, education and labour

- private-sector investment decisions to develop, target and price the appropriate remittance products in the market

However, systems that capture and analyse transaction-level data can be costly in terms of financial investment, time, increased compliance burden for reporting entities, the need for new regulation and reporting standards, and increased requirements for technical capacity (both within regulators and reporting entities). Additionally, costs may include structural and organizational changes to optimize data-driven decision-making.

This guide aims to provide central banks and financial regulators, especially those in environments with limited financial and human resources, a path and tools to explore and define the following:

- use cases and insights most supportive to their needs, most appropriate to their market/economy and most achievable in their operating environment

- available resources

- scope of the reporting and analysis system

- feasibility and value of a system for reporting disaggregated data

- key system-design considerations

The first part of this guide describes UNCDF's **outcome-focused approach**. The second introduces the **nine-step** process, provides practical exercises and describes some of the tools available to central banks.

The following nine steps outline the process for implementing a Remittances Reporting and Analysis System to support and inform data-driven policy and product design. Each of the steps includes key questions and practical exercises.

Exploration of concept and use case development

Data requirements and standards

Resource mapping

System scope

System design considerations and approach

Feasibility

Finalising data requirements and use cases

Thinking about costs

Developing a system model
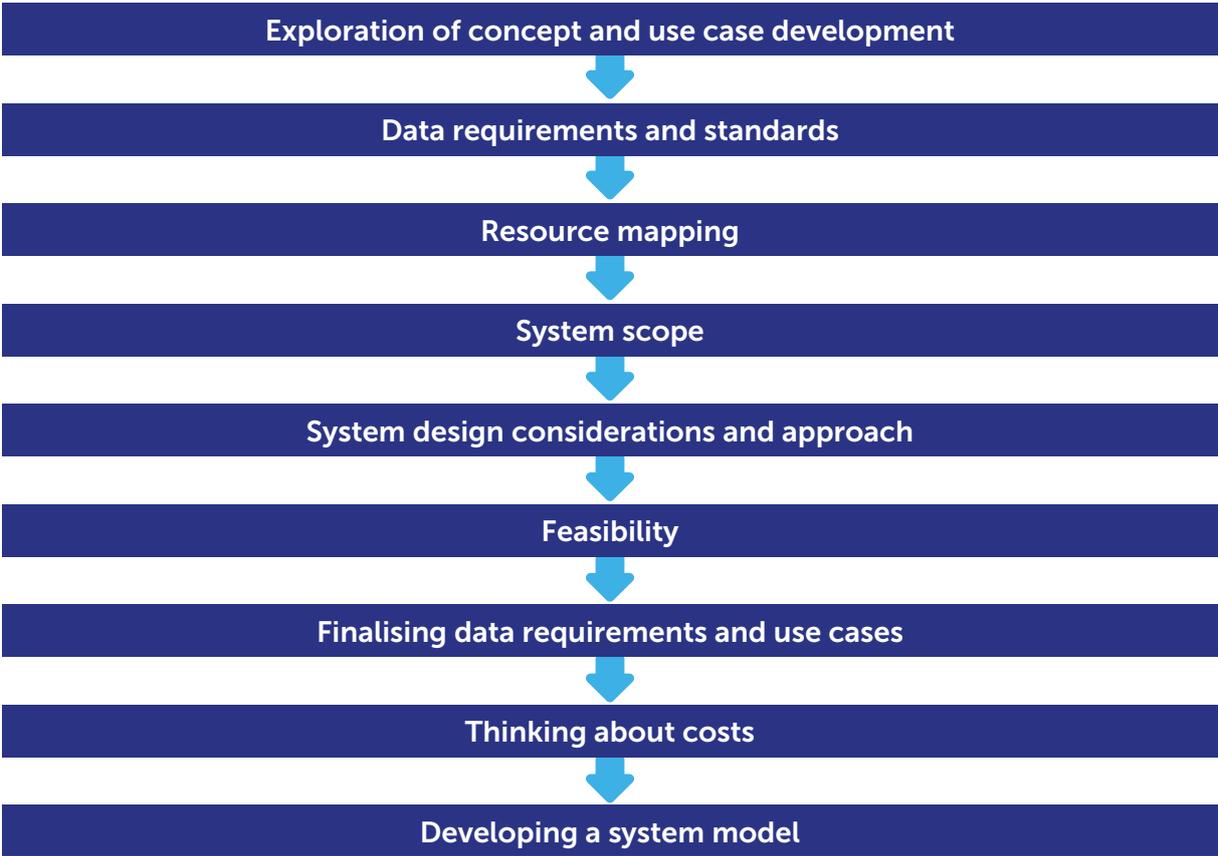
AN OUTCOME-FOCUSED APPROACH

Any system design process that hopes to support data-driven decision-making should begin with a thorough **exploration of the data and use case development**. The purpose of this exercise is to answer the question:

'Who needs to know what?'

This question places the audience at the centre of the design process and ensures a focus on outcomes rather than systems.

	SYSTEM-FOCUSED APPROACH	OUTCOME-FOCUSED APPROACH
Defining question	**How do I build...** e.g. How do I build a system that can...?	**How do I achieve...** e.g. how do I increase the value of remittances flowing through formal channels?
User focus	**System administrators and managers, data compilers**	**Policy and decision makers**
Data starting point	**Existing reporting templates**	**Ideal data required to best inform decisions**

Many system projects put the initial focus on the methods used to collect, aggregate, and store data and only consider analysis and end-user needs in the project's final stages. This system-focused approach often leads to generated insights that may not meet user needs. This oversight is often realized only at a project's late stage, at which point changing the data-reporting requirements and updating the system to meet user needs can be costly and time consuming. In addition, reporting systems may be populated with inappropriate data and without a capacity for insight generation beyond exporting the data to spreadsheets for analysis.

In addition, the system-focused approach often concentrates on providing a more efficient way to collect high-quality data based on existing reporting templates. While improving data quality is vital, it should be considered a baseline prerequisite for a data reporting and analysis system rather than the main goal. Focusing purely on data-quality issues, and failing to engage with high-level user requirements at the start of the project, means this approach can miss opportunities to support policymakers and decision makers.

In contrast, **the outcome-focused approach** starts with existing high-level outcomes or proposed outcomes. The approach can be summarized as a series of questions, shown in the table below.

OUTCOME	For example: How do I increase the value of remittances flowing through formal channels?
INSIGHT	What do I need to know to achieve my outcome?
DATA	What data do I need to generate my insights?
FEASIBILITY	Do these data exist in the market, and if not, do I have the mandate to require these data to be reported?
SYSTEM	What is the most effective way to collect, store, manage and analyse these data?

This is a simplified model and, in reality, systems often have to feed into multiple outcomes. However, following this process for all desired outcomes is an important part of identifying the project's scope. This approach also encourages a focus on all the necessary supporting processes, along with developing the ability to generate insights to inform the desired outcomes.

STEP 1: EXPLORATION OF CONCEPT AND USE-CASE DEVELOPMENT

AUDIENCE

KEY QUESTION: WHO ARE THE MAIN PROJECT STAKEHOLDERS? DEFINE THE PROJECT ROLES, DUTIES, BENEFICIARIES AND OWNERSHIP.

KEY PARTICIPANTS: POLICYMAKERS, MARKET SUPERVISION TEAMS AND PRIVATE-SECTOR PROVIDERS OF REMITTANCE SERVICES.

Insights on remittances can influence many policy areas, and it is, therefore, important to identify the potential audience, stakeholders and collaborators before doing the activities to define use cases. While the central bank and/or financial regulator responsible for collecting the data is likely to be the primary audience, other parties may require insights on remittances to inform policy or drive market development. For example, in economies where international remittances account for a significant percentage of economy size, data on the value, structure, country of origin and geographic distribution of value received could inform insights into areas such as:

- **financial regulation**, including licensing of new entities or technologies

- **migration and labour policy** (i.e. for certain economies, should diplomatic efforts be employed to lower entry barriers for migrant workers?)

- **education policy** (i.e. could investment in education be structured to increase capacity in areas of high demand, along with increased remuneration for migrant workers?)

- **broad economic policy**, including understanding the impact of remittances on localized, subnational economies, sectors (such as trade, finance, SMEs, real estate and education, among others) and the gendered impact of remittances in the economy

Financial regulators should also be aware of the power of data to inform and influence the private sector. For example, data on the distance that remittance recipients travel to cash out transfers can generate insights into areas of high demand and limited supply of cash-out services. The distance can be calculated if the recipient's residential location is collected alongside the location of the financial service point. If made publicly available, these data could be used by service providers to inform investment decisions about service expansion and distribution. The information could also spur product innovation and the exploration of alternative channels for service delivery.

While such an increase in relevant information would benefit private-sector service providers by allowing them to make smarter, more informed investment decisions, it would also allow them to create and target more appropriate formal financial products. By using data to reduce risk and lower barriers to private-sector investment, the financial regulator could facilitate an increase in the uptake of formal remittance services and reduce the percentage of remittances flowing through informal channels.

Other ministries in the government, including investment, trade, entrepreneurship and migration, can benefit from such data insights to inform better policymaking and create an enabling environment through regulation, incentives and proactive measures within their respective sectors. For instance, data insights can enable investment and migration ministries to work together to create better investment avenues and incentives for diaspora investors or entrepreneurs.

After identifying the key participants, they should be included as much as possible in the following use case development exercises.

USE CASE DEVELOPMENT

KEY QUESTION: WHAT DO I NEED TO KNOW TO ACHIEVE MY OUTCOME?

KEY PARTICIPANTS: POLICYMAKERS, MARKET-SUPERVISION TEAMS AND PRIVATE-SECTOR PROVIDERS OF REMITTANCE SERVICES

The 'proof of concept' method often uses some form of rapid-design tool, such as a 'design sprint', to develop use cases and answer critical questions. Rapid prototyping may then build and test system models before they are scaled up. This method can be highly effective in institutions with high technical capacity, significant technical resources and a budget that allows the hiring of external expertise where required. The following methodology is inspired by the 'proof of concept' method and focuses on developing a deep understanding of user needs and requirements. We will call this methodology 'Exploration of Concept'.

To determine which data points and insights will best inform policy and drive market change, we must start at the point where most systems end, with the analysis. The most effective way is to start with an idealized set of data that captures every possible variable that could inform your analysis – rather than defining focus on the existing data-reporting templates and the data tables they produce. At this point, neither the existence nor the availability of these data in the real world should be a limiting factor. The point of the following exercises is to explore an ideal data set that will provide the broadest possible support for the desired outcome. Refining and prioritizing these requirements will come later.

EXERCISE 1: DEFINE THE IDEAL DATASET	This process is best done as a collaborative brainstorming exercise among decision makers, policymakers and other potential data users to determine the data that they would like to have available in an ideal world.
	During this exercise, no idea or request should be considered too impractical to record; rather, the focus should be on identifying the data that would best support them in their decision-making. Some examples of novel data attributes that could inform policy and drive market change include detailed records of the location of remittances' recipients, the sex or recipient age and the proposed usage of remittances. Potential analysis using these data attributes is explored in the accompanying paper *The case for the collection and analysis of transaction-level, supply-side data on remittances*.
EXERCISE 2: CREATE THE IDEAL DATASET	A vital part of the design process for data-driven decision support systems is to see and explore the kinds of analysis available at the end of the process. However, if your ideal dataset is a long way from your existing real-world dataset, it is common to assume that it is impossible to see the analytic outputs because the required data do not exist.
	If your ideal dataset is markedly different from your existing dataset, then you're going to have to get creative and create a dummy dataset that reflects your ideal needs. For example, if Exercise 1 reveals a need to understand the regional distribution of remittances values, but the existing data set does not include this information, then you will have to create a dummy data set to explore the potential results.
	While several methods and tools can be used to build dummy datasets, the easiest approach is to use a dedicated service such as Mockaroo or generatedata.com. These web applications provide a user-friendly interface that allows inexperienced users to generate dummy data including randomized countries, dates, customized value lists, numeric values, currency types and other data types. Mockaroo allows sample datasets of up to 1,000 rows to be generated at no cost and charges a small annual fee for the creation of datasets up to 100,000 rows. Generatedata.com is a free, open source that lets users generate large volumes of custom data in a variety of formats.
	If in-house capacity and experience are available, the 'RANDBETWEEN' function in Excel or other spreadsheet applications can be effective. This function generates a random integer within a user-defined range, which allows simple dummy datasets to be quickly generated. This function can also be used to generate string (text) fields such as 'commercial bank' or 'money transfer operator' by randomly generating a number between 1 and 2 and then using the 'REPLACE' function to substitute the number for the required text. You can also generate random dates between two defined limits. These functions within Excel can be used to generate dummy data quickly and simply by anyone comfortable using basic formulas.
	More advanced tools for creating dummy data allow for the creation of more complex random fields such as names, locations and multiple numeric values with specific correlations. These tools need more advanced programming and data-science experience than needed for the Excel functions described in the previous paragraph. In most cases, however, dedicated services or spreadsheet programmes will suffice.

EXERCISE 3: VISUALIZATION	The next step of this process is to use the dummy data, based on the ideal dataset, to create interactive data visualizations. This step will allow the data to be explored and showcase the types of insights the data can produce.

This part of the process requires some experience with data visualization and dashboard design and some specialist software. Options for data-visualization applications include Tableau and Microsoft Power BI. Many institutions have the opportunity to use, or at least try, these applications at no cost.

Microsoft Power BI comes bundled with some Office 365 licenses, and the desktop version of Power BI allows a single user to create visualizations on one machine at no cost.

Tableau Public users can access the desktop visualization software at no cost. Visualizations and data can be uploaded and publicly shared via the Tableau Public server. Using dummy rather than real data allows the data analysis and visualisation-design process to happen using free tools without publicly exposing sensitive data.

Both applications offer online comprehensive training and support materials and are widely used globally as external support to develop the initial dashboards and visualizations.

The purpose of these analysis tools is to allow users to interact with the data and better understand the kinds of analysis that would be possible if their ideal dataset were made available. |
| **EXERCISE 4:** ITERATE ON THE IDEAL DATASET | The process of interacting with the data, even if the data points are fictional, provides a valuable opportunity to review the possible use cases and the data required to generate insights. This is an important step in the iterative process of defining data needs.

Being able to see and interact with the data often provokes new questions and suggests new data requirements or analysis needs. Often, users don't get to interact with the data and see if it meets their requirements until the final stage of system development, at which point it can be extremely costly and inconvenient to change the data- reporting requirements and update the system to accommodate them.

This process allows users to iterate on their data requirements, and the exercise can be repeated until users are comfortable that the data will generate insights that contribute to understanding the market and achieving their outcomes. |

EXERCISE 5: USE CASE DEVELOPMENT

The process of defining an ideal dataset and interacting with the data is an important step in encouraging users to think beyond their established use cases. New data attributes, more highly disaggregated reporting structures and appropriate analysis tools will present opportunities for new use cases and insights.

Once users are open to the potential insights generated from an ideal dataset, they can start defining use cases through the exploration – already begun – of the analysis tools as policymakers, along with new ways the data can be used for supervision, to inform policy, to de-risk and to inform private-sector investment.

This exercise focuses on documenting these potential use cases and will be used to prioritize data needs and inform the ultimate system design. Typically, all potential users are given time to explore the data analysis tools populated with dummy data and to individually note how the insights could inform or support their existing use cases and how they could inform new use cases.

These insights should then be shared within user groups with a facilitator supporting users to share, explore and develop their potential use cases. Multiple users may have similar use cases, in which case they can be consolidated into a single-use case.

EXERCISE 6: PRIORITIZATION

The use cases should now be prioritized using two scales. The first scale indicates the importance of the use case on a scale of ESSENTIAL to NICE TO HAVE. The second scale indicates the urgency with which the insights are required, from IMMEDIATE to LONG TERM. This will allow each use case to be placed in the following matrix.

USE CASE PRIORITISATION MATRIX

	ESSENTIAL	NICE TO HAVE
URGENT	Essential and urgent	Urgent but not vital
LONG TERM	Essential but not urgent	Not urgent and not vital
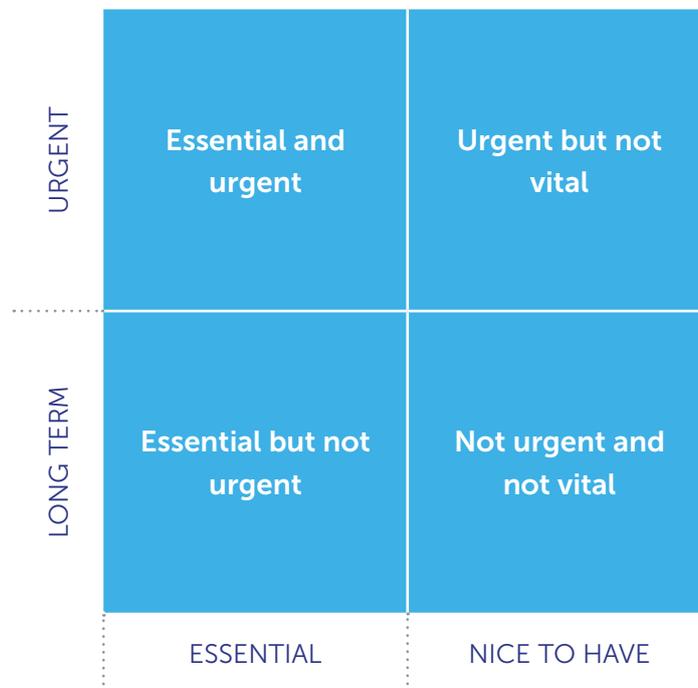
STEP 2: DATA REQUIREMENTS AND STANDARDS

KEY QUESTION: WHAT DATA DO I NEED TO GENERATE MY INSIGHTS?

KEY PARTICIPANTS: COMPLIANCE OFFICERS, DATA ANALYSTS (WHERE AVAILABLE)

Once the relevant audiences have defined the ideal data attributes needed to generate their ideal insights, it is time for the data analysts and compliance officers to structure these requirements and suggest data standards for each attribute.

SUGGESTED DATA REQUIREMENTS AND STANDARDS FOR TRANSACTION-LEVEL REPORTING

EXERCISE 7:
SUGGESTED DATA REQUIREMENTS AND STANDARDS FOR TRANSACTION-LEVEL REPORTING

An institution considering shifting to transaction-level remittance-data reporting can use the template shown below as a starting point. While every market will have different priorities and needs, this template should provide a grounding for discussions on data requirements and standards setting.

INBOUND TRANSFERS

FIELD	NOTES	SUGGESTED STATUS
Transaction ID	Should be a unique ID for each transaction	Required
Sending entity type	For example: • Commercial bank • Money transfer operator • Mobile money provider	Required
Receiving entity type	For example: • Commercial bank – direct account transfer • Commercial bank – on behalf of other money transfer operators (for historical data) • Money transfer operator • Mobile money provider	Required
Receiving entity name and code (where codes are required by the regulator)	I.e. bank or money transfer operator name and license number	Required
Residency of receiver	I.e. resident, non-resident	Required
Cash out/deposit point name/code (where codes are required by the regulator)	I.e. bank or money transfer operator branch name and sort code or agent identifier	Required
Country and country code of origin of transfer	Should employ a globally recognized standard such as ISO-3166-1	Required
Country and country code of transfer intermediary	In cases where funds flow through an intermediary bank (Should employ a globally recognized standard such as ISO-3166-1)	Required
Remitting currency	Should employ a globally recognized standard such as ISO-4217	Required
Value in remitting currency		Required
Value in local currency	To be calculated using a standard exchange rate in line with local convention/regulations	Required
Date and time of transfer receipt		Required
Balance-of-payments category and code	To be classified according to the International Monetary Fund's latest balance-of-payments manual IMF CTC codes	Required
Date and time of deposit or cash out		Optional – recommended

FIELD	NOTES	SUGGESTED STATUS
Transfer mechanism	I.e. SWIFT, money order, proprietary transfer, automatic teller machine withdrawals of point-of-sale transactions using foreign cards	Optional – recommended
Sex of receiving individual	Crucial for understanding the gendered dynamics of cross-border remittance transfers and informing public policy and product design, and infrastructure investment by money transfer operators	Optional – recommended
Year of birth of receiving individual	This data point would help further understanding of the profile of remittance beneficiaries. Capturing only the year of birth ensures that individuals cannot be identified, thus preventing any legal restrictions on the use of personally identifiable information.	Optional – recommended
Cash-out or deposit point location	The location of the branch where cross-border fund transfers are deposited or the location of the cash-out point in the case of an over-the-counter transaction. (Ideally, the Global Positioning System coordinates for each bank branch and over-the-counter service point should be captured and stored in a separate database. This process would allow easy lookup based on the branch or over-the-counter point code. If this is not available, a suitable administrative level should be chosen for reporting and standardized codes used to report the location.)	Optional – recommended
Address of receiving individual	Structured and standardized address fields should be used to capture the location of the receiving individuals' normal residence. This data will provide insights into the distances that people will travel to access formal services and allow an understanding of the relationship between access to formal services and usage.	Optional – recommended
Account type	Some jurisdictions have accounts (e.g. diaspora accounts) that have different rules for the retention and management of foreign currency.	Optional – recommended
Purpose of transfer – Detail	The purpose of the transfer will provide further details about how incoming funds will be used or the origin of the transfer; this would supplement the balance-of-payments codes, which may not be sufficient for a full understanding of remittance behaviours.	Optional – recommended

OUTBOUND TRANSFERS

FIELD	NOTES	SUGGESTED STATUS
Transaction ID	This should be a unique ID for each transaction	Required
Sending entity type	For example: • Commercial bank – direct account transfer • Commercial bank – on behalf of other money transfer operators (for historical data) • Money transfer operator • Mobile money provider	Required
Sending entity name and code (where codes are required by the regulator)	I.e. bank or money transfer operator name and license number	Required
Branch/agent name/code (where codes are required by the regulator)	I.e. bank or money transfer operator branch name and sort code or agent identifier	Required
Country and country code of destination of transfer	Should employ a globally recognized standard such as ISO-3166-1	Required
Remitting currency	Should employ a globally recognized standard such as ISO-4217	Required
Value in remitting currency		Required
Value in local currency	To be calculated using a standard exchange rate in line with local convention/regulations	Required
Date and time of transfer		Required
Balance-of-payments category and code	To be classified according to the International Monetary Fund's latest balance-of-payments manual IMF CTC codes	Required
Residency of receiver	I.e. resident, non-resident	Required
Account type	Some jurisdictions have accounts (i.e. diaspora accounts) with different rules for the retention and management of foreign currency	Optional – recommended
Purpose of transfer – detail	The purpose of the transfer provides further details about the purpose of outbound funds; this would supplement the balance-of-payments codes that, otherwise, may not be sufficient for a full understanding of foreign cash outflows.	Optional – recommended
Transfer mechanism	I.e. SWIFT, money order, proprietary transfer, automatic teller machine withdrawals of point-of-sale transactions using foreign cards	Optional – recommended

STEP 3: RESOURCE MAPPING – UNDERSTANDING POLICIES AND PROCESSES AROUND DATA CAPTURE

This step will provide a framework to assess the organizational readiness – in terms of existing policies, processes and practice – to implement a remittance reporting and analysis system that captures transaction level or highly disaggregated data. This resource mapping section is based on the Assessment guide on remittance data collection and covers the necessary non-technical and non-systems-based conditions to ensure effectiveness and legitimacy.

UNDERSTANDING THE POLICIES

In assessing the suitability of the existing regulations to support the collection of transaction-level or highly granular supply-side data, it is crucial to understand the legal responsibilities of reporting entities and the limitations of the financial regulator's authority to compel data to be reported. They may also impact how and with whom the data and insights can be shared.

A legal framework must entitle the central bank or financial regulator to request information from all providers of cross-border transfers, not only financial institutions. This framework is especially necessary due to new technology such as international mobile money transfers, fintechs and transfer services that exploit cryptocurrency or distributed ledger technology. Ideally, reporting entities should be defined by the nature of the services they provide, regardless of whether or not they are licensed by the central bank or considered financial service providers in a wider sense. In cases where certain service types, such as mobile money service providers are licensed and regulated by multiple regulators, as in Tanzania, it is important to determine if data-sharing arrangements are in place and if data needs have been coordinated between regulators.

? KEY QUESTIONS

- What kind of mandate does the financial regulator hold regarding data collection for remittance transactions?

- Which service provider types are covered by the existing legislation? Does the wording define the entities covered by the regulation or does it define a set of services and require any entity providing these services to comply with the reporting requirements?

- Does the existing regulation define a specific data-reporting template, or does it require reporting entities to comply with whatever template is published by the regulator?

- Does the existing regulation require, prohibit, or remain silent regarding requiring service providers to submit highly disaggregated transaction-level, or highly disaggregated, data?

- Are adequate mechanisms in place to facilitate data sharing and coordination among data-producing agencies?

- Does the data collectors' legal mandate allow for data sharing with the private sector and other policymakers?

DATA CAPTURE PROCESS – REGULATOR

To inform system design, it is vital to understand the existing processes and capacities of compilers. Many central banks and financial regulators are replacing manual template-based, aggregated-reporting processes and old legacy systems with more granular transaction-level reporting processes and systems. This move is critical to the generation of meaningful insights on remittances.

❓ KEY QUESTIONS

- Are data on remittances reported to the central bank?

- Are data on remittances reported outside the high-level aggregate figures required for the compilation of balance-of-payments or external sector statistics?

- Are data captured from all remittance services providers? If not, why?

- Are data reported at the transaction level or are they aggregated using defined attributes, such as country of origin?

- Does the regulator provide user guides and/or training to reporting entities on data reporting requirements?

- If no remittance data is captured, how are remittances estimated in the balance of payments?

- Is there a method to estimate informal remittance flows?

DATA CAPTURE PROCESS – SUPPLY SIDE

Understanding the existing processes and capacities of reporting entities is also important to inform system design. While the central bank may have the legal power to compel service providers to report a wide variety of data, there may be significant system and process-based challenges for the reporting entities to provide the requested data. If the reporting burden is set too high, it will likely harm compliance and could significantly lengthen the implementation time required to complete the project.

? KEY QUESTIONS

- Do reporting entities currently capture and store all the data required in the ideal data requirements' system (e.g. are sex-disaggregated data available for each remittance transfer)?

- Are data generated from a single system or database or do they have to be compiled from different sources?

- How do reporting entities prepare their returns?

- Do all data come from transfer instructions or do they come from other sources, such as the reporting mandate used by service providers in South Africa to capture data on purpose of transfer, sex, etc.?

- Are returns prepared manually or by a rules-based system?

- Do reporting entities use application programming interfaces for purposes other than reporting to the financial regulator?

- Is there a set template for reporting entities to follow when reporting remittance data?

STEP 4: RESOURCE MAPPING – TECHNICAL RESOURCES

Before planning the design and implementation of a new system to collect, store, manage and analyse the required data, it is important to take stock of the current systems used in your organization to perform these tasks for other datasets.

SYSTEM DEVELOPMENT

Understanding the current system or systems used to collect, manage and analyse remittance data will help identify gaps in skills, staff capacity and availability, and infrastructure. This understanding will also inform the system design and the required level of support from an outside vendor.

⊗ KEY QUESTIONS

- Are reporting and analysing remittance data gathered through a standalone system or as part of a broader system, such as for the collection and compilation of balance-of-payments statistics?

- Was the current system for reporting remittances data developed in-house or with outside support?

- Does the current system run on off-the-shelf software or was it custom-built?

    – if using off-the-shelf software, is it a turnkey solution or are existing software packages combined to create a complete data reporting, management and analysis solution using a modular approach?

- Which department or departments within the regulator:

    – manage the current system?

    – 'own' and fund the current system?

- Does the department that manages/owns the current system collaborate with any other department, for example National Statistics Office for the collection/estimation/ownership of the system/data?

- Who manages the system updates, including ensuring compliance with updated security standards and global best practice and adding new features on an ongoing basis?

- What software packages or programming languages does the existing system use for:

  – data collection

  – data entry

  – data validation

  – database management

  – server management

DATA TRANSMISSION

Historically, data transmission for reporting institutions were hand-delivered or mailed paper reports. Eventually, institutions could transmit reports via email. More recently, institutions could upload required reporting data via web portals established by financial regulators. Authorities are now moving towards models that support the direct system-to-system transmission of data between reporting institutions and regulators. These models use relatively new technologies such as application programming interfaces, which facilitate the transfer of data between systems. This shift dramatically improves data quality by removing the need for human manipulation of the data, and making possible the submission of improved granular data. This process is done through systemizing data preparation and submission without overloading the reporting entity's human capacity.

KEY QUESTIONS

- What options are available for reporting entities to transmit the required data to the financial regulator? For example:

  – Transmission channels, such as email, web portals, bulk file transfer (via File Transfer Protocol or similar), fax, courier, etc.

  – Format of data, for example, spreadsheets (XLS, CSV), PDF, XML, word documents, etc.

- Do any other systems within the organization use application programming interfaces for data-reporting purposes?

- What is the frequency and acceptable lag for data submission?

- Do all available reporting entities file reports and if so, are they filed on a timely basis?

These questions should be asked about the existing remittance-reporting system and for other data reported to the financial regulator. The answers will assist in better understanding of the capacity and range of the current data-reporting systems.

DATA VALIDATION AND QUALITY CONTROL

Data validation is the process by which data are checked against the standards outlined in the reporting requirements. Data validation and quality-control processes ensure that data are complete and of high quality. These processes can be automated or manual. Assessment will provide insights into the current capacity to implement data-reporting systems and give an indication of the quality of data within the existing system.

KEY QUESTIONS

- What are the current data validation and quality-control processes for the reporting of remittance data and other statutory returns?

- Are there formally defined rules for data validation?

- What is the process for returning records or files found to be incomplete or are suspected of containing data errors?

    – Are these validation rules shared with reporting entities or published on your official website?

    – Are there penalties/censure for reporting entities that submit incorrect or invalid data?

DATA STORAGE

Data storage is a crucial issue in the design and development of a transaction-level reporting system. Transaction-level data require substantially more server space than aggregated data and require a data-storage solution that can expand easily and cost-effectively over time. This section will assess which data-storage options are available and suitable for the system implementation.

KEY QUESTIONS

- Storage infrastructure: How does your institution store information? For example, locally on a computer, stored on a shared drive such as Sharepoint, Dropbox or Google Docs, cloud services, physical databases, locally hosted servers owned and managed by the institution, local data centre.

- Format: In what formats are data currently stored at your institution? For example, plain text files, CSV, XML, spreadsheets (e.g. Excel, Google Sheets), Relational Database Management System (e.g. Microsoft Access, Oracle, MySQL), other document-based management systems (e.g. NoSQL)

- If data systems rely on local servers:

- are these servers backed up?

- are they a shared resource or does each system within the regulator have its infrastructure?

- is there any spare storage capacity?

- Does the institution, or country, currently have, or is planning, a policy on cloud storage of data?

- Are there any legal restrictions requiring sensitive data, such as financial transactions or other personally identifiable information, to be stored within the country?

- Are there laws on data protection, privacy and confidentiality that exist at the national level? Do they apply to stored data?

DATA ANALYSIS

While analysis of remittances data is rarely a priority in balance-of-payments focused systems – as the data are often so high-level that the added cost of tools to support analysis is hard to justify – analysis tools and analytic capacity are crucial to the development of systems that aim to support the generation of insights to support policy and investment decisions.

KEY QUESTIONS

- Are remittances data currently analysed in any meaningful way, or are they simply compiled for publication and reporting to international bodies, such as the International Monetary Fund and World Bank?

- Is there currently an expressed need for such remittance-data analysis within the central bank and/or other ministries? What are the currently computed indicators?

- Who within the regulator has access to the raw data necessary for analysis?

- What internal human resources are available to support data analysis? How are the human resources structured – is there a centralized analysis or research team responsible for generating insights, or is there analytic capacity within individual departments?

- Does the current remittances-data management system (or any other data system in the organization) have an analysis module that supports the creation of interactive dashboards or other data-analysis tools?

- If so, what software is used?

- Are the dashboards or other tools created in-house or supported by an external resource?

- If dashboarding or data visualization tools are not used, what software is used to analyse and share data and insights?

- Are the dashboards or visualization tools available for use by:

  - a single team within the regulator?

  - other teams within the regulator?

  - other public sector stakeholders and policymakers?

  - financial service providers?

  - the public at large?

- Is data analysis done proactively – with insights generated through data exploration – or reactively, where analysis responds directly to specific, ad-hoc requests for certain figures?

- Does the data-analysis team have the knowledge/tools to conduct a gender analysis on the remittance data?

- What are the gender differences observed during data analysis?

- What gender indicators guide the analysis of remittance data?

- Is there adequate resource mapping?

  - Human resources

  - system development and management

Understanding the available human resource capacity will allow an assessment of the potential of existing staff to either develop or manage a remittance reporting and analysis system, and will also inform the required level of support from outside vendors. This section will also assess willingness and experience with contracting services from third-party vendors for both system development and implementation, and the potential to use off-the-shelf solutions licensed under software-as-a-service models.

❓ KEY QUESTIONS

- Is there an in-house software development team? If so,

  - how many people does it have?

  - what are their experience levels and specialized skill sets?

- what are examples of major past projects?

- have they adopted frameworks such as agile or scrum?

- Is there an in-house systems management team? If so,

  - how many people does it have?

  - what is their level of experience and specialized skill sets?

- What is the level of spare capacity of the system developers and systems management team?

- Are any of the existing in-house systems supported by outside resources or developers?

- Does the institution currently use any software under a software-as-a-service license?

  - If not, would this be an option that they would be able to consider?

- What is the current budget for ongoing maintenance of the remittance reporting system?

RESOURCE MAPPING: EXTERNAL RESOURCES – SYSTEM AND LICENSE SHARING

In certain economic blocs, financial regulators have either co-developed systems or a higher-capacity country has developed a data reporting and analysis system and then shared this software with surrounding countries at no cost or for a fee.[2] This arrangement can offer substantial cost savings benefits when the needs of a bloc of countries are broadly aligned, and it also ensures regional standardization. Understanding if these arrangements or software sharing opportunities exist in your market will help support an informed decision when it comes time to design your reporting and analysis system.

KEY QUESTIONS

- What, if any, arrangements are in place for system or software sharing with central banks and financial regulators in other countries?

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[2] For example South Africa Reserve Bank supports other SADC members to deploy the FinServe system, developed by SARB, for the reporting of cross border transactions

STEP 5: SYSTEM SCOPE AND EXPLOITING/INTEGRATION WITH BALANCE-OF-PAYMENTS REPORTING SYSTEMS

For many financial regulators, remittances data is 'owned' and managed under the system responsible for the compilation of balance-of-payments statistics, often found in the external sector department of the central bank. However, these systems and this department may not be the most effective home for a system for reporting and analysing transaction-level or highly disaggregated data on remittances for two reasons. First, balance-of-payments systems are focused primarily on the compilation of statistics for reporting purposes and not for generating novel insights to inform policy and private sector productivity and product development. Second, external sector departments may not have the capacity to explore, analyse and generate insights from the remittances data for external audiences.

It is vital to assess the potential of the existing balance-of-payments reporting system to play a role in the remittance reporting and analysis system. There are four options to make this assessment, as described below.

OPTION 1: USING THE BALANCE-OF-PAYMENTS REPORTING SYSTEM FOR THE CAPTURE AND ANALYSIS OF TRANSACTION-LEVEL OR HIGHLY DISAGGREGATED REMITTANCE DATA

KEY QUESTION: CAN I EXPAND THE REMIT OF EXISTING SYSTEMS TO MEET THE REQUIREMENTS OF A REMITTANCES REPORTING AND ANALYSIS SYSTEM?

KEY PARTICIPANTS: POLICYMAKERS, MARKET SUPERVISION TEAMS AND PRIVATE-SECTOR PROVIDERS OF REMITTANCE SERVICES

Expanding the remit of an existing balance-of-payments reporting system can be an efficient and cost-effective solution to the challenge of capturing and analysing transaction-level remittance data where the existing system has the following characteristics:

- the ability to capture transaction-level data from various service providers (not only banks)

- data-reporting mechanisms that support system-to-system, transaction-level data transmission (for example, via an application programming interface)

- validation tools that allow data submissions to be checked against a set of established rules and criteria before being passed on for data storage

- flexible data storage with enough capacity to store and backup several years' worth of transaction-level data

- software and infrastructure that provide adequate levels of security and allow extensions such as modern data-analysis software

Where these conditions exist, these main system changes may be required:

- removal of any lower financial limit on the transactions to be reported

- additional data-reporting fields for remittances in line with the data requirements, such as:

    – purpose of remittance

    – sex of sender/recipient

    – channel or service-provider type

- addition of a business intelligence/analytics module

- increased data storage capacity to accommodate increased records

OPTION 2: DEVELOPING AN INTEGRATED MODULE FOR THE EXISTING BALANCE-OF-PAYMENTS SYSTEM FOR THE CAPTURE AND ANALYSIS OF TRANSACTION-LEVEL OR HIGHLY DISAGGREGATED REMITTANCE DATA

KEY QUESTION: CAN I DEVELOP A SUPPLEMENTAL MODULE TO MEET THE REQUIREMENTS OF A REMITTANCES REPORTING AND ANALYSIS SYSTEM?

KEY PARTICIPANTS: POLICYMAKERS, MARKET SUPERVISION TEAMS AND PRIVATE-SECTOR PROVIDERS OF REMITTANCE SERVICES

Where the conditions listed above do not exist or would be too complex or costly to implement, it may be possible to develop a supplemental module linked to the existing system using the same basic infrastructure and system design. This would be possible under the following conditions:

- modern database software and architecture

- flexible data storage with enough capacity to store and back up several years' worth of transaction-level data

This would allow other features such as data transmission, validation and analysis capabilities to be developed and implemented independently while still taking advantage of the existing database and storage infrastructure.

OPTION 3: UTILISING AN EXISTING TRANSACTION-LEVEL REPORTING SYSTEM, NOT LINKED TO THE COMPILATION OF BALANCE-OF-PAYMENTS DATA, TO CAPTURE AND ANALYSE TRANSACTION-LEVEL REMITTANCE DATA

It may be the case that the central bank does not collect transaction-level data for balance-of-payments compilation but does collect transaction-level data for other purposes, for example transaction-level credit reporting. Where such systems exist, even where the data being reported have no relation to cross-border transfers, leveraging these systems may represent a highly effective and cost-efficient option. This approach can be especially effective where there is significant overlap between the reporting institutions of the existing system and those required to report transaction-level remittances data.

Where such a system does exist, likely requirements would include:

- standardized data-reporting structures

- increased data-storage capacity

OPTION 4: DEVELOPING A STANDALONE SYSTEM FOR THE REPORTING AND ANALYSIS OF TRANSACTION-LEVEL OR HIGHLY DISAGGREGATED REMITTANCE DATA

Where no transaction-level reporting system exists that can capture and analyse remittance or other data, it will likely be necessary to develop a standalone system from scratch. Developing a standalone system may also be appropriate where the 'owners' and/or main users of the proposed system are not the same as those who compile the balance-of-payments statistics. For example, if the design exercises establish key use cases that focus on guiding broad economic policy, it may be more appropriate to develop a remittance reporting and analysis system within the research or other policy-focused team, rather than linking it to the balance-of-payments compilation.

EXERCISE 8:
REVIEW THE INFORMATION COLLECTED DURING THE RESOURCE MAPPING AND SEE HOW WELL THE INSTITUTIONAL RESOURCES MEET THE CONDITIONS OF EACH OPTION. THIS EXERCISE WILL HELP NARROW YOUR OPTIONS FOR SYSTEM DESIGN.

STEP 6: SYSTEM DESIGN CONSIDERATIONS AND APPROACH

TO CONSOLIDATE REPORTING SYSTEMS OR DEVELOP A STANDALONE REMITTANCE REPORTING SYSTEM

The single biggest consideration when designing and implementing a remittance reporting system will probably be defining the system scope. Many financial regulators have multiple, often fragmented and frequently siloed data reporting, management and analysis systems. This practice can lead to significant issues with analysis and value extraction and often adds complexity and cost for reporting entities that have to use different standards and technology to report to different departments within the regulator. Managing information in an environment where data are siloed leads to redundancies, inefficiencies, inconsistencies and underuse of the available information.

For many central banks and financial regulators, a strong case can be made for replacing the existing outdated, underperforming and wasteful systems with a consolidated system that brings all data reported into the regulator under a single system. Supervisory technology specialist-service providers offer such systems as turnkey solutions, with quick implementation and possible cost efficiency. Benefits of this type of system consolidation can include:

- reduced effort required to manage and maintain systems

- cost savings through consolidation of data-storage solutions

- cost savings through shared software licenses or consolidated service contracts

- improved standardisation of data within the system

- simplification for reporting entities that have to comply with a single technology and standardized data formats

- analysis across datasets from different departments without having to manually extract data from different systems

However, while there are many benefits to a consolidated reporting and analysis system, there are also significant barriers to a consolidated-system approach. The first barrier is time. Generating the buy-in, securing the budget and achieving the level of cooperation and coordination required to successfully implement such a large project can take years. This may not be ideal in economies where data on remittances is needed urgently to inform policy and investment.

The second barrier is cost. While long-term savings are often possible with consolidated systems, the cost of the initial development of such a system can exceed the budget available for any single year.

There is also, however, a possible middle ground. This solution would involve identifying a supervisory technology service provider with a suite of products and services that would meet the requirements of multiple departments and could provide a consolidated system for all data to be reported and analysed within the regulator. This provider could then be used to replace one discrete system (e.g. a remittances reporting and analysis system) or to create one where no system currently exists. If this pilot was successful, the system could be slowly expanded to replace other reporting and analysis systems until a single consolidated system existed for all data received by the regulator. This approach can be costly in the short term, because the services, infrastructure and licences required may not be fully utilized. However, it also offers regulators a method through which to test supervisory technology solutions within a prescribed limit, while appraising the system or service as a possible future replacement for existing systems.

AGGREGATED, HIGHLY DISAGGREGATED, OR TRANSACTION-LEVEL DATA

The level of aggregation at which the data are to be reported will have a dramatic impact on generated insights, along with the design of the reporting and analysis system. The paper *The case for the collection and analysis of transaction-level, supply-side data on remittances* outlines the case for the collection and analysis of transaction-level data on remittances.

Aggregated data is where volumes and values of transactions are aggregated by one or more separate attributes. For example, the value of the remittances report may be summarized by the country of origin or by the channel (i.e. bank or money transfer operator). This method would provide a central bank with the ability to analyse the data either by country or by channel, but not by both.

This is the current reporting model for most financial regulators. While the summarized data are useful for the compilation of balance-of-payments statistics, they can tell you very little about the state or drivers of the remittances market. This level of data reporting is not capable of producing insights that can inform policy or investment decisions.

Highly disaggregated data refers to data aggregated using multiple attributes in combination rather than singular attributes. For example, reported remittance values and volumes might be summarized by all the following: country of origin, channel, currency, sex and location of residence of the sender or recipient. A highly simplified template can be found in Figure 1, below. It would, for example, enable a central bank to see how many women in a certain region received what total value of remittances from the United States through a transfer via a commercial bank.

COUNTRY OF ORIGIN	CHANNEL	SEX	LOCATION OF RECIPIENT	VALUE IN LOCAL CURRENCY
Country 1	Bank transfer	Male	Region 1	
		Female		
	Money transfer operator	Male		
		Female		
	Bank transfer	Male	Region 2	
		Female		
	Money transfer operator	Male		
		Female		
Country 2	Bank transfer	Male	Region 1	
		Female		
	Money transfer operator	Male		
		Female		
	Bank transfer	Male	Region 2	
		Female		
	Money transfer operator	Male		
		Female		

Figure 1: Example of a highly disaggregated data structure using multiple, combined attributes

An interesting example of the reporting of highly disaggregated data in Nepal can be found in the accompanying paper of the series, *The case for the collection and analysis of transaction-level, supply-side data on remittances*. While this level of data reporting can be a useful intermediate step if a regulator cannot move to transaction-level data reporting, it can limit data quality and possible analysis.

Transaction-level data can be thought of as every transfer having its record or entry in a database, the equivalent of a single row in an Excel document. This level of reporting makes it possible to analyse the data based on any combination of fields in the data. It offers the potential to dive deep into the data and generate descriptive insights to inform you about the current state of the market. Transaction-level data also lays the groundwork for the future application of artificial intelligence and machine-learning algorithms, which could provide both predictive and prescriptive insights. Detailed descriptions of some of the potential use cases for transaction-level reporting can be found in the accompanying paper *The case for the collection and analysis of transaction-level, supply-side data on remittances*.

The appropriate reporting level will be dictated by a combination of the use cases defined in the early stages of this process and the constraints identified in the later stages.

Costs and benefits: The level of data disaggregation required to meet the use cases will likely be a key determining factor in the eventual system cost. Many factors may be involved in this decision including the defined current use cases, anticipated future needs, and current systems and capacity. The table, below, offers a simplified structure of the relative advantages of each level of data collection, their implications and the scenarios under which each could offer good value.

ADVANTAGES	IMPLICATIONS	SUITABILITY
Aggregate-level reporting		
Likely conform very closely, if not exactly, to the balance-of-payments reporting requirements. This means that balance-of-payments reporting templates and systems are likely suitable to collect the data. The data are so limited in scope that they can be effectively analysed using spreadsheet tools such as Excel.	Aggregate reporting produces data that provide limited insights on the remittance market. The data would be unlikely to produce insights to support data-driven policy or product design.	This option is unlikely to produce data that can meet the essential use cases of any economy that gets meaningful value-of-remittance payments. Aggregate-level reporting may be appropriate where remittances are not economically important and there is limited need to closely supervise international transactions for financial integrity reasons. Implementing an aggregate level reporting system may also be useful in circumstances lacking a data-reporting system. Systematizing this reporting process may help improve data quality but will likely provide low-level return on investment in terms of the additional insights or value created.
Highly disaggregated reporting		
Offers a compromise between aggregate and transaction-level reporting that can allow central banks with an existing high-quality reporting and analysis platform to adapt their existing infrastructure at low cost to meet specific use cases.	Highly disaggregated data reporting is likely to dramatically increase the reporting burden on reporting institutions. It requires data to be processed before reporting and this increases the level of effort and the potential for the introduction of errors where returns are prepared manually.	In cases where use cases and data requirements are clearly defined and existing systems are flexible and high-quality, the cost of implementing highly disaggregated reporting can be as little as changing the reporting template, creating a new database table and adding some new dashboards. In these cases, the extremely low cost of the intervention may make this an attractive option as either an end solution or as a stepping stone to explore and justify the investment required for transaction-level reporting. The highly disaggregated reporting model has been used successfully by Nepal Rastra Bank to quickly obtain valuable insights into the economy to aid the recovery from the 2015 earthquake. This is explored in the accompanying paper *The case for disaggregated supply-side remittance data*.

ADVANTAGES	IMPLICATIONS	SUITABILITY
Transaction-level data		
Offers the most flexible solution for insights generation. Allows any combination of variables in the data at any time. Allows generation of the deepest insights and unlimited explorations. For example, it would allow insights as detailed as the impact of holidays in remitting countries on the value of money remitted by women comparing banks to digital channels. These types of insights could be used to guide services providers on gaps in the market for services or to target marketing or offers to certain populations at certain times. This could be used to encourage the use of formal services at key times of the year. Supervision – transaction-level reporting allows detailed data mining to identify patterns of suspicious transactions and help identify money laundering and terrorist financing.	Capturing transaction-level data may be the most expensive option for the central bank. It may require increased data storage space and in many cases will require new systems to be developed or procured from supervisory technology service providers.	A lack of an existing system in a central bank, together with a demonstrated need for detailed insights to drive policy and product design, will justify the extra financial investment required to implement a transaction-level data system, as compared to a highly disaggregated system. Transaction-level reporting will provide more detailed insights to meet current use cases and will help hedge against changing future needs by providing the most detailed and flexible information.

CUSTOM DEVELOPMENT OR TURNKEY SUPERVISORY-TECHNOLOGY SOLUTIONS

One of the most important design considerations, especially for regulators with budget constraints and limited human resources, will be whether to develop a system from scratch or to customize existing software and applications. Interviews conducted by UNCDF with 15 central banks who collected remittances data via their balance-of-payments reporting systems revealed they had all developed systems in-house. While some banks had outside vendor support, most had developed custom-reporting systems or had gradually adapted legacy systems.

The relatively recent focus on supervisory technology has spurred an increase in commercial offerings of standardized solutions aimed at addressing the challenges of digitizing reporting and regulatory processes. While supervisory-technology solutions can be built in-house by financial regulators, there can be significant benefits to licensing existing industry-standard systems from third-party providers.

> **Supervisory technology (often abbreviated as SupTech) is the use of innovative technology by supervisory agencies to support supervision.** It helps supervisory agencies to digitalize reporting and regulatory processes, resulting in more efficient and proactive monitoring of risk and compliance at financial institutions.
>
> Bank for International Settlements

CUSTOM SYSTEM DEVELOPMENT	STANDARDIZED SUPERVISORY-TECHNOLOGY SYSTEM
Flexibility: Custom system development means it is technically possible to deploy almost any system feature. This factor can be beneficial to regulators operating in markets with highly specialized supervisory needs for which a supervisory- technology solution is not available.	**Automatic updates and best practice:** The majority of software-as-a-service providers offer regular updates to the software, ensuring compliance with global best practice and ensuring security protocols are kept up to date.
Resource sharing: Some regulators have large software development teams in-house with spare capacity to develop and deploy large-scale projects. In these situations, in-house development can be more cost effective than outsourcing development or purchasing a standardized supervisory-technology solution system.	**Support:** Service providers offer various levels of support from ongoing system maintenance to software customization and new feature development. While there is a risk associated with dependency on a single vendor, the flipside is the assurance that a vendor exists that can fill any gaps within the regulator or the local technology-provider market.
Compatibility with legacy systems: Many regulators have several data collection and management systems for different teams and purposes. Many regulators may also be running legacy systems built on platforms and technologies that may no longer be compatible with or supported by modern systems. Custom system development may be the only option when legacy systems have to interact with the new system.	**Modularity:** Many service providers offer products that can be built up in a modular fashion to create a comprehensive and integrated system. For example, some vendors offer independent data reporting and licensing modules. Such system consolidation can significantly reduce the impact of data being siloed on different, non-interoperable systems.
Regional standardization: Some regulators within economic blocs or geographic areas have established system-sharing agreements. In such agreements, a lead regulator develops a data reporting and management system that is shared with partner regulators inside the bloc. This method can ensure standardization across countries and help facilitate regional analysis. An example of this system-sharing agreement is the International Transaction Reporting System developed by the South Africa Reserve Bank, which is shared by several other bank members.	**Feature sharing:** Service providers who offer a dedicated supervisory technical solution for data reporting often develop custom features and services following the client request. The development of these features is often funded by the regulator who initially requests the feature. However, the features may then be incorporated into the core product suite for all clients. The features gradually expand and develop organically through the users' community at no extra cost to base users who did not request feature additions.
	Deployment time: Turnkey supervisory-technology solutions can often be quickly deployed where requirements and use cases are clearly defined. Because the software has already been developed, clients can move to the customization and deployment phase without needing to develop new software and systems. This solution can cut deployment time from years to a few months.

Advantages

	CUSTOM SYSTEM DEVELOPMENT	STANDARDIZED SUPERVISORY-TECHNOLOGY SYSTEM
Challenges and risks	**Resource intensive:** Developing a system from the beginning is resource intensive, requiring either in-house resources or an external development team. Many financial regulators lack sufficient capacity in-house to develop large and complex systems. In some cases, regulators also lack the capacity to design a system and supervise its development by an external team. **Deployment time:** It can take years to build systems when starting from the beginning. **Upfront costs:** Unless a capable development team with significant spare capacity is available in-house, system development requires considerable upfront costs. This will either come in the form of hiring an internal development team or outsourcing to a third party. Either way, a significant proportion of the full cost of development will have to be paid upfront. **Changing needs:** While custom systems are flexible in that they can be designed to meet almost any need at the outset of the project, it often requires a significant effort to add new features and functionality. In a market where new and disruptive technology can rapidly change the reporting and data needs of a regulator, this possibility can present a significant challenge to the long-term relevance of custom systems. **Staff turnover and institutional memory:** Lack of adequate documentation and high staff turnover can be significant challenges when developing systems in-house or with small-scale vendors. This is especially true for regulators operating in environments of constrained financial and human resources. The unexpected loss of even one key member of staff can lead to a significant knowledge gap that may make it difficult or impossible for systems to be updated or maintained. This risk can be somewhat mitigated by adequately documenting the system development, but in economies where technical skills are in high demand, regulators may struggle to compete with financial service providers to hire adequately skilled staff at competitive salaries.	**Ready-made supervisory-technology solutions may not exist:** Vendor numbers and solutions have increased over the past few years. However, there still may not be a solution available for every use case. It is also possible that, for niche requirements, the small number of vendors can make it difficult to get a competitive tender. Luckily, the reporting requirements of a remittance reporting and analysis system are similar to those of many other regulatory reporting systems. This means that while a local vendor may not be available, there are likely to be vendors available through international procurement. **Vendor lock-in:** This refers to when the cost of migrating the data from one system to another is so high that regulators are effectively locked into continuing to work with the same service provider in perpetuity. This situation can place the regulator in a weak position when negotiating future license fees. While this possibility is a risk, it can be significantly mitigated by ensuring that vendors adhere to global best practice and standards and that data are accessible and exportable in a range of standard formats. **Customisation:** The ease with which supervisory-technology solutions can be updated and new features added varies between vendors and systems. In some cases, the systems are designed to meet a broad range of standard use cases but may not be easily customizable to add unique features. It is important to know whether your supplier is the developer of the software or application or simply a vendor responsible for selling and distributing the product. Suppliers who developed the product are likely to have a much higher capacity for customisation.

DATA AND APPLICATION HOSTING

Applications used for data reporting and analysis, and the database or databases that contain the data tables will need to be hosted on a server[3]. Broadly speaking, there are two options:

LOCAL HOSTING   CLOUD HOSTING

Local hosting is the traditional option for hosting data and applications within financial regulators. For a long time, it was the only option. Local hosting involves investment in physical servers that are usually physically located within the regulating institution or at least within the same country.

Cloud hosting involves renting server functionality from a service provider instead of purchasing the physical infrastructure to locally host the applications and data. While the adoption of new technologies by central banks continues to evolve, the use of cloud hosting is becoming increasingly mainstream. A 2020 survey of 32 central banks by www. centralbanking.com found that almost two-thirds of the central banks surveyed were using at least one cloud-hosted service, with data hosting being the most common use. This shift has been driven, in part, by the increasing volume of data generated and reported and the subsequent need for an efficient, scalable solution to the problem of data storage as well as one with sufficient flexibility to support deeper analysis and insight generation.

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[3]   A server is a piece of hardware or software that provides services to other computers and their users over a network.

	LOCAL HOSTING	CLOUD HOSTING
Advantages	**Legal compliance**: An increasing number of countries require data containing citizens' personal information to be stored within the geographic boundaries of the country. While it is possible to meet these requirements with local cloud hosting, where the servers are located in the country of use, this option is not currently available in the developing world. **Comfort and familiarity:** Many non-technical audiences are more comfortable with the idea of a locally hosted server that they can see and touch rather than the idea of a cloud-storage solution that is not tangible. **Does not require a working Internet connection:** While access to the data stored in an onsite server requires either direct access to the server terminal or a client machine on a local network, data can still be accessed in cases where an Internet connection is unavailable.	**Scalability:** Cloud data hosting is structured as a service where an agreed amount of space is 'rented' from the service provider. As the volume of data increases, the service provider allocates more space to accommodate the increased need. This pay-as-you-use model is easy to use and enables a quick response to increased storage needs. **Cost:** Cloud hosting does not require a large capital outlay to buy new hardware and infrastructure, allowing the overall costs of the project to be spread out over time. **Security:** Cloud-based systems offer varying levels of encryption and security, which are managed as part of the service fee. This factor can help ensure compliance with global best practice without the expense associated with updating a locally hosted system. **Increased reliability and reduced system maintenance:** Cloud storage solutions usually come with service-level agreements that guarantee uptime. They can also offer stable and reliable service because the servers can be located in countries with favourable environmental conditions, reliable power, stable Internet connections, and multiple levels of backups and redundancy. For example, Amazon guarantees that any services included in the service-level agreement for Amazon Web Services are for 99.9 percent uptime in any given month. This is the equivalent of a maximum downtime of roughly four minutes per month. **No need for physical backup server:** Cloud storage solutions can provide hosted backup services, reducing the need for costly locally hosted backup servers. **Many financial regulators are already using cloud services without knowing it:** Services including email servers and document servers, such as Microsoft's 365 product, are increasingly using cloud infrastructure to offer their services. Many institutions may already use this infrastructure without ever consciously deciding to.

	LOCAL HOSTING	CLOUD HOSTING
Challenges	**Expense:** Initial capital outlay for onsite data hosting can be high. Locally hosted solutions require at least one server stack – to be replaced or supplemented as it degrades or reaches its storage capacity – and two as ideal best practice. This system involves establishing and maintaining a second, offsite backup server. **Scalability:** Disaggregated data reporting, especially transaction-level reporting, requires the retention of large volumes of data. New technologies and increased product choices will result in a subsequent increase in transactions and reporting entities, and the volume of data will increase exponentially over time. With a locally hosted solution, a new server and backup would have to be purchased and installed each time the server capacity is reached. **Reliability and chances of environmental failure:** Managing large server stacks is challenging and costly in countries where power and Internet connections are unreliable, and where dust and other environmental challenges can shorten hardware life.	**Legal requirements to host locally:** Some countries have policies or laws that certain types of data must be stored within the geographic bounds of the country concerned. While it is possible to meet these requirements with local cloud hosting, where the servers are located in the country of use, this option is not currently available in the developing world. **Migration costs:** While setting up and developing an application on the cloud may be cost efficient, migrating existing systems to run on the cloud can be both time-consuming and expensive and may outweigh long-term cost savings. **Access requires an Internet connection:** Cloud-hosted services are only accessible via an Internet connection. There is no physical infrastructure to plug in a laptop if a connection is unavailable. In environments where Internet connections are unstable or prone to interruption, this could impact reporting and analysis. **Service only available as long as you can pay:** The 'pay-as-you-use' model is contingent on the ability to pay for the services. Failure to pay the periodic licence fee could result in a cloud-service provider blocking access to both the applications and the data stored on its infrastructure. **Fear and unfamiliarity:** Cloud hosting is often poorly understood and can be associated with increased fear of hacking or security breaches.

In reality, many organizations are still in the process of understanding the place of cloud infrastructure in their systems, and may adopt a hybrid model with some data and applications being hosted locally and some being moved to the cloud. A remittance reporting and analysis system may provide a good testing ground for cloud computing for some regulators, especially those with limited budgets for capital expenditure, limited human resources for managing and maintaining data systems, and where the regulator does not require the reporting of data containing personally identifiable information.

ANALYTIC CAPACITY

The analytic capacity required to turn raw data into actionable insights is an often-overlooked area of system design. The users of any data-driven system are an integral part of that system, and their ability to interrogate and interpret the data is the difference between the

generation of simple data tables, charts, graphs and maps and the generation of detailed insights that can inform and drive policy and private-sector investment.

DEDICATED RESOURCE OR INCREASING CAPACITY FOR ALL

Broadly speaking, two approaches may increase analytic capacity and can be combined in various ways to suit the organization's needs.

HIGH-CAPACITY DEDICATED RESOURCE	INCREASING CAPACITY FOR ALL
Summary: This approach involves developing a high-capacity analysis team with access to a wide range of data from within and outside of the regulator. This team should be given the freedom to explore data for novel insights and respond to standard data requests. This group should include individuals with a high level of technical and analytical skills and in-depth knowledge of and familiarity with the needs of the various teams within the regulator.	**Summary:** This approach involves providing tools and training to a wide range of data users within the regulator, and giving them the freedom to explore and interrogate data from across the organization to generate new insights.
Advantages: • Ensures that data is being analysed in the wider context beyond the narrow requirements of individual teams and departments. • Insights less likely to be constrained to answering immediate needs or based on existing requirements. • Increasing capacity of a small team to a high level can be more cost-effective than raising the capacity of a whole organization. • Can be more appropriate in organizations with strong hierarchies, where insights from junior members stand little chance of gaining traction within the organization as a whole.	**Advantages:** • Likely to generate a wider range of insights • Insights likely to be directly linked to known use cases • Can support organizational change to become more data-driven at every level of decision-making • Staff with a combination of technical and IT skills can understand the data and ask the right business questions. This ability is critical for success.
Challenges: • Centralizing the function of data analysis can create the impression that only that team can or should analyse data. If unproperly managed, this impression can be a significant barrier to an organizational shift to becoming data-driven. • Fierce competition for human resources, especially in markets with a large fintech scene, can result in hiring and retention challenges when seeking high-quality analysis staff with relevant industry experience.	**Challenges:** • Providing training and support to staff on the effective exploration and analysis of data can be costly and time consuming. These costs may be partially mitigated by designing simple-to-use data visualizations that are flexible yet allow deep analysis. • Democratizing data and allowing access for analysis to relatively junior staff can remove the information differential between junior and senior staff. However, if improperly managed, such action may lead to discomfort among staff, especially if more junior, computer-literate staff are more comfortable with data analysis.

In reality, a combination of these two approaches will be effective in most situations. A dedicated analysis team can provide training and technical support, and can develop data visualization and analysis tools for individual teams. This team can also explore data across departments and generate novel insights that might fall outside the remit of any individual team or department. At the same time, subject-matter experts within other departments should be encouraged to mainstream data analysis into their everyday work to support better supervision, oversight and market understanding.

DEMOCRATIZATION, DATA SHARING AND LOWERING THE BAR

One of the most important things to consider is access to the data. While many financial regulators have a natural tendency to protect and silo data, this can be antagonistic to the goal of extracting the maximum value and insights from the data.

Data and insights are often locked away behind gatekeepers. The impact of these arrangements is illustrated by the following workflow within financial regulators:

1. The Governor of a central bank wants to know the value of remittances from a certain region of the country for the past month.

2. Assuming the data exists, a request is passed to the External Statistics department for the data.

3. The External Statistics department passes the request to a system administrator.

4. The system administrator formats an SQL query to extract the data from the relevant database.

5. The single figure is passed to the External Statistics department.

6. The External Statistics department passes this to the Governor.

7. The Governor looks at the single data point and realizes he needs the data for all regions to put this figure into context.

8. Steps 2–6 are repeated.

9. Once the data have been generated for all regions, the Governor notices an interesting pattern in the values bordering a neighbouring country and would like to understand the trends and changes in the values for these regions over the previous six months. She considers requesting the additional data from External Statistics, but as it has already been two weeks since her initial query, the urgency has passed and the request is not made.

This kind of workflow is typical in many institutions responsible for collecting and managing large datasets, and it is understandable when many regulators rely on older legacy systems and formal processes for requesting and accessing data. However, it is easy to see how this process is inefficient in terms of the person-hours and time it takes to access and generate a simple datapoint. Increasingly, insights need to be generated quickly, flexibly and responsively to inform decision-making. Systems and processes that create a barrier to this informed decision-making should be rethought.

New technologies provide many effective tools for sharing and analysing data. Business intelligence software is a class of software designed to allow data to be interrogated and explored using interactive visual interfaces. This software uses dashboards that allow users to filter and query content, and control its level, type and analysis. This system empowers dedicated data analysts with a set of tools to support their analysis and provides an opportunity for institutions to democratize access to data within their organization, thus allowing users more access and opportunities to proactively generate insights.

ORGANIZATIONAL READINESS?

Data-driven systems can only add value to institutions that are ready to drive policy and regulation from data-driven insights. In the conference paper 'Becoming a data-driven organization',[4] Mikael Berndtsson et al., propose the following tool for diagnosing the maturity level of an organization as it relates to becoming data-driven:

	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
Organization	No explicit Business Intelligence or analytics unit	A dedicated Business Intelligence unit established	Business Intelligence and advanced analytics are separate units	An organization-wide analytics team established
Technology	Mostly spreadsheets	Data warehouse in place	Data warehouse and data mining tools are used	Insights are operationalized as soon as possible
Decision process	HIPPO-culture (Highest Paid Person's Opinion)	Reports and dashboards are generated automatically and on demand	Test and learn the culture	(Semi) automatized decisions
People	Little trust in data and analytics	Mixed feelings about analytics	Self-service data warehouse Mixed feelings about advanced analytics	Self-service analytics
Analytics	Descriptive	Descriptive	Descriptive, predictive	Descriptive, predictive, prescriptive

If this is the first data-driven decision-support system implemented by the regulator, it should aim to be somewhere between a Level 2 and a Level 3 organization by the end of the project. While the organizational structure may take some time to adapt and change, there should be a reasonable level of trust in the data, analytics in general and the generated insights.

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4   www.researchgate.net/publication/328233575_Becoming_a_data-driven_organization

STEP 7: FEASIBILITY

DEFINING LIMITATIONS

The preceding steps should have given answers to the two key questions in this process:

KEY QUESTION: WHAT WOULD I KNOW IN AN IDEAL WORLD?

KEY QUESTION: WHAT LIMITATIONS EXIST IN THIS WORLD THAT WILL PREVENT ME FROM KNOWING EVERYTHING I WANT TO KNOW?

This step aims to classify the limitations into the hard and soft limitations and to determine the best possible system within real-world constraints.

HARD LIMITATIONS

Hard limitations are impossible or impractical to work around or mitigate, and may include the following:

HARD LIMITATION EXAMPLE	IMPLICATION
National policy prevents any government-managed data from being stored on a public cloud.	Any system will have to rely on local storage. This may significantly increase the initial project cost and the time and bureaucracy involved in allocating funding.
An entrenched internal policy requires that source code be made available for any system used by the regulator.	This type of policy may rule out the option of contracting a software-as-a-service provider that relies on proprietary code and could be unwilling to make their source code available. Some policies allow vendors to supply the source code relating only to features specifically designed or customized for the use of the central bank.
Lack of guaranteed ongoing funding.	A lack of funding, or even uncertainty of the availability of funding for subsequent years, can make it risky to implement a software-as-a-service solution for the collection and analysis of transaction-level data. Software-as-a-service requires the service user to pay the required annual license fee to continue using the system. If the license fee is not paid, the vendor can restrict or close access to the reporting and analysis functions. In these cases, users may feel more comfortable developing a system from the beginning although it may not be the most cost-effective or appropriate solution in terms of functionality.

HARD LIMITATION EXAMPLE	IMPLICATION
Procurement procedures and vendor availability.	Complex and restrictive procurement processes can prove a significant barrier if a central bank has to procure the services of an outside vendor to implement or develop the system. For example, some countries require government projects to use local companies, but suitable service providers may not be available in the local markets. This process can lead to limited system functionality determined by local capacity.

SOFT LIMITATIONS

Soft limitations may be overcome but would require a change in existing priorities to ensure adequate resources. Examples of soft limitations would include the following:

SOFT LIMITATION EXAMPLE	IMPLICATION AND MITIGATION
Lack of data for key variables, such as sex and location, within systems of reporting entities.	This is a common issue across markets. While the regulator can compel financial service providers to collect the required data going forward, the most likely implication is a delay in analysing transactions using the missing attributes. To reduce such delays, regulators could support the creation of definitive standards and templates for collecting required data. When Nepal Rastra Bank required financial service providers to report the exact location of their service points, it produced a data-collection app that service providers could use to capture and report data directly from the field.
Unfamiliarity with software-as-a-service licensing model and a lack of established procurement protocols for this type of service agreement.	Many regulators have limited exposure to new kinds of licensing where software is provided as a service rather than a piece of code. Further complications can arise from the use of an annual license fee rather than a one-off up-front cost. This type of license can require significant socialization within both the technical teams and procurement teams to help draw up the relevant processes and procedures.
Existing regulations and reporting requirements do not provide the regulator with the legitimacy to request transaction-level or highly disaggregated data.	If existing regulations rigidly define the data required from reporting entities and do not include requirements for data to be reported at the required level of granularity, this process can cause significant delay as it may require the passage of new regulations. In some countries, reporting entities may have the legal right to challenge the regulator's right to request transaction-level or highly disaggregated data, claiming it places an undue burden.
The existence of a data-reporting system that does not meet the required needs and would not allow for the relevant insights to be generated but would be extremely cheap and quick to implement.	This is a common scenario. The only way to combat this situation is to have defined use cases and needs, and to ensure that potential users of the data-driven insights will advocate for a system that meets their needs.

Policy requiring data-reporting systems to be developed in-house, combined with a lack of capacity or experience to develop the system required to meet the use cases defined.	While often an expensive and time-consuming barrier, any internal capacity limitations could be overcome either through training for existing staff or by supplementing the existing development team with a specialist either seconded to or recruited by the central bank.

EXERCISE 9:

USE THIS FRAMEWORK TO DEFINE THE HARD AND SOFT LIMITATIONS OF THE PARTICULAR ORGANIZATION AND OPERATING ENVIRONMENT

STEP 8: USE CASE AND DATA REQUIREMENT REFINEMENT

FINALISING USE CASES AND DATA REQUIREMENTS

You should now be in a position to revisit your use cases and data requirements and see which of these are impacted by the hard and soft limitations. Once this has been done, discussions and negotiations can help decide which of the soft limitations the regulator is prepared to address and overcome with consideration to the desired use cases.

From here you should be able to define:

- a final set of use cases

- the audiences for data and insights

- final data requirements and reporting templates

- the potential of the regulator to develop and manage the proposed system in-house

- the potential to adapt or exploit existing systems to meet the requirements of a remittances reporting and analysis system

- the potential to use turnkey supervisory-technology solutions under a software-as-a-service license

- available options for data storage, including existing capacity and infrastructure and the potential to exploit cloud-hosting applications.

STEP 9: COST–BENEFIT VS COST-INSIGHT

The previous sections should have allowed you to define and whittle down the available options and to answer the following questions, which are likely to have the greatest impact on the project's budget and effectiveness:

- Will data be collected in aggregate, highly disaggregated, or transaction-level form?

- Will a custom system be developed from the beginning or will a supervisory- technology solution be implemented, supported by an external service provider?

- How and where will data be hosted?

In some scenarios, the case for one option may be so overwhelming that the only remaining decisions are about system implementation. For example, Country A has a balance-of-payments reporting system that collects transaction-level data for all cross-border transfers, and it could easily accommodate the extra data for remittances. Country A is also highly dependent on remittances, which account for a high percentage of GDP. Two items prevent Country A from accessing and analysing these data at the transaction level: the transaction limit, which requires reporting transactions more than US$10,000, together with a method of effectively analysing this data to support policy. In this case, the investment required would probably be the effort to remove the financial-reporting limit and an investment in data-analysis tools and capacity. This case appears so strong that it does not require much more consideration.

However, in most cases, especially for countries with limited financial resources, the trade-offs may be less clear and more nuanced. For example, Country B's parliament has assigned the central bank the task of providing high-quality, timely, sex-disaggregated data to support policy development to increase the value of remittances through formal channels, and subsequently increase access to international capital markets. This process could be accomplished by requiring data providers to supply either highly disaggregated data or transaction-level data. In these cases, a decision-making framework can help this process.

COST–BENEFIT

A conventional tool that may help support such decision-making is a cost-benefit analysis that converts all value into a common currency. This tool allows decision makers to compare, for example, the expected costs of different options (i.e. the expected costs of a transaction-level reporting system or a highly aggregated reporting system) against the value of the expected outcome (in this case, the increased value of formal remittances).

Unfortunately, this methodology is particularly difficult to implement in this scenario, as the lack of accurate data about the remittance market is exactly the problem we are attempting to solve. In the case described above, the country wishes to increase the value of formal remittances, while recognizing the lack of quality data on the size of the informal remittance market together with a lack of detailed data about the formal market. This situation makes the valuation of any hypothetical data-driven policy or product design speculative at best. There are also great uncertainties about the type of insights that will emerge from the data, how readily they will lend themselves to producing value through data-driven policy or product design, and the timeframe of the intended outcomes. Additional uncertainties include the likelihood that not all costs will be borne by the central bank, as reporting institutions may have to adapt, upgrade, or develop new systems to comply with the new reporting requirements. These uncertainties can add significant complexity to the exercise due to the differences in service providers' existing systems. For example, a bank with several siloed, legacy systems is likely to have to invest more than a newer, digital-focused fintech provider with newer systems and a focus on internal use of data.

However, even with these limitations, the exercise of estimating potential impact in currency terms can be instructive and provide context when considering a suitable budget for the proposed system. For example, according to data from the Nepal Rastra Bank,[5] the value of formal remittances coming into Nepal in the fiscal year to July 2020 was approximately $7.2 billion. So, if a remittances reporting and analysis system provided insights that contributed to policies or products that increased formal remittances by 5 percent, this would represent an increase of more than $350 million or approximately 1 percent of GDP per year.

COST-INSIGHT

Cost-insight is a complementary tool that can be used to consider the costs of implementing a system to meet the use cases and needs defined through the exercises in this guide. Where cost−benefit asks:

'How much monetary value will be created by this action?'

cost-insight asks:

'How much would I pay to be able to better understand and influence the economy?'

Reframing this question, as shown above, emphasizes the insights and knowledge that the system can generate, rather than trying to calculate the monetary value of the actions that could be taken from those insights, which would likely be taken by a wider array of governmental bodies and private-sector actors than just the central bank. This tool places the central bank at the centre of the market, in a position to provide insights to grow the market.

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[5]   www.nrb.org.np/contents/uploads/2021/08/Annual-Report-2019-20-English.pdf

For example, in Ethiopia, the value of remittances according to the Central Bank's estimations is around $5-6 billion per year, although this uses a conservative estimate of informal remittances. This is equivalent to approximately 5 percent of GDP and is around three times greater than the value of foreign exchange generated through exports[6]. Despite their obvious economic importance, little is currently known about this vital inflow of foreign currency. Data are only disaggregated by country of origin and whether the transfer service was provided by a bank or money transfer operator.

The crucial question could be framed as how much would you pay to better understand and be able to influence a flow of foreign currency that covers 35 percent of the value of imports and accounts for 5 percent of GDP?

Ethiopia's remittance market has a high percentage of informal transfers[7] and estimates of the size of this market vary significantly. However, no one disputes that the size of the informal market is significant. This informality has significant macroeconomic impacts. As informal flows cannot be accurately quantified, capital markets are unlikely to consider them when establishing credit ratings and pricing bonds. Informal flows also deprive the country of the foreign currency reserves required to pay for imports, which can stifle businesses and impact foreign investment.

Without such detailed remittance-market information that a transaction-level remittance reporting and analysis system would provide, the tools available to decision makers to influence this situation are instinct and gut feeling.

In the cost-insight framing, the question becomes: '**How much is it worth to have the information to understand and influence the drivers of remittance formality?**'

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[6]   www.theigc.org/blog/pass-through-shocks-and-income-the-impact-of-covid-19-on-remittances-in-ethiopia/
[7]   https://cenfri.org/wp-content/uploads/2018/11/Barriers-study-volume-4-Remittances-in-Ethiopia_November-2018.pdf

STEP 10: DEVELOPING A SYSTEM MODEL

With all these questions answered, you should now be in a good position to start modelling your remittances reporting and analysis system, which should allow you to draft functional and business specifications for your in-house development team or an external vendor. A sample model for a remittances reporting and analysis system can be found in the accompanying paper *A model for the systematic capture, management and analysis of remittance data by central banks*, which will guide you through the next steps.

TOOLS AND GUIDES

UNCDF MIGRATION AND REMITTANCES PROGRAMME

This guide is part of a library of open-source guides and toolkits published by the UNCDF Migration and Remittances Programme to share the methods developed by the programme for enabling the flow of digital remittances. These guides and toolkits are designed for a variety of audiences, from development practitioners to remittance service providers, and are available across the four workstreams in which UNCDF operates:

Enabling policy and regulation	Inclusive innovation	Empowered customers	Open digital payment ecosystem

The complete library of guides and toolkits is available here.

This guide is part of the work under the enabling policy and regulations workstream, which is informed by the enabling policy and regulations framework.

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