



Impact Pathways Methodology

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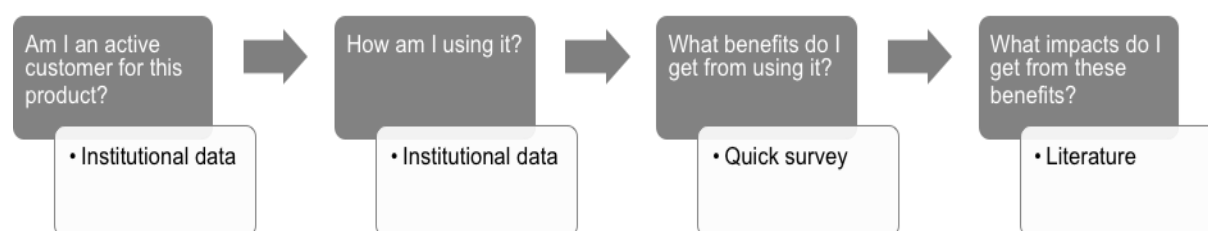
The Impact Pathways methodology explained

The United Nations Capital Development Fund's (UNCDF) Pacific Financial Inclusion Programme (PFIP) is mandated to increase access to and usage of financial services for underbanked and unbanked communities in the Pacific. The programme does this by focusing on three workstreams—financial innovation, policy and regulation, and consumer empowerment—to provide a comprehensive approach to financial inclusion.

Worldwide, as a result of efforts by many stakeholders, access to and usage of financial services have grown exponentially, but evidence of impact has been less clear. Macroeconomic effects appear to positively impact economic growth, reduce inequality and empower women, as shown in an International Monetary Fund discussion paper (Sahay *et al.*, 2015) and a study of the impact of M-PESA in Kenya (Suri and Jack, 2016). Klapper, Demirguc-Kunt and Singer (2017) have drawn together the micro and macro literature to provide additional support for the importance of financial inclusion. Nevertheless, the impact on individual households has been less easy to quantify. Randomized control tests have generally shown mild effects on productivity growth or household consumption, which cannot be described as transformational, especially for women or the poorest members of society.

One reason it has been difficult to show household-specific impact is that financial inclusion has a **range of interwoven effects** on household well-being that may not trigger a large swing in specific indicators. A second reason is that **effects may be long-term** and difficult to capture in the study period.

This has created a dilemma for the financial inclusion community: how to demonstrate the effects of its substantial investment in financial inclusion. This formed the impetus for a new approach to impact measurement pioneered by UNCDF in the Pacific, with conceptual and technical support from BFA. This approach complements existing rigorous evaluation methods by focusing on specific customers of financial services. It uses light-touch methods to understand their actual behaviour and identify the benefits that customers associate with financial tools. Our method then uses relevant literature to extrapolate the impacts that customers may receive.



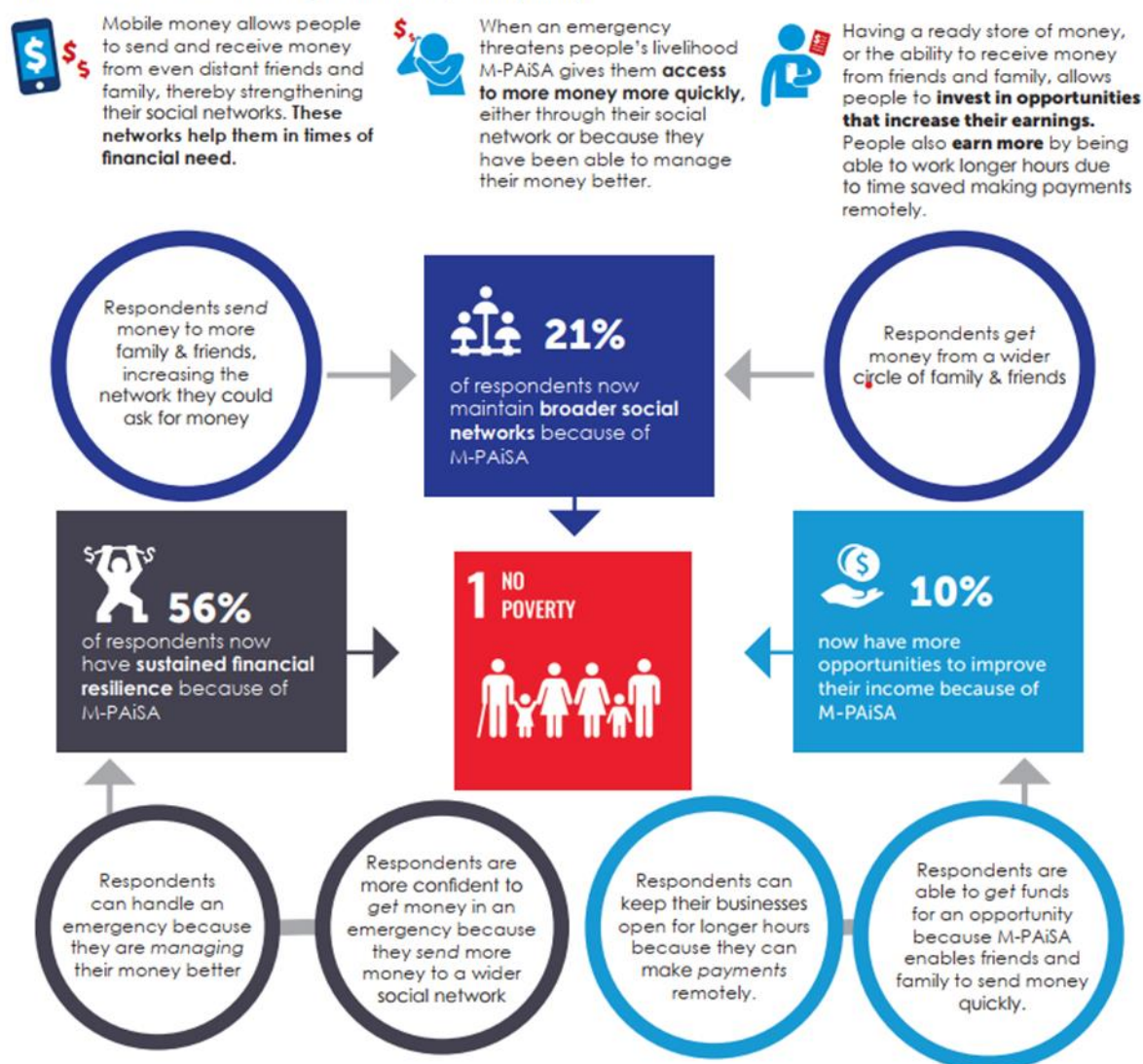
The result is a customer-centred approach that focuses on understanding how customers experience value. It complements the costlier academic research methods with a combination of qualitative and quantitative methods to produce quick results that can contribute to shorter-term project design choices. This method is particularly suited to development initiatives that are implemented within a time-frame and budget that prohibit academic studies of impact. Because the approach is light-touch and low-cost, it can be repeated frequently, allowing programme managers to follow trends in usage, benefits and impacts.

The Impact Pathways methodology allows a programme to quantify impact and identify

where it is having the most success in achieving development objectives. Figure 1 is an example of the type of summary results that the tool produces, in this case for [the Vodafone case study](#).

Figure 1. Snapshot of the Vodafone Explainer Tool results

Unsurprisingly, there are multiple pathways to **SDG 1: No Poverty** from the usage of M-PAiSA. Several of the benefits reported by M-PAiSA users can help users **get out and stay out of poverty**.



The Impact Pathways framework was developed by UNCDF in the Pacific based on the examination of existing data reported by grantees and taking into consideration the capacity of grantees to administer short surveys, while also respecting stakeholders' interests and concerns around impact measurement. The aim of this impact measurement approach is to get maximum value out of the existing data and complement it with light survey data and an annual, more in-depth analysis of customer transaction data.

UNCDF applied the methodology in Fiji, Papua New Guinea, Solomon Islands and Zambia. A comparative analysis of these four case studies, [Mapping the Benefits of](#)

[Financial Inclusion](#), helps identify the range of different ways in which financial services create benefits for their users, and a number of trends, both specific to each country and across the four case studies. We invite other organizations to apply the methodology to their own portfolios, and welcome any proposed improvements relating to design, ease of use and presentation of results. We hope to promote a community of practice that will contribute to constantly refining the methodology.

This Impact Pathway methodology contains an overall guide to the conceptual framework, an instruction manual explaining how to execute the various elements of the framework, instructions for assigning customers to specific use cases and for conducting phone surveys, and a literature annex. The [annex](#) is a compendium of relevant academic and grey literature that provides the back-up to all the weightings used in the methodology and helped develop the overall picture of impact.

All other Impact Pathways publications can be found at <https://www.uncdf.org/impact-pathways/home>.

Part 1: Conceptual framework

This section explains the conceptual approach, with details about use case, impact pathways, benefits and goals. It includes methodological details about what institutions can and cannot capture on a regular (monthly or quarterly) basis. It assumes throughout that only active accounts will be considered against each use case.

Use cases

Six use cases have been identified that capture the various ways in which people use financial services to manage their money and, therefore, their lives. The use cases are defined in Table 1. The proposed use cases were 'stress-tested' by considering literature and research on how and why people use financial services. Transaction data from a range of financial institutions were analysed to see how these use cases could be observed in customer behaviour (Amin, 2015 and GAFIS, 2014). As such, the use cases are based not only on our theoretical understanding of the possible ways in which people could use financial services, but also observation of the ways in which they actually do use them.

Table 1. How does a digital finance market development approach work?

USE CASE	DEFINITION
MANAGE	Stretch money during the short term (< 1 month)
	In many instances, we saw that the incomes and expenses of low-income people were not well matched. Expenses such as food recurred daily, while salaries were monthly. Rent was monthly, yet labourers were paid weekly. Poor families struggled to stretch their money across the month, and engaged with financial instruments to help meet financial needs throughout the month (indeed the entire Mexico Financial Diaries report is entitled 'Stretching the Budget' (Sanford, 2015)); more description of this effort is in the Kenya Financial Diaries report (Zollmann, 2016).
PROTECT	Retain or have the right to receive a usefully large lump sum
	Everyone encounters negative financial shocks across their lifetime, from health emergencies to harvest losses. People use various financial products to protect against these shocks, including saving, borrowing and insurance. The impact of using financial products to assist with PROTECT is quite well established (see recent review articles (Klapper, Demircuc-Kunt and Singer, 2017; Robert, Tilman and Nina, 2014)).
PAY	<ul style="list-style-type: none"> • Make bill payments • Send money to another person digitally and directly • Pay for a purchase
	While making a payment appears like a mundane function, the benefits of reducing transaction costs extend beyond the immediate costs saved (in money, time and effort) to larger financial networks, better resilience and better ability to seize opportunities. These effects have been documented by Jack and Suri in their papers on the impact of M-PESA in Kenya (Jack and Suri, 2014; Suri and Jack, 2016).
	Switching to digital payments can help users develop a credit history and bring millions of new users into the financial system, as happened in Kenya with the introduction of the mobile banking product M-Shwari (Cook and McKay, 2015). It can also improve crime rates, as has been

INFORM	shown in the USA (Wright <i>et al.</i> , 2014).
	<ul style="list-style-type: none"> • Check balance • Access customer support to help use this instrument to oversee my finances
	Although there is little literature to support the importance of INFORM as a use case, the high level of usage of balance checks and customer services is testament to the value customers attribute to this function. Logically, INFORM is an important contributor to financial capability and is included in measures of financial capability across the world, including, for example, the UK 2015 Financial Capability Survey (Money Advice Service, 2015).
GET	Receive a payment (salary, remittance, government payment, insurance claim payout)
	In the Pacific Islands, where remittances constitute a significant share of national income, and where average remittance costs are high (International Organization for Migration Fiji, 2020), GET is an important function. But it also applies to time and money saved by avoiding cashing in paychecks manually or waiting for social transfer payments. The benefits from streamlining the GET use case can be substantial, as shown in the review by Klapper <i>et al.</i> (2017).
GROW	GROW assets by having the ability to save up (savings) or pay down (loans)
	Collins <i>et al.</i> (2009) and Rutherford (2001) point out that low-income households can GROW ‘usefully large lump sums’ (which they see as equivalent to a month of income) in one financial instrument. These lump sums can be created in savings, loans and insurance instruments, and the funds can be put to emergency, life-cycle and opportunity uses. In this way, savings might be considered accumulators or ‘saving up’, while loans might be considered accelerators or ‘saving down’. These are, therefore, usefully lump sums that can ‘grow’ within a financial instrument.

During the field-testing of the methodology, the names and definitions of the use cases evolved significantly, in response to the realities on the ground. Some of the alternative options that were explored are described in [Annex 4](#).

Table 2. Financial instruments and their associated use cases

Financial instrument	Use case	Narrative description of use cases
Mobile money wallet	MANAGE	Stretch lump sums over the course of a shorter period (< 1 month)
	PROTECT	Retain or enable customer to receive and retain usefully large lump sum
	PAY	Make bill payments Send money directly to another person digitally Pay for a purchase
	INFORM	Check balance Access customer support to help me use this instrument to be in charge of my finances
	GET	Receive a payment (salary, remittance, government payment)

Transaction account	MANAGE	Stretch money during the short term (< 1 month)
	PAY	Make bill payments Send money to another person digitally and directly Pay for a purchase
	INFORM	Check my balance Access customer support to help me use this instrument to be in charge of my finances
	GET	Receive a payment (salary, remittance, government payment)
Savings account	MANAGE	Stretch money during the short term (< 1 month)
	PAY	Make bill payments Send money to another person digitally and directly Pay for a purchase
	PROTECT	Retain or have the right to receive a usefully large lump sum; this use case typically has a long-term horizon (> 1 year)
	INFORM	Check my balance Access customer support to help me use this instrument to be in charge of my finances
	GET	Receive a payment (salary, remittance, government payment)
Loan	GROW	Having ability to save up (savings) or pay down (loans)
Short-term credit (<= 1 month)	GROW	Having ability to save up (savings) or pay down (loans)
	PROTECT	Retain or have the right to receive a usefully large lump sum
Saving groups	GROW	Having ability to save up (savings) or pay down (loans)
	PROTECT	Retain or have the right to receive a usefully large lump sum
Insurance	PROTECT	Retain or have the right to receive a usefully large lump sum
	GET	Receive a payment (receive insurance payout for a claim)
Pension fund contributions	PROTECT	Retain or have the right to receive a usefully large lump sum
Education savings account	PROTECT	Retain or have the right to receive a usefully large lump sum

Why we ascribe many use cases to each financial instrument

To properly visualize the impact that financial instruments have on the lives of low-income customers, we need to first assess the potential use cases of each financial instrument and then look at how customers are actually using it. Previous experience shows that people use instruments in a variety of ways, and this is confirmed by looking at transaction behaviour for a range of instruments. A simplified transaction account, for example, might be intended by the service provider simply to 'transact' or 'manage' money with many transactions and low balances. However, it is entirely possible to use it in other ways, and people frequently use current accounts to 'save' over periods of time, causing many a bank manager to complain that customers are not using the products as intended. It is also worth noting that any limitations placed on the account holders will naturally reduce the number of use cases that the account can be used for. For example, some accounts can be used to receive money but not to pay for goods. It is, therefore, important to map out the range of potential use cases that relate to a specific instrument. The more use cases an instrument can allow, the higher chances are people use this product, and the more benefits it is likely to create.

Mapping financial instruments to use cases using estimated discount rates

To understand how to assign customers to use cases, PFIP examined customer data provided by financial institutions. Ideally, an in-depth analysis of customer transactions would take place, on the basis of which active customers (i.e. those who have used the product within a period of time specific to the financial institution) would be assigned to each use case. In cases where this is not possible, UNCDF used discount rates to assign active customers to each use case.

The discount rates are based on analysis of transaction data from financial institutions in other countries, as well as studies and data on the lives of low-income people. The discount rates only provide an initial, lower estimate of the possible impacts as the portfolio progresses. Over time, the discount rates will be increasingly accurate as the number of transactions analysed increases and more surveys are conducted. The discount rates have been designed to minimize double-counting.

Please see the [Measurement and Metrics](#) section on how to apply the discount rates.

Mapping customers to use cases: Transaction analysis

These transaction data allow us to identify which use cases the customer is using the account for. We know from our analysis of bank accounts that even if an account is not structured for a particular use, customers will use it in whatever way they find most helpful to them. As alluded to before, just because an account is a transaction account does not mean that a customer cannot use it to save or PROTECT a lump sum of money. It may be the only tool they have for keeping it safe.

To do this, we look at transaction-level data from the institutions that are offering the instrument. In many cases there are not many potential use case pathways that the instrument can offer. For example, we know from the nature of the instrument which pathway an active client is on, such as in the case of someone investing in a pension fund, where they can only use the instrument to GROW. In other situations, such as in the case of a bank account or mobile money wallet, there are a multitude of possible use cases and pathways that an active customer could be on.

This in-depth analysis will also be used to update the discount rates to ensure that the use case estimates are appropriate to the Pacific Island context as it evolves (i.e. protect is X percent; manage is X percent of accounts etc.).

Benefits and goals

Once we have mapped the portfolio to the use cases using estimated discount rates, we want to know whether the active customers are on a pathway to impact. We answer this question by establishing a set of benefits that active customers could be getting from their financial products and then mapping these benefits to the end goals that a financial inclusion portfolio might be seeking. Research literature, surveys and transactional data are required to help pave the impact pathway from benefits to goals.

Benefits play a critical step in the pathway. They enable institutions to track incremental progress, which might be short-lived but is a key step in helping customers reach larger goals (i.e. gender equality). Identifying benefits lets institutions identify areas in which positive outcomes are being created and helps them understand the multitude of effects that an instrument's use can have on a consumer's life. They also help disaggregate positive outcomes, which further helps connect use cases to larger goals.

Benefits

Use cases can tell us about what can be done with a financial instrument, but how do we know whether there is a benefit to the customer or not? Though the transaction-level data tell us what use case an active customer of a tool might be engaged in, it does not tell us what their intentions are when using the instrument, nor whether it results in a discernible benefit. Therefore, we will complement the transaction-level data with a set of qualitative questions put directly to the customer.

They serve two purposes:

- To act as a splitter, allowing us to identify the outcome that the customer intended from a particular use of an instrument
- To confirm and attribute the benefit created by using the financial instrument.

Goals

As we connect use cases to a variety of potential benefits using discount rates, we begin to gain a better understanding of the multitude of ways in which financial services can exert their influence on the lives of low-income people. Moreover, because we narrow down the sample size to customers who are on the pathway (using transaction analysis and surveys), we can then determine whether or not the financial instrument is producing the benefit that we might have expected.

However, simply using an instrument for a year and feeling that it has a benefit does not necessarily mean that the instrument will have a long-term impact on the poverty level, living standards and other factors that affect the lives of low-income people. To confirm the impact across a population, we would need to see sustained levels of use and consistently reported benefits.

That said, as we gain a better understanding of how the benefits impact people's lives, we can start to identify potential pathways between the benefits and specific Sustainable Development Goals (SDGs). To confirm the existence of these pathways, we would need to go one step further.

Research literature: Paving impact pathways from benefits to goals

As we consider the final stages of our impact pathways journey from benefits to goals, we have found that there are several ways in which we can complete the journey.

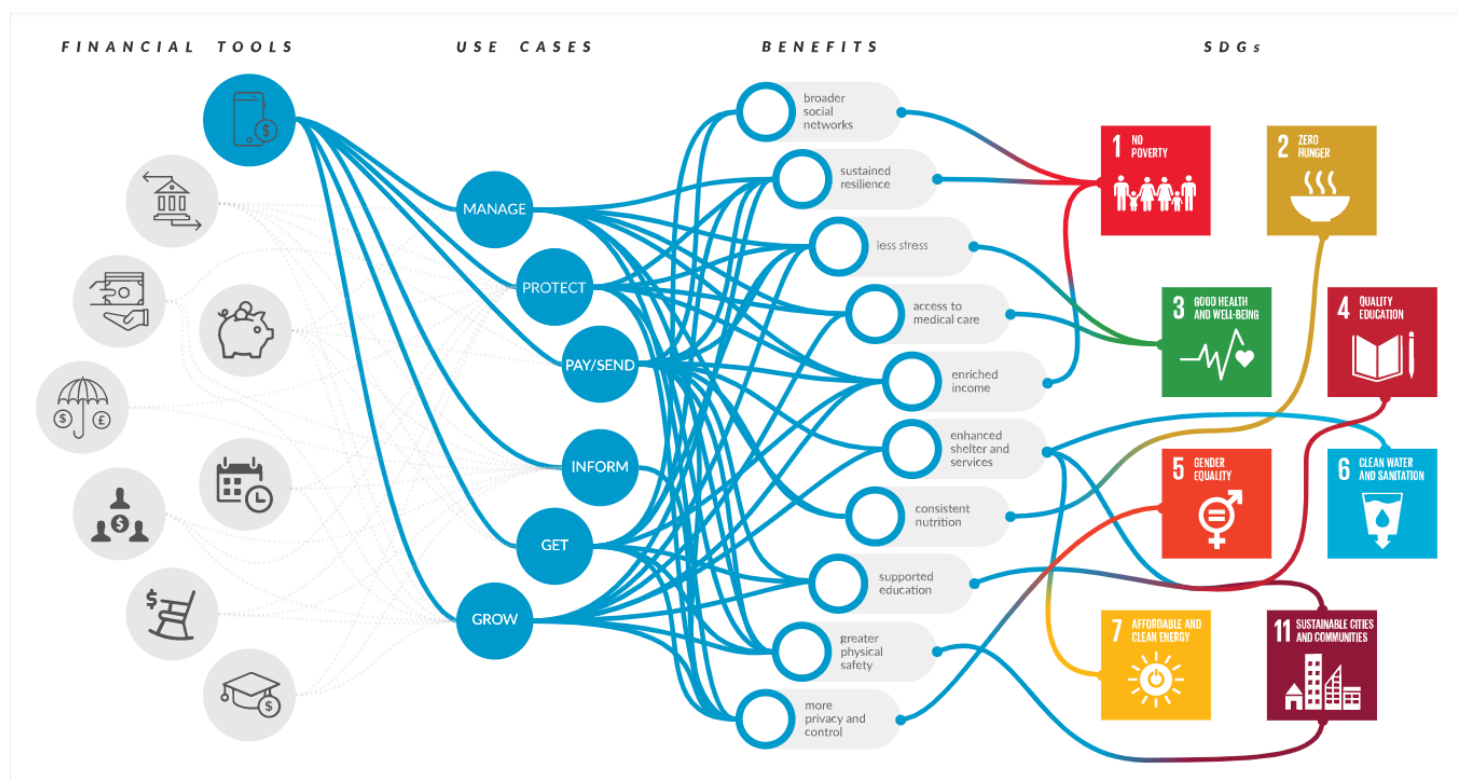
Some benefits lead quite directly to goals, which can be confirmed through customer surveys. For example, for the benefit ENHANCED SHELTER AND SERVICES, the impact is felt immediately and can be verified immediately by the consumer. For example, if a consumer says that they were able to buy a solar lamp because of a payment facility, and they attribute this to the product, then they have verified that the product has helped them achieve the goal of affordable and cleaner energy.

Other benefits are either less tangible or take more time to achieve. For example, a consumer might say that a product helped him feel less anxious about caring for his family in an emergency and this brings him the benefit of LESS STRESS. There is extensive literature that ties financial stress of poverty to the prevalence of mental health issues and suicide rates and which suggest that decreasing the (often substantial) stress of a low-income person may eventually lead to improved health, and thereby to SDG 3: good health and well-being. But whether the benefit of LESS STRESS is likely to

lead to good health and well-being is not firmly established. In such instances, we will need to rely on the literature research to provide us with estimates of impact.

Therefore, at least part of the final portion of our impact pathway journey will be a theoretical one, using the results of research conducted on comparable populations. We use this to substantiate the existence of a pathway between a set of benefits and goals. The Impact Pathways infographic showcases the links from financial tools to use cases, to benefits and the SDGs.

Table 3. Snapshot of Impact Pathways infographic, visualizing the pathways from financial tools to use cases to benefits and the SDGs



Survey questions

We reviewed the collected data points and assessed whether the existing data collected quarterly by PFIP (which is aggregated at the partner level) were sufficient to add to the pathway or whether further data collection was necessary. We decided that it would be important to confirm with clients whether they are indeed using the product as suggested and what benefits they perceive from this use. The client-level survey questions enable us to ascribe a use case to a benefit and then a benefit to a specific goal, and it walks a fine line between academic robustness and the ability to operationalize a lean method. The preferred method for surveying customers is to add questions to ongoing consumer satisfaction surveys, which are conducted regularly by institutions to gauge their clients' satisfaction. The aim is to simply tack a few (3–5) questions onto the consumer satisfaction surveys to keep the survey as lean as possible. With this in mind, it is preferable to have fewer questions that accurately target those who fall into specific use cases. The survey should be conducted annually in conjunction with the transaction data analysis.

The measurement methodology aims to suggest causal links between a result in a client's life and a specific financial intervention, and it can be difficult to ascertain from the data whether the customers recognize this link themselves. Therefore, we have

decided to ask not just whether customers' lives had changed since they began using the product, but also a second question asking whether they consider this to be as a result of the product in question. Although this increases the number of survey questions, it also helps strengthen claims of attribution, at least from the client's perspective, and allows programmes to make stronger statements, such as 'In the opinion of x clients, the product introduced increased their resilience, bringing them closer to the end goal of emerging from poverty.'

Given our findings noted above, it can be challenging to ascribe MANAGE and PROTECT use cases to account holders without having access to their individual transaction data. In some cases, it is critical to conduct qualitative phone surveys with customers using the same product over a two-year span or longer. This level of persistence enables the measurement of impact and confirmation of the impact pathways. Table 4 lists the various use cases and the first question that we would ask to tie them to a benefit. The second question for all of these is 'Would you attribute this change to this product?' For all of these questions, we would ask customers to select from three possible responses: 'Substantially', 'Partially' or 'Not at all'. This builds more subtlety into the survey responses than simple yes/no responses while maintaining a lean approach. The potential benefits described here are supported by extensive academic literature (see [Annex 1](#)).

Table 4. Survey: Use cases and associated benefits

Use case	Survey questions that measure whether a customer experienced a benefit	Survey questions that measure whether a customer attributes one or more benefits to the product	Benefit(s)	Survey questions that measure whether a customer receiving a benefit is on the path towards achieving a goal	Goals
MANAGE	Are you better able to make your money last through the month since starting to use this product?	Would you attribute this change to the product?	Smoother consumption	Do you eat better food through the month? Are you better able to buy medications if you need them? Are you able to take safer transport throughout the month? Are you able to buy what is needed for school throughout the month? Are you able to save or invest more?	SDG 2: Zero hunger SDG 3: Good health and well-being SDG 3: Good health and well-being SDG 4: Quality education SDG 1: No poverty
	Have you felt that your money is safer since you started using this product?	Would you attribute this change to the product?	Increased security		SDG 11: Sustainable cities, communities and housing
	Do you worry less about how you will pay your bills and/or expenses since you started using this product?	Would you attribute this change to the product?	Less stress		SDG 3: Good health and well-being
	Do you spend less time and money performing financial transactions since you started using this product?	Would you attribute this change to the product?	Greater efficiency	Do you save time that you now spend being productive at home/work/in your business? Do your financial transactions cost less?	SDG 1: No poverty
PROTECT	Have you felt more willing to take advantage of potential	Would you attribute this change to the	Enriched income		SDG 1: No poverty

PAY	opportunities (business, land, housing) since you started using this product?	product?			
	Are you more confident about handling an emergency or looking after yourself and your family since you started using this product?	Would you attribute this change to the product?	Increased resilience		SDG 1: No poverty
	Are you less anxious about handling an emergency or looking after yourself and your family since you started using this product?	Would you attribute this change to the product?	Less stress		SDG 3: Good health and well-being
	Have you been able to access additional services such as utilities, school, credit etc. since you started using this product?	Would you attribute this change to the product?	Improved access to resources	Do you have better access to energy/utility services? Do you have more hours of electric light than before? Do you have better access to water? Do you have better access to sanitation? Do you feel able to extend the education of your children? Are you able to access loans/credit? Do you have access to better, lower-priced inputs for agriculture? Do you have access to better or lower-priced inputs for business?	SDG 7: Affordable and clean energy SDG 4: Quality education SDG 6: Clean water and sanitation SDG 6: Clean water and sanitation SDG 4: Quality education SDG 1: No poverty SDG 2: Zero hunger SDG 1: No poverty SDG 1: No poverty
	Have you sent more money to more people since you started	Would you attribute this change to the	Stronger social		

INFORM	using this product? Has your personal safety increased since you started using this product?	product? Would you attribute this change to the product?	networks Increased personal safety		SDG 11: Sustainable cities, communities and housing SDG 1: No poverty
	Do you spend less time and money doing financial transactions since you started using this product?	Would you attribute this change to the product?	Greater efficiency	Do you save time that you now spend being productive at home/work/in your business? Do your financial transactions cost less?	SDG 1: No poverty
	Are you better able to plan how you spend your money since using this product?	Would you attribute this change to the product?	Smoother consumption	Do you eat better food through the month? Are you better able to buy medications if you need them? Are you able to take safer transport throughout the month? Are you able to buy what is needed for school throughout the month?	SDG 2: Zero hunger SDG 3: Good health and well-being SDG 3: Good health and well-being SDG 4: Quality education SDG 5: Gender equality
	Since adopting this product do you have more privacy and control over your money? Given these features (balance enquiry), are you better able to manage your money? Are you able to pay for better education since you started using this product? Have you been better able to keep your business going since you started using this product? Have you been able to invest more in your crops since you	Would you attribute this change to the product? Would you attribute this change to the product? Would you attribute this change to the product? Would you attribute this change to the product?	Greater control and privacy Greater control and privacy Improved access to resources Increased income Increased income	Have these investments been profitable? Have you been able to sell more crops as a result?	SDG 5: Gender equality SDG 4: Quality education SDG 1: No poverty SDG 1: No poverty
PROTECT					

GET	started using this product?	product?		Have you been able to eat better as a result?	SDG 2: Zero hunger SDG 11: Sustainable cities, communities and housing
	Have you been able to invest in your house since using this product?	Would you attribute this change to the product?	Improved access to resources		
	Have you been able to invest in better transportation?	Would you attribute this change to the product?	Improved access to resources		SDG 11: Sustainable cities, communities and housing SDG 4: Quality education
	Have you been able to invest in improving access to electricity in your house since you started using this product?	Would you attribute this change to the product?	Improved access to resources	If so, do you have more hours of light for children to study?	
	Have you been able to invest in better water and/or sanitation at your home?	Would you attribute this change to the product?	Improved access to resources		SDG 7: Affordable and clean energy SDG 6: Clean water and sanitation SDG 3: Good health and well-being
	Were you able to get a medical procedure done since you have started using this product?	Would you attribute this change to the product?	Improved access to resources		
	Are you able to receive social benefit payments without interruption?	Would you attribute this change to the product?	Increased income		SDG 1: No poverty
	Are you able to call on a wider group of people for assistance when something unexpected happens?	Would you attribute this change to the product?	Stronger social networks		SDG 1: No poverty
	Has your personal safety increased since you started using	Would you attribute this change to the	Increased personal		SDG 11: Sustainable cities,

this product?	product?	safety		communities and housing
Do you spend less time and money to receive funds since you started using this product?	Would you attribute this change to the product?	Greater efficiency	Do you save time that you now spend being productive at home/work/in your business?	SDG 1: No poverty
Were you able to receive an insurance payout because you used this product?	(Note: Because the question is specific to the insurance payout, no need to ask attribution questions.)	Increased income	Do your financial transactions cost less?	SDG 1: No poverty
Were you able to receive an insurance payout more quickly because you used this product?	(Note: Because the question is specific to the insurance payout, no need to ask attribution questions.)	Less stress		SDG 3: Good health and well-being

Part 2: Measurement and metrics

Data collection and assigning customers to use cases

UNCDF in the Pacific has designed this methodology to be used over a number of years to help understand impact and help guide investment decisions. The framework will be adjusted and updated to include lessons learned, and will incorporate new findings in the field of financial inclusion and development that might help refine the benefits and their links to goals.

The Impact Pathway methodology comprises the following:

- 1) **Monthly/quarterly data collection: Assigning users to use cases**
 - a) Can be done at the beginning or when a new institution or product joins the portfolio, and updated every time reports are received
 - b) Assign financial products to use cases based on estimated discount rates
 - c) Fill in the active user numbers from recent periodic reports received from financial institutions
 - d) Calculate estimated use case numbers.
- 2) **Annually: Ascribing benefits and goals to the portfolio**
 - a) Undertake customer surveys to identify benefits and link them to goals
 - b) Enter survey results
 - c) Analyse estimated benefits and goals.
- 3) **Periodically (annually or every two years): Fine-tune model with full transaction analysis**
 - a) Analyse customer transactions to assign each customer to particular use cases
 - b) Update the accurate percentages of customers in each use case
 - c) Review the results of the customer transaction analysis, customer surveys and other information (such as external surveys or institutional feedback) to understand whether the model needs adjustment or revision
 - d) Update the discount rates for the subsequent year. The accuracy of the discount rates will increase with a larger sample size.

Assigning users to use cases

This section includes a description of how to use transaction data collected from the institutions to apply to use cases. It also includes instructions on how to conduct an annual deep dive into the data and a description of the data specifications to request from institutions. We have also included a description of what a data scientist would need to do for the deep dives.

Data request specification sheet

The typical data request comprises the following data items from the institutions:

- **Customer information:** Date of birth, gender, enrolment date, geographical information, demographic information
- **Savings account information:** Account type, status of account, opening date, opening balance, place account was opened and other account specifics
- **Savings account transactions:** Date and time, amount, type (deposit, withdrawal, transfer, tax, fees etc.), channel and other transaction specifics
- **Savings account balance information:** End-of-day balance for each account, for the entire duration for which data are retrieved

- **Initial credit/loan account information:** Account type, branch office, credit officer, date of disbursement, date of maturity, amount disbursed, interest rate, repayment frequency, fees, commissions, guarantor and collateral
- **Current credit/loan account information:** Principal outstanding, interest collected, status and, if applicable, days overdue, principal amount overdue, interest accrued but not paid, other overdue amounts
- **Expected repayment schedule:** Expected date of repayment, expected total amount, expected principal repayment, expected interest repayment, other fees and collections to be paid
- **Actual credit/loan repayment schedule:** Date of repayment, total amount, principal repaid, interest repaid, other fees and collections.

Period of coverage: 3 years of data at least

Note that these are granular data—i.e. they must be identifiable as belonging to individual customers, accounts and transactions.

Here are some Do's and Don'ts to keep in mind when handling data extraction from a client:

Do ...	Don't ...
<ul style="list-style-type: none"> • Ask for the data in a flat-file or database format you are comfortable handling. • Provide a secure protocol for file transfer. FTP works well for online exchanges. • Ask for data that are stripped of names and identifying information except for a numerical identifier. • Budget for multiple iterations of the data pull, especially the first time, as this is often the first time the client is asked for 'everything'. 	<ul style="list-style-type: none"> • Allow anything short of completely granular data to be submitted—any degree of aggregation can lead to information loss. • Accept data in any other format than the one stipulated—it is not worth the time trying to learn about the specifics of a database, for example.

Overview of steps of analysis

The overall process can be broken down into three parts: validation and verification of obtained data, harmonization to internal protocols, and analytics based on project needs. The data scientist performs all the analysis, although it is helpful to share results with an analyst from the institution itself to see if the results resonate with their understanding of their customers' activities. Moreover, institutions will value receiving a new perspective on the transactional behaviour of their customer base.

Data validation and verification

Check for consistency and accuracy of data, such as:

- All numeric fields have just numbers
- Missing values are properly noted (NULL values preferred)
- Date fields follow consistent formats (YYYY-MM-DD, or some variation thereof, preferred)
- The number of accounts or individuals on whom data are reported over time follows a reasonable trend; lack of a trend may indicate missing data
- The debit and credit transactions in any given month do add up to the difference between the opening and closing balances for the month; if not, transaction data are missing
- There is no duplication of data—this can happen during manual, bulk pulls; best checked by various unique IDs.

Data harmonization

This is the translation from 'their' format to 'our' format, and is related to both form and content. Presumably, they have a set-up to store relatively large amounts of data (1–100 GB), but not so large as to require distributed computing resources. Note that this is not the SFTP site mentioned above, which is for data transfers; this is for the actual processing of data.

Ideally, your internal data warehouse follows a similar structure to what was described in the specification sheet: there are 'tables' for customers, accounts and transactions. While it may seem reasonable to assume that the data sent by a client could simply be dumped into this warehouse, given similar architectures, the reality is often that significant translation needs to happen to ensure that fields mean the same thing across clients. Interest rates, for example, can have different definitions.

The warehouse also contains derived fields from the raw data that are always calculated. These represent a first layer of aggregation and provide useful information on their own but can be further processed. Some of these derived fields include:

- Running daily balances, if only monthly are provided
- Average monthly balance
- Frequency and amount of transaction types
- Running delinquency records
- Running prepayment records.

One final component of harmonization is using a data dictionary to translate transactions seen in the raw data to predefined buckets used in the warehouse. Usually this involves mapping between specific codes, but in some cases it can be more subjective, where either manually annotated notes must be mapped or where the transaction code is constructed by imputing from other data points.

Data analytics

The exact nature of the data analytics conducted depends on the needs of the project. Some common ones to consider running to understand the underlying behaviour of an institution's customers are:

- Segmentation analysis: This is simple 'glorified cross-tabulations', where variables of interest are reported against some other variable(s) of interest. Segmentations are particularly useful in giving a first view of a portfolio that may not have been analysed before. They help plot the way for future analysis. This allows us, for example, to see if the savings behaviour of self-employed women differs from that of salaried men.
- Vintage analysis: Most financial data have a strong time-series component. Client behaviour changes over time and can even change over the lifetime of engagement with a single product. By comparing the behavioural changes from month to month, useful information can be gleaned about the underlying momentum of the portfolio. This is particularly effective for metrics such as delinquency, where the probability of incidence of the phenomenon changes with age.
- 'Cluster' analysis: Clients and products can be grouped together based on underlying properties. Studying clustering behaviour is particularly useful if additional data sources, such as survey data, can be brought into play. Sometimes such analysis can indicate the presence of underlying drivers, even though they cannot be quantified.
- Product uptake: If an institution provides multiple products and clients can potentially use more than one, it is often instructive to see how they move from one to another. Microcredit borrowers might start out with an ordinary credit account and a current savings account, for example, but then graduate to taking a specialized home improvement loan while also opening a term deposit product.
- Association analysis: Usually done through regular or logistic regression techniques, associations are sought between variables of interest, such as poverty levels or loan default, and possible explanatory variables, such as product features and demographic

variables. Random forests and other machine-learning-oriented tools can provide additional nuance to this, though the 'black box' nature of a lot of these tools can be off-putting.

- Typology creation: One of the interesting aspects of having a free-form savings account is that it allows clients to express their preferred savings behaviours. Expert systems and pattern recognition algorithms can be trained to identify these behavioural motifs and reconstruct a typology of savings behaviour.

Tools of the trade: We view Python + R as the ideal combination for a data scientist. If this is someone who is just starting out, we recommend Python for someone who has prior experience in C++/Java/Perl, and R for someone who has prior experience in Stata/SPSS/SAS. Python is better suited for the data validation, verification and harmonization role, while R is suited for more of the downstream data analysis.

Conducting phone surveys

Phone surveys can be deployed by partner institutions as part of their usual consumer satisfaction surveys. However, if the grantee does not conduct surveys, we have also included alternative instructions for an outside survey company.

Phone surveys

As mobile phone ownership is rising, phone surveys are becoming increasingly popular in developing countries. Although phone surveys have drawbacks and cannot always be used in place of face-to-face interviews, there are situations when they are preferable.

The main advantages offered by phone surveys over face-to-face interviews are lower cost, the ease of access to remote and sometimes unsafe areas, and the speed with which data can be collected. Studies are still being conducted on how data quality compares to that of face-to-face interviews, but the general opinion is that it is comparable, and even higher in certain instances. For example, answering sensitive questions over the phone may offer the respondent more privacy and security. When used for monitoring and evaluation, phone surveys can be used with high frequency, allowing researchers access to panel data that can be used to infer causal relationships.

Phone surveys are not without their limitations, and it is important to consider issues such as coverage biases. Are the intervention beneficiaries likely to have a phone? If not, what options are available to obtain a representative sample? One other drawback is that the length of a phone questionnaire needs to be much shorter than that of a face-to-face questionnaire. However, one possible solution is to break down the questionnaire into multiple shorter ones. Finally, in the case of panel data collection (when the same people are interviewed in subsequent years), phone interviews may have higher attrition rates (people dropping out of the study) than face-to-face interviews.

Types of phone surveys

A phone survey can be conducted in several manners:

- Voice: computer-assisted telephone interview (CATI)
- Interactive voice response (IVR)
- Unstructured supplementary service data (USSD)
- Short message service (SMS)
- Wireless application protocol (WAP)

Generally, CATIs seem to provide the best data quality and the lowest attrition rates. They allow for more flexibility, such as different languages and giving explanations to respondents when necessary, including illiterate respondents. CATIs seem to also be preferable due to

other technical considerations, such as Internet-enabled phone ownership (necessary for WAP), literacy (needed for SMS, USSD, WAP), length of questions and answers (needs to be very short for SMS, for example) etc. Nevertheless, the other methods can also be used, especially for large-scale data collection.

Steps for planning a phone survey

- 1) The first step in conducting a phone survey is to **clearly articulate the research questions**, the target population and the variables to be collected. Because the number of questions that can be asked in a phone interview is limited, researchers need to have a clear research plan and only include questions that are relevant. At this stage, the unit of analysis should also be identified. It could be individuals, households, groups of individuals or institutions (e.g. a hospital) etc., depending on the research goals.
- 2) **Select the data collection method based on the research needs:** A) a one-off survey (a survey that is conducted only once); B) a repeated cross-section (a survey that is conducted multiple times but with different respondents each time); or C) a panel (a survey that is repeated over time with the same respondents). Generally, researchers make this decision when they choose the impact evaluation methodology.
- 3) **With what frequency will the data be collected?** Generally, more frequent data collection is advisable for indicators that change rapidly, and less frequent data collection works best for slowly changing indicators.
- 4) The **duration of the study** should be dictated by the time it takes to see impact, but issues such as attrition (people dropping out of the study) and panel decay (loss of representativeness due to shifts in population) should be taken into consideration when using panel data collection.
- 5) A **sampling frame** represents a complete list of units (either individuals or households) from which the researchers can select a representative sample. It could mean a list of households, a list of phone numbers or some other administrative list.
- 6) **Sampling method:** In most cases of impact evaluation, the researchers need to select a representative sample of respondents to make inferences about the target population. Depending on other research purposes, available sampling frames and other technical considerations, the selection method may need to differ from simple random selection—one of the most popular selection methods.
- 7) The **sample size** represents the number of people that need to be interviewed to achieve the level of accuracy desired. It often needs to take into account budget or time-frame limitations.
- 8) **Conducting the survey:** Usually this should be done by the institution, using their own call centre.
- 9) **Survey data analysis:** Organisations should undertake the data analysis themselves.

Sampling frame

To achieve a representative sample, a proper sampling frame is essential. An ideal sampling frame would list all the units, with no duplicates. In the case of phone surveys this entails several assumptions. The Pacific Islands have low mobile phone penetration rates, which are likely to be even lower among poorer populations, such as those that would be targeted by interventions. However, a phone survey is tractable if the beneficiary has access to a family member's phone or a landline phone.

If this is not the case, one other solution would be to simply exclude those who do not have phones, if the group is small enough or unlikely to cause biased results (for example, if the majority of the poorest beneficiaries do not have access to phones, the survey results would be biased).

Another possible solution would be to give phones and credit to individuals that have been selected into the sample but do not own a phone, or alternatively to use a different data collection method for these individuals.

A third assumption is that phone numbers have been accurately recorded and are periodically updated. If phone numbers are not available in administrative data, a short survey—for example, to simply collect phone numbers from individuals selected into the sample—may be needed. This need not be a dedicated activity: if the programme has any touch points with its beneficiaries, it can take advantage of face-to-face contacts with customers (for example, in the customer onboarding process or through customer support help lines) to at least collect phone numbers from individuals selected into the sample.

Sampling method

The main types of sampling are probability sampling and non-probability sampling. In probability sampling, the probability of a member of the population being selected is known. In non-probability sampling, the selection process is not formal, and the probability of selecting a unit is not known. Non-probability sampling is not recommended for impact evaluation purposes, as the results cannot be generalized beyond the sample itself.

There are also several forms of probability sampling. Simple random sampling involves allocating a number to each unit in the sampling frame and then randomly selecting numbers. Systematic random sampling is an adaptation of the simple random sampling used when the sampling frame is too large to conveniently assign numbers; however, the process assumes that the sampling frame is randomly distributed.

Stratified random sampling consists of separating the units into groups (strata) that are mutually exclusive, and then randomly selecting a sample from each group. The primary purpose of this type of sampling is to ensure that a representative sample is allocated to each stratum. For example, if the researcher is interested in understanding the impact of a programme on men vs. women but knows that 90 percent of the beneficiaries are women, a random sample would consist of too many women and too few men to draw any statistically significant conclusions. In such a case, half of the sample could be allocated to men and half to women.

Cluster sampling is a variation of the simple random sampling that uses a hierarchy of sampling units and a multistage selection procedure. The primary sampling unit is a grouping (cluster) of units that represent the focus of the study. Such a group could be represented by a village or a savings group, for example. Next, smaller subsets are selected, until a random sample of the actual units of analysis is selected. This type of sampling is employed when it is too cumbersome to reach the individual units directly, due to a lack of a sampling frame, travel costs etc. Typically, with all types of sampling except simple random sampling, it is necessary to use the appropriate weighting during the analysis to ensure representativeness.

In the case of simple random sampling, the probability of being selected into the sample is equal for everyone. When, for various reasons, a different type of probability sampling is employed, respondents have different probabilities of being selected. In such cases it is necessary to use survey weightings that correct the differences in probability of selection (base weightings). Sample weightings indicate the number of population members represented by a respondent. In general terms, an individual sample weighting is the inverse of the adjusted probability of obtaining the data for the respondent. Survey weightings may also be used to compensate for non-response or to make certain key variables (e.g. gender or age) conform to a known distribution.

The base raw weighting for individual 1 is simply:

$$\omega_i = \frac{1}{p_i}$$

where p_i is the probability of being selected for individual 1.

For example, if individual i is selected from a population of 50 individuals, their probability of selection will be 1/50, and their sample weighting will be 50. In other words, they will represent 50 individuals from the population.

In the case of multistage sampling, the individual weighting is the inverse of the product of the probability of selection at each stage.

$$\omega_i = \frac{1}{p_{1i} \times p_{2i}}$$

Where

p_{1i} is the probability of selection during stage 1

p_{2i} is the probability of selection during stage 2

For example, imagine a simple case. During stage 1, 5 villages are selected with equal probability from among 100 villages. During stage 2, 10 individuals are randomly selected from each village, from among people aged 18 or older.

The probability of selection for individual i is equal to the product between the probability of their village being selected (here equal to 5/100 for all villages) and their probability of being selected from their village (10/village population over 18 years). To calculate the selection probability, for each village we would need to know the size of the population aged 18 or over. Let us assume that in this particular case it is 300. Then:

$$p_i = \frac{10}{100} \times \frac{5}{300} p_i = \frac{10}{100} \times \frac{5}{300}$$

$$\omega_i \omega_i = 600$$

The more complex the sample design (for example, including clustering), the more complicated it becomes to calculate weightings. Furthermore, other types of weighting may need to be applied if the survey includes many non-responses (either at the question level or total non-response). For more complex designs, whenever possible, it is ideal to employ a professional statistician to construct sample weightings. It helps if the same person who designed the sampling is also involved in the construction of weightings.

Sample size calculation

Calculating the proper sample size can be complicated, especially for complex sampling designs. However, for a simple sampling approach there are several considerations.

- It is important to determine which segments the results will be reported for. If, in addition to an overall result, the researchers want to report separate results for men and women or by urban vs. rural location, the minimum sample size will double. If the goal is to report by gender and urban vs. rural location (e.g. rural men, rural women, urban men, urban women), then the minimum sample size with quadruple.
- Acceptable margin of error (the maximum amount of error that can be tolerated): A common choice is 5 percent; however, it depends on the expectations of the results. For example, if the proportion of respondents that answer 'Yes' to a question is expected to be close to that of respondents who answer 'No', a smaller margin of error is acceptable. A lower margin of error requires a larger sample.

- Confidence level (the amount of uncertainty that can be tolerated): A typical choice is 95 percent. A 95 percent confidence level means that if the survey were repeated over and over again, the results would match the results from the actual population 95 percent of the time.
- Population size (the size of the total target population being surveyed): This measure is less important, and it is irrelevant for population sizes larger than 20,000.
- The estimated distribution of responses (for each question, what proportion of the population is expected to respond in a certain way): When no estimations are available, it is typical to use 50 percent, as this results in the largest sample size.
- In the case of a panel study, the attrition rate (number of people dropping out of the study over time) also needs to be considered.

Additional considerations are needed for more complex studies, such as clustered or stratified designs.

One formula that can be used to calculate the required sample size for a randomly selected sample is:

$$n = \frac{N_x}{((N-1)E^2 + x)}$$

$$x = Z\left(\frac{c}{100}\right)^2 r(100-r)$$

$$E = \sqrt{(N-n)x/n(N-1)}$$

where N is the population size, r is the fraction of responses that you are interested in, and $Z(c/100)$ is the critical value for the confidence level c . However, researchers generally use software that calculates sample size based on inputs.

An appropriate discount rate is to use a sample size of approximately 350–500 respondents per segment. For example, if the goal is to report results differentiated by gender, a total sample of 700–1,000 respondents would be needed.

For example, if you are interested in conducting a survey of health insurance beneficiaries and would like to be able to compare the proportion of men vs. the proportion of women who report needing a doctor but not receiving treatment over the past year, without any other information you could rely on the estimated discount rate above and sample 350–500 men and 350–500 women, based on budget constraints. A larger sample is always preferable, where possible.

Conducting the survey itself

A phone survey is quick to conduct and may take no more than a week or two to complete.

Partner institutions conducting the survey

Since the intention of this survey is to minimize the effort for all parties, the survey should generally be conducted by the partner institutions themselves, using their existing call centres. The customer service agents will be able to introduce themselves in a friendly way and put the customers at ease to answer the survey questions.

The introduction that the customer service agent reads should explain that the customer has been selected at random and that the answers given are entirely confidential.

For the survey results to be valid, it is important to ensure that the random selection of customers is observed by the institution. The institution may not understand or value the need for randomization, or it may even select its 'best' customers to answer the questions. This may

require project officers to participate in the randomization exercise, drawing on the list of customer phone numbers. Project officers can oversee some of the initial calls to ensure that the research protocol is being followed at the call centre.

Since the customer knows that the caller is from the institution, there might be some degree of bias in the answers, but we cannot tell in advance whether this would be a tendency to want to please the institution with positive responses or to make complaints since they have the customer service agent on the line. Any bias will become clear during the calls overseen by project officers.

Research companies conducting the survey

An alternative (or in cases where the institution does not have a call centre) would be for a research company to conduct the survey. In this case, there are usually more training requirements for staff to ensure that they understand the survey and present it in a friendly manner to the respondents.

Apply the appropriate discount rate

For all portfolio investments, assign the financial products to use cases using [Table 5](#), and update the use cases tab accordingly.

The use case discount rate has been updated using the data from the Fiji Demand Side Survey 2016, which included questions about how people were using their financial products. Where specific data from the survey were not available, we used our judgement based on prior analysis of customer data. Conservative discount rates were selected so that when the data analysis takes place, it does not result in reducing the estimated impact numbers. Discount rates should be updated every time transaction data are analysed.

Table 5. Basis for estimating use case discount rate

Financial instrument	Use case	Discount rate (based on initial data from Fiji Demand Side Survey 2016)
Mobile money wallet	MANAGE	15% of active users of a particular device will be those who are in the MANAGE use case
	PROTECT	20% of active users of a mobile money wallet or savings or transaction account will be those who are in the PROTECT use case
	PAY	4% of active users of a particular device will be those who are in the PAY use case
	INFORM	25% of active users of a particular device will be those who are in the INFORM use case
	GET	60% of active users of a particular device will be those who are in the GET use case
Transaction account	MANAGE	15% of active users of a particular device will be those who are in the MANAGE use case
	PROTECT	20% of active users of a mobile money wallet or savings or transaction account will be those who are in the PROTECT use case
	PAY	4% of active users of a particular device will be those who are in the PAY use case
	INFORM	25% of active users of a particular device will be those who are in the INFORM use case
	GET	60% of active users of a particular device will be those who are in the GET use case
Savings account	MANAGE	15% of active users of a particular device will be those

		who are in the MANAGE use case.
Loan Short-term credit (≤ 1 month)	PAY	4% of active users of a particular device will be those who are in the PAY use case
	PROTECT	20% of active users of a mobile money wallet or savings or transaction account will be those who are in the PROTECT use case
	INFORM	25% of active users of a particular device will be those who are in the INFORM use case
	GET	60% of active users of a particular device will be those who are in the GET use case
	BORROW	100% of users are in the BORROW use case
Saving groups	MANAGE	10% of active users of a particular device will be those who are in the MANAGE use case
	PROTECT	20% of active users of a mobile money wallet or savings or transaction account will be those who are in the PROTECT use case
Insurance	BORROW	10% of active users of a particular device will be those who are in the BORROW use case
	PROTECT	100% of users are in the PROTECT use case
Pension fund contributions Education savings account	PROTECT	100% of users are in the PROTECT use case
	GET	10% of users receive a payment (receive an insurance payout for a claim)
	PROTECT	100% of users are in the PROTECT use case
	PROTECT	100% of users are in the PROTECT use case

Applying the discount rate

Discount rates play a critical role in the Impact Pathway tool, as they prevent us from double-counting and overestimating impact. In this model, all of the discount rates have been constructed to be conservative so that when the data analysis takes place, it does not result in reducing the estimated impact numbers but begins to highlight which financial product is having the most impact against development objectives. Ultimately, we know that all enrolled customers will not remain active and will not receive the benefits of a financial product. We designed the Impact Pathway tool to ensure that we do not count these customers and do not overestimate the impact a product has had on their lives. However, we are focused on capturing the important impact and positive outcomes that active users received.

- **Enrolled customers → active customers:** PFIP receives summary information from each institution, indicating how many customers are registered for each product (enrolled), and how many are active. For example, an institution might provide the following information: 100 customers enrolled/registered for the product, but only 70 have actively used the product in the last 90 days.
- Depending on the product, additional information may be received, such as the average balance for a deposit account. Therefore, PFIP used discount rates to assign active customers to each use case.
- **Active customers → use case users:**
Short term: Map financial instruments to their associated use cases based on product specifications (see Table 2). Depending on the product, additional information may be received, such as the average balance for a deposit account. Therefore, PFIP used discount

rates to assign active customers to each use case based on an estimated discount rate (see Table 5).

Long term: Conduct an in-depth analysis of customer transactions and use the findings to assign active customers (i.e. those who have used the product within a period of time specific to the financial institution) to each use case. After the first in-depth analysis, conduct an annual analysis of customer transactions to update the discount rates to ensure that the use case estimates are appropriate to the Pacific Island context as it evolves (i.e. protect is X percent; manage is X percent of accounts etc.).

- **Use case users → benefits:** Connect use cases to a variety of potential benefits using qualitative surveys. Instead of qualitative surveys, it is possible to use the generalized estimated discount rate. These surveys tell us the intention and purpose of the customer in their use of the instrument in a particular way and confirm the benefit of the financial instrument in the way that we assume (see section on Benefits).
- **Benefits → goals:** Measure the sustained level of use (in-depth transaction analysis) and reported benefits (qualitative survey data). Over time these measurements enable us to tie the benefits that customers are reporting to a set of longer-term goals or targets which we might expect that sustained use would bring customers closer to. Having multiple instruments that are ultimately helping customers get to an end goal might increase the likelihood that they will get to that goal over time.

Assigning a new product to use cases

In the case of a new product which is not listed in [Table 5](#), consider the question: *What does this product enable a user to do?* Then assign use case(s) to the product based on the most likely outcomes.

It is initially helpful not to think about the intention that a user might have in mind for the instrument, because these issues are dealt with in the next step. When we ask the user how they intend to use the product, we are focusing on the benefit rather than the design of the product. Initially, we need to identify what can or cannot be done with the instrument, which can then be verified through supplier data.

Remember that you need to associate a use case with the instrument itself, not what the chain of events might be. For example, if you have insurance, you might receive a digital or cash payout, but the insurance instrument does not enable a digital payment; a mobile money wallet or bank account enables that. Therefore, the insurance instrument does not have a PAY use case associated with it; this is a use case inherently associated with a wallet or account.

We have focused mostly on the list of financial instruments that UNCDF in the Pacific is supporting through its portfolio of grants, rather than the full universe of both formal and informal instruments that a low-income person can use. However, in some instances, attaching use cases to an informal instrument can help clarify which use cases are appropriate for each instrument. For example, a critical instrument that is missing from Table 2 is a form of short-term loan or credit, such as one might receive from a relative, or a credit from a shopkeeper or loan from a moneylender. These short-term credits are usually small and paid back within a month and are typically used to meet an emergency expense or smooth consumption.

Moving from estimated to actual data

A full analysis of the transaction data from the financial institutions every year or two would confirm how customers are actually using financial products. Performing this analysis probably requires a data scientist and cannot be predetermined, at least in the first few years. A fuller description of the analysis is found in [Annex 5](#).

The goal of this exercise is for the programme team to review the results of ongoing projects and adjust the impact measurement methodology as needed. It is also an important opportunity for the team to draw strategic and operational lessons to apply to the programme as it evolves. The steps to carry out are:

1. Analyse customer transactions to assign each customer to use cases.
2. Update the results with the accurate percentages of customers in each use case.
3. Review the results of the customer transaction analysis, customer surveys and other information (such as external surveys or institutional feedback) to understand whether the model needs adjustment or revision.
4. Update the discount rates for the subsequent year, which will become more accurate as the volume of transactions analysed increases.

Part 3: How the literature leads from benefits to goals

Our last step is to map benefits to end goals. In thinking through how we were going to make this happen in practice, we realized that there are some important differences in how this mapping could occur.

As the Conceptual Framework section explains, in no way are we, in this framework, considering these pathways a measure of 'impact'. The academic conditions for proving impact are far too stringent for this type of exercise. Instead, we are looking to the existing body of evidence to provide justification for the various pathways we have envisioned that this measurement process should consider. As we examined the existing evidence, we found that we needed to cast our net as wide as possible. Simply looking for evidence in published literature that is aligned with financial inclusion did not get us far. And the existing data sets and grey literature on financial inclusion did not get us much further. We also had to look at existing publications on any of the topics relevant in sustainable development: nutrition, agriculture, energy, housing, education and health. This broader set of literature helped us identify some additional connection points to financial inclusion.

We found that the conceptual framework helped guide us to the areas that needed more evidence to justify the pathway. In some instances, the survey questions that link use cases to the 'benefits' stages already provide sufficient evidence. Mapping from benefits to goals then becomes somewhat 'self-evident'. For example, a client survey may ask: 'Do you feel your money is safer since you started using this product?' In this situation, the movement from the benefit—increased personal safety—leads to the goal—safer environment and housing—without much need for literature that allows measurement of whether the goal was reached. In other cases, we need to provide a good estimate of how many people cross from benefit to goal—i.e. before a sufficient number of client surveys have been conducted. Once the surveys are complete, this confirms the impact pathway from product use to benefit to goal.

Then there are instances where the possibility of evidence leading us from a benefit to a goal is currently elusive and is likely to remain so. For example, we may ask a client 'Since you started using this product, are you able to call on a wider group of people when something unexpected happened?', and if they say yes, then we would move this person into the benefit stage of stronger social networks. However, it is not clear whether this stronger social network can create a significant enough change to move them closer to the goal of increased livelihoods and resilience. This will only become clear if we can do a retrospective study and, even then, it is difficult to tie the increased networks to the end goal. In other words, in this situation, it is not about waiting until enough surveys with enough clients are done—the link between benefit and goal will always be elusive without further research. The literature, therefore, provides us with a clue about how likely it is that stronger social networks will lead to increased livelihoods and resilience, and with what level of strength. We organize this review of the literature in terms of the goals and benefits as outlined above.

Annexes

Annex 1: Full literature review

Improved livelihoods and resilience

Using financial tools to keep small businesses going

Small businesses are ubiquitous in low-income communities. Banerjee and Duflo (2007) estimate that about a quarter of low-income households have at least one self-employed household member. In Kenya small businesses account for more than 20 percent of adult employment (Daniels and Mead, 1998).

However, a question that goes back to microfinance days is whether saving or borrowing large lump sums significantly impacts businesses and brings about improved livelihoods and resilience. Although there is good evidence that usefully large lump sum loans and savings can help improve businesses, it is only a percentage of the time when a lump sum is successfully obtained. Moreover, it is unclear what difference the investments make on the profits of the business.

What would be useful research to help us fill in the gaps?

The biggest challenge with interpreting the impact of large lump sums that are generated out of savings or loan instruments is to determine whether the resulting investments made a difference to the business, as well as the scale of the impact. For example, small shop owners can invest in a small refrigerator to keep drinks cold, but what is the impact on how many drinks they sell, and how does this flow through to their bottom line? A car wash can invest in a sofa so that customers can sit comfortably while their cars are being washed, but we do not know how many more customers came to the car wash or whether the car wash could charge higher prices. It is through these details that we see whether it resulted in higher income, and how much higher.

Likewise, there is not enough research into whether 'resilience' is really achieved by acquiring a large lump sum and investing in a business. Is resilience achieved when a business simply keeps going and keeps generating the same amount of income? Or is it achieved when the business could possibly be sold?

Using finance to invest more in crop inputs: Does it actually mean yields will increase, and you will earn more? Does it mean you will eat better?

There is little information on the nutritional outcomes of household-level investment in agricultural production. Nonetheless, a review article covering 30 agriculture interventions that measured impact on nutritional status reported that "Nutrition was improved in 11 of 13 home gardening interventions, and in 11 of 17 other types of intervention." In the majority of these successful cases, the intervention covered investment in a range of other types of capital, beyond the agricultural intervention (Berti, Krasevec and FitzGerald, 2004).

What would be useful research to help us fill in the gaps?

Additional research is needed on household-level nutrition resulting from agricultural investment due to financial products. The Consultative Group to Assist the Poor (CGAP)

smallholder financial diaries¹ collected production information but not meal-level consumption data.

Using finance to receive a government-to-person (G2P) or donor-to-person (D2P) payment

Pickens, Porteous and Rotman (2009) estimate that governments make regular payments to at least 170 million low-income people worldwide. Digital finance offers an opportunity to make the process of extending payments cheaper and more transparent for governments while potentially making it more financially inclusive for low-income recipients. This paper looks at programmes in Brazil, India, Mexico and South Africa that provide these payments digitally. It points out that the benefits in terms of transparency and cost savings can be significant for governments. Leakage from bribes and fraud is cut significantly if payments are made to instruments controlled by recipients. If governments were to use agents with a Point-of-Sale (POS) terminal to distribute social payments, it would save them about 11 percent over 5 years.

Zimmerman, Bohling and Parker (2014) extend this discussion to less-developed countries where payments are from both governments and donors. This paper studied four cash transfer programmes in Haiti, Kenya, the Philippines and Uganda.

In both of these papers, the advantages in terms of transparency and cost savings that are realized by paying into a digital device are too enticing for payers not to insist that recipients have digital accounts. Therefore, being able to open an account (having the documents required for Know-Your-Customer (KYC) and then registering for an account) is effectively a hurdle that must be crossed before one can receive a transfer.

Using finance to receive a remittance payment

The evidence is widespread that international remittances help recipient households. A review of 115 countries (Adams, 2011) found that “resource flows do tend to reduce the level and depth of poverty. At the household level, a review of findings from recent research suggests that households that receive international remittances spend less on consumption goods—like food—and more on investment goods—like education and housing. Households receiving international remittances also tend to invest more in entrepreneurial activities.”

That said, many studies noted that there may be disincentives to work; a review of 50 articles looking at household survey data confirmed the positive impact on poverty and health but noted that there may be negative effects on education, labour supply and economic growth (Adams, 2006).

Domestic remittances (more commonly called person-to-person or P2P transfers) can also have important effects on income and vulnerability. The Kenya Financial Diaries analysis (Jacobs Foundation, 2015) indicated that net senders had higher household incomes than net receivers. The work by Jack and Suri (2014) on M-PESA in Kenya indicates that users of mobile money are better able to weather shocks, mostly by being able to mobilize more from their social network resources in times of need. Their recent study (Suri and Jack, 2016) shows that

¹ See <http://www.cgap.org/publications/financial-diaries-smallholder-families>.

mobile money users increased their incomes, lifting 2 percent of the population out of poverty. Increases in the availability of mobile money agents led to increases in income, and also an increase in the number of women leaving agriculture for business occupations.

What would be useful research to help us fill in the gaps?

It would be interesting to know whether domestic remittances outside East Africa are impactful, and whether particular modes are more impactful than others (e.g. is mobile money better than a money transfer company?).

Improved access to resources: Affordable and clean energy; clean water and sanitation; quality education

Using finances to secure better-quality education

‘Getting an education in rural Kenya’ is a paper commissioned by the Jacobs Foundation (2015) to look specifically at how households pay for quality education in rural Kenya, using the Kenya Financial Diaries. The research found that, at the median, education accounts for 11 percent of monthly consumption expenditures. For agriculture-dominant households, which have both lower and more variable incomes, education is an extremely important investment, especially secondary school. In addition to having more children, agriculture-dominant households spend disproportionately more on education. At the median, they spend just under USD10 per child per month, compared to USD6 by part-time farmers. For households dependent on agriculture, this is 18 percent of monthly expenses. Even when schools are free, there are additional costs for materials, food, extra payments for teachers and exams. School fees are almost never paid in a lump sum, but rather in small amounts during the year, when households have money. If school fees go unpaid for too long, children are sent home. Eighty percent of agriculture-dependent households had a child sent home from school at least once during the Financial Diaries year, compared to only 58 percent of urban households. School fees are paid from a mixture of sources, often from remittances from family. Savings are usually not the main source for financing education.

What would be useful research to help us fill in the gaps?

It would be important to include ‘quality education’ in the GET use case, as school fees are mostly paid by remittances, at least in Kenya.

Using finance to buy the educational materials you need

At the institutional level, the idea that more educational materials lead to better learning attainment was not substantiated in the literature. On the contrary, it was shown to have “minimal influence on learning outcomes” unless complemented by other interventions. A meta-analysis of randomized controlled trials on the effectiveness of educational interventions in developing countries found that “instructional materials have few effects on learning in the absence of teacher training” (McEwan, 2015).

These studies all evaluated institutional interventions. Numerous independent sources identify parental involvement and books at home as being important predictors of educational outcomes. A meta-analysis of nationally representative samples in 27 countries found that books at home are as important as parents’ education in predicting children’s educational attainment (Usher and Kober, 2012). It stands to reason that if parents can make their money last and buy the necessary school materials, it will contribute to children’s learning abilities.

Evidence from the USA indicates that the educational outcomes of low-income students who do not continue to learn over the summer in elementary school (as their higher-income peers do) suffer long-term consequences (Alexander, Entwisle and Olson, 2007), which implies that missing a few months of learning materials could affect children negatively.

What would be useful research to help us fill in the gaps?

It would be useful to have more research on the educational attainment that follows parents' private investment in learning materials, and on the impact of missing learning materials for a portion of the school year and to what extent this might set back learning.

Using finances to improve access to water and sanitation

Diarrhoeal diseases account for 20 percent of all deaths under age 5 according to the World Health Organization factbook (Prüss-Ustün *et al.*, 2016). Nearly 60 percent of these deaths were due to poor water quality, sanitation and hygiene.

Improvements in access to water and sanitation have led to a substantial decline in the number of deaths from diarrhoea and intestinal infections across the world, reducing the number of deaths caused by environmental factors from 31 percent in 2002 to 20 percent in 2014. However, missing just a few days of access to clean water can set back health outcomes to almost zero (Hunter, Zmirou-Navier and Hartemann, 2009). This may be particularly relevant in some Pacific Island nations such as Papua New Guinea and the Solomon Islands, where improved sanitation is available to less than 30 percent of the population, according to the World Bank development indicators.

Where facilities are available from public infrastructure, funding to sustain a reliable supply is often a challenge leading to unreliable water supply. Numerous projects aimed at addressing the sustainability of water projects have experimented with different methods of collecting payments from water users. The use of prepaid water meters has contributed to the expansion of water infrastructure to low-income areas (Heymans, Eales and Franceys, 2014), and there are experiments with mobile money ongoing in several African countries (e.g. eWater and Grundfos) and water ATMs that dispense clean drinking water (e.g. Sarvajal in India).

Utility systems usually combine water and sanitation for billing. Separate payments for sanitation mostly concern pay toilets.

Using finances to improve access to light and energy

There are a number of studies that assess the household-level impact of using a clean source of lighting, solar or otherwise. The results of the studies, which were done across a range of environments and with different products, were mixed.

Productive activity/studying: Studies find mixed results on the impact of solar lighting products on time spent on productive activities. In a randomized controlled trial of a small solar system in Rwanda, Grimm *et al.* (2014) found that households use 15 percent more hours of light, but observe no significant change in hours spent by adults on chores or by children on studying. They do note that household members often used solar lighting for these activities when they either did not use a lighting product or used a non-solar light source before, with children shifting studying time from the afternoon to the evening. In a randomized controlled trial of solar lamps in rural Uganda, Furukawa (2013) found an increase in self-reported hours spent studying but, curiously, a slight (statistically insignificant) decrease in test scores. Using household survey data to examine usage of a high-capacity

solar home system in Bangladesh, Samad *et al.* (2013) found increased evening studying hours.

The IDinsight (2015) impact evaluation of D.light pay-as-you-go solar systems in southern Uganda found that most households in the southern Uganda study used 2–3 low-quality lighting products to meet daily lighting needs. These included kerosene lanterns, flashlights, other battery-driven lights and wax candles. High-quality lighting was generally an electric light from a solar system or a lantern or fixed electric light source powered by electricity or a generator. D.light households consumed 4.3 fewer hours of low-quality light and 6.2 more hours of high-quality light than comparison households, for a net gain of 2.9 additional hours of lighting per day. However, there was no statistically significant increase or decrease in the amount of time that D.light households spent on productive activities (income-generating activities, household chores, studying) compared to control households. The increase in lighting hours observed could be largely spent on overnight security lighting.

Expenditure: Given the USD230 cost of the D.light system, households spend less on daily costs but still need to repay the cost of the system, which does not create a net saving over the course of a year. After the system is paid off (after about a year), they then spent about 73 percent less on energy than comparison households.

Safety: The IDinsight (2015) impact evaluation of D.light pay-as-you-go solar systems in southern Uganda found that there was an 88 percent reduction in the incidence of burns and a 93 percent decrease in reported incidence of fires within the course of 6 months as a result of owning the system. In a randomized experimental study of solar lamps given to children in Uganda, Furukawa (2012) found that there was a decreased probability of fires and burns.

Health: It is worth noting that the reported incidence of coughing was reduced among D.light households by 12 percent, although this was not statistically significant. In a longer-term study of clean cook stoves, Hanna *et al.* (2012) found that inhaled smoke decreased during the first year, but there was no long-term impact on inhaled smoke and no ultimate benefits. Grimm *et al.* (2014) conducted a randomized controlled trial in Rwanda of a smaller solar system and found that households reported improved air quality but no impact on respiratory disease symptoms.

Happiness: The IDinsight (2015) impact evaluation of D.light pay-as-you-go solar systems in southern Uganda found that overall 97 percent of respondents reported that they had told their friends and family to buy the system. Further, 95 percent reported increased happiness and satisfaction with their home as a result of having purchased the system.

What would be useful research to help us fill in the gaps?

The outcomes of cleaner and more affordable energy are not yet very robust for different types of device and environment. The solution to this would be more experimental research and a continuation of meta-analyses that compare the result patterns across these experiments. If an improved lighting scheme comes to the Pacific, it would be useful to perform an impact analysis to add the Pacific experience to the mix.

The results of the client surveys will be particularly interesting to hold up against the results of these more structured impact studies and will hopefully allow us to provide a better, broader sense of how alternative finance structures for cleaner, affordable energy ultimately impact overall welfare goals.

Safe environment and housing

A need and priority for safety (i.e. non-cash) in low-income communities

Low-income households are always aware of the risk of theft of their assets and cash, especially as they keep much of their cash either on themselves or hidden in their houses. Various studies suggest that nearly 100 percent of the sample population keep money in their houses, even if it takes a few months of trust to build up for them to share this with us. Even one-off surveys, such as FinScope and the Financial Inclusion Insights, show that at least 50 percent of most populations keep money in the house.

However, there is limited data on the incidence rates of crime in these areas. The International Crime Victimization Survey (ICVS) series compares crime rates between countries and lays the ground work for a better understanding of safety considerations in a global context. However, this survey is unfortunately limited when it comes to developing countries, with only South Africa and Mozambique representing Africa, and very few low-income countries in Asia represented. Therefore, data on crime and the likelihood of theft are difficult to come by.

More in-depth studies shine a light onto the impact that crime can have on low-income households. Over a quarter of Kenyan respondents said that they had experienced theft via mugging in their lives (FSD Kenya, 2015). Skilling and Rogers (2017) also concluded that M-PESA contributes to reducing crime in a Nairobi slum, Kibera, because it makes cash less available.

What would be useful research to help us fill in the gaps?

It is striking that neither FinScope nor the Financial Inclusion Insights include questions about safety as a motivation for adopting digital finance. Findex, as part of the Gallup World Poll, could be connected to the Better Life Index, but this is not done in many developing countries. More should be understood about the perception of crime and how digital finance could be seen to address this problem.

More expensive transport is safer

Worldwide, road traffic collisions are the leading cause of death for adults aged 15–29, according to the World Health Organization (2017a), with developing countries being much more dangerous. Vulnerable road users—pedestrians, cyclists and motorcyclists—make up half of these fatalities. The World Health Organization reports that even in higher-income countries lower socio-economic groups are more likely to be victims of traffic collisions.

Although the physical conditions of roads and vehicles contribute to accidents, the most important factors indicated by the World Health Organization relate to human error: speeding, driving while intoxicated, not wearing a helmet and distracted driving.

Although we were unable to find research to support this hypothesis, it seems logical that passengers who have more money will spend it on safer transport, including choosing public transport companies (buses, minivans and boats) that have better policies to manage drivers.

Good health and well-being

Finance that leads to less stress: Does that actually mean better health and well-being?

There are clear data that link poverty, stress and well-being, once one begins to measure well-being in terms of suicide rates, rates of alcoholism and drug abuse, and mental disorders. The World Health Organization (2017b) states on mental health: “Mental disorders occur in persons of all genders, ages and backgrounds. No group is immune to mental disorders, but the risk is higher among the poor, homeless, the unemployed, persons with low education...”

Kuruville and Jacob (2007) point out that the relationship between poor mental health and the experience of poverty and deprivation is complex, to say the least. For example, in which direction does the causality go: does poverty cause mental disorders, or mental disorders cause poverty? While there are many interesting and important paths of research we can assess and report, the most important are those related to finance and how financial inclusion can lower the likelihood or severity of mental illness that might be caused by poverty. This paper certainly points to a potential way in which it can. There is a psychological impact of living in poverty that includes stigma and shame. "People experiencing poverty report higher levels of hopelessness, fatalism, a lack of control over their circumstances, an orientation towards the present rather than the future and lower levels of satisfaction with life than the better off."

Patel and Kleinman (2003) conducted a meta-analysis of 11 community studies on the association between poverty and common mental disorders in six low- and middle-income countries. The factors that arose most often are the feelings of insecurity and hopelessness and the risks of violence and physical ill-health. They conducted a review of primary and secondary interventions. Although the evidence is weak, it points to providing alternative sources of credit as a way to decrease financial stress levels. The cognitive impact of living in poverty is illustrated by this narrative from a man in Guinea Bissau from *Voices of the Poor*: "When I don't have [any food to bring my family], I borrow, mainly from neighbours and friends. I feel ashamed standing before my children when I have nothing to help feed my family. I'm not well when I'm unemployed. It's terrible." They also point to a Chilean study which found a strong relationship between an acute fall in income in the previous 6 months and the risk of mental disorders (Araya, 2003). Sundar (1999) shows that the suicide of farmers in parts of India since the mid-1990s during the debt crisis with microfinance institutions provides another illustration of the impact of financial insecurity on mental health.

Weich and Lewis (1998) suggest that the association between poverty/unemployment and common mental disorders can be explained by subjective financial strain. They find that financial strain is a better predictor of future common mental disorders. There is evidence that the effects of unemployment and poverty on mental health may be mediated or modified by financial strain. The authors used the UK household panel survey of individuals in England, Scotland and Wales which covered a range of topics, including one for common mental disorders. Subjective financial strain was assessed by asking: 'How well would you say you are managing financially these days?' While poverty and unemployment were associated with common mental disorders, the association was not as strong as that between financial strain and common mental disorders, or their duration.

Goodman, Smyth and Borges (2009) point out that there is a close connection between intimate partner violence and persistent poverty, and that the two combine to constrain coping mechanisms. It reminds us that most people in poverty are dealing with struggles in several different domains: physical safety, challenges dealing with public services, medical problems etc., which mutually constrain a low-income person's ability to address even one of these problems. They introduce the term 'survival-focused coping' to describe how women cope with both. This definition emphasizes the focus on surviving over the short term, meeting basic needs and keeping oneself and one's loved ones as safe as possible. The state of survival-focused coping means making a series of micro-decisions, each of which may lead to the possibility of longer-term changes. It may be that taking a small step in taking financial

control, such as buying a small insurance policy, is an important factor in changing the short-term, survivalist mentality of low-income people.

What would be useful research to help us fill in the gaps?

More research is needed that studies the link between the conditions of poverty and common mental disorders and what impact financial services can have to alleviate those conditions. The potential impact of better finance on decreasing stress, shame and worry could prove to have a significant effect on development.

Gender equality

Having more privacy and control: Does having better information actually lead to a sense of control, and does that in turn lead to changes in behaviour and outcomes?

There is relatively little literature on how financial information may lead to a greater sense of control, although anecdotes from the financial sector abound (including the high use of 'balance enquiry' in financial institutions).

In the energy sector, it is widely accepted that information will lead to a sense of control, which in turn leads to behaviour change. A 2007 review of the international experience with demand-side management for electricity showed that customer feedback successfully contributed to reduced demand in nearly all 26 studies of 11 (developed) countries. Importantly, consumers in all countries wanted more detailed, real-time data on their own consumption, increasing their sense of control (Fischer, 2015). A randomized controlled trial showed that providing people with tailored information and feedback on their usage, combined with goal-setting, leads to a reduction in energy consumption (Abrahamse et al., 2007).

What would be useful research to help us fill in the gaps?

It would be extremely useful to be able to leverage research that addresses whether information leads to a sense of control, and whether the sense of control leads to changes in behaviour desired by customers (such as saving more). Moreover, it would be useful to have data on the volume of information requests to financial institutions, including balance enquiries, as well as a measurement of what value customers derive from these interactions, including a sense of control.

Just because you have more privacy with your money, does that always mean you have more control over your money?

Privacy is of considerable value to all users of financial tools, but particularly for women. In the GSMA mWomen study (GSMA, VISA and BFA, 2013), only 52 percent of women who send remittances in person believe they are doing so in private, compared to 94 percent of those who send money using mobile money. In terms of saving, 74 percent of women in Pakistan who both hide money at home and on their mobile phones believe the money hidden at home is private, while 81 percent who hide money in their mobile wallet believe it is private.

Qualitative research in 2011 found that vulnerable Haitians valued the privacy and security of mobile money (Mercy Corps, 2011).

If you say you have eaten better food throughout the month, does it really improve your nutrition? How long do you need to do this before it really changes your potential health outcomes?

The Financial Diaries series shows that income comes in unpredictable lumps and that financial services are what helps smooth the lumps so that expenditure can be more or less the same on a day to day basis. But we also know that this smoothing is imperfect—households often spend money on higher-quality food (such as meat) when income is earned and then increasingly eat poorer-quality or less food until the next lump of income arrives.

However, most discussions of food security and nutrition in the developing world have to do with a food supply shock or a chronic lack of food, rather than this up and down pattern between lumps of income that we know exist from ethnographic studies such as the Financial Diaries.

A brief by Robert Rector published by the Heritage Foundation (Rector and Heritage Foundation, 2016) called 'Reducing Hunger and Very Low Food Security' is one of the few pieces of work to point this out. Very Low Food Security (VLFS) is defined as "when the eating patterns of one or more household members were disrupted and their food intake reduced"—this includes worrying that food will run out, eating unbalanced meals or relying on cheaper foods. Even in the USA this is a common, though episodic problem. In the USA in a typical month in 2013, 1 in 30 adults experienced VLFS; 1 in 35 adults was hungry for at least one day because there was not enough money for food; and 1 in 100 did not eat for a whole day because of a lack of money for food. A critical factor in VLFS is managing money so that money for good food can last through the month.

The US Department of Agriculture (Coleman-Jensen and Smith, 2016) seems to also have adopted this term (or perhaps coined it in the first place) and done some additional research. Using 2015 data from the Current Population Survey Food Security Supplement, it estimates that 5 percent of US households experienced VLFS in that year. It defines VLFS households as those that were food secure to the extent that the food intake of one or more household members was reduced and normal eating patterns were disrupted at times during the year. Low food security was associated with being worried that food would run out, having food bought not last, not affording balanced meals, cutting the size of meals or skipping meals, eating less than they felt they should, or being hungry but not eating. VLFS households include many single mother households with incomes near or below the poverty line. In this publication, it is noted that prior to 2006, VLFS was labelled 'food insecurity with hunger'. The new definition reflects that this state is connected with economic and social contexts that lead to hunger.

What would be useful research to help us fill in the gaps?

The concept is one that should be explored among the low-income populations that are commonly considered when addressing issues of financial inclusion. The responses to nutrition-related survey question within the context of this impact framework will inform us to what extent this phenomenon exists among these populations in developing countries. However, it would be helpful to collect 'nutrition diaries' among low-income populations to discover more about how this phenomenon occurs and what lessons should be taken away in understanding it.

Annex 2: Surveys and data series

CGAP smallholder financial diaries: <http://www.cgap.org/publications/financial-diaries-smallholder-families>

Financial diaries undertaken by BFA: <http://financialdiaries.com/>

Financial Inclusion Insights by Intermedia: <http://finclusion.org/>

Finscope Surveys by the FinMark Trust: <https://www.finmark.org.za/finscope-surveys/>

Gallup World Poll Global Findex: <http://www.worldbank.org/en/programs/globalfindex>

International Crime Victims Survey:
http://www.unicri.it/services/library_documentation/publications/icvs/

World Bank World Development Indicators: <http://data.worldbank.org/data-catalog/world-development-indicators>

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Annex 4: Use cases and the results of the initial review of institutional transaction data

Our aim was to choose use cases that reflect what a consumer can do with a financial instrument, while trying not to guess at the consumer's intended use for the instrument or fall into the trap of considering financial instruments to be use cases in and of themselves. Part of the learning curve that we have experienced in Financial Inclusion has been that low-income consumers do not necessarily work with the same definition of different instruments as we do. It has been a sticking point in designing new tools that we are caught in our 'own' definitions rather than 'their' definitions. This shift from instruments to use cases is one way to help us move away from defining use cases by the type of product.

For example, when one thinks of the use case PROTECT, one always thinks of insurance, yet we know well that most low-income people do not have insurance. However, they manage their way through financial shocks with savings and borrowing tools. PROTECT refers to having a lump sum of money 'just in case' an event happens. Therefore, PROTECT is not a use case that is only associated with insurance, but also includes credit and savings.

Likewise, there are different types of credit that can fall into different use cases. When borrowing is for a significant amount (larger than a month of income, say) and takes more than several months to pay back, this cash flow pattern reflects that for BORROW. On the other hand, when borrowing is small and short-term (about a week of income or less and takes less than a month to pay back), this reflects a MANAGE use case, in that it helps smooth consumption over a short-term period and would apply, for example, to most moneylender loans or credit from a local store.

Estimating MANAGE and PROTECT use case percentages

It was suggested that until more detailed transaction analysis can be done, the use case discount rates serve to estimate the percentage of active users who are likely to fall into each use case. For the MANAGE or PROTECT pathways, these estimates are taken from studies of behavioural segmentations from 11 products across 7 institutions in a range of countries.

However, these estimates are not a substitute for comprehensive data, as there is a wide distribution between the percentage of active users who fall into these different behaviour buckets. Table 6 shows the results of analysed disaggregated data from 11 banking institutions. The percentage of active users within the MANAGE segment was anywhere between 1 percent and 71 percent, and the percentage of active users in the PROTECT segment was anywhere between 3 percent and 62 percent. Therefore, there is no real predictable pattern of what share of active users would fall into either bucket.

In the end, we used the lower estimates to come up with the use case discount rates for the percentage of customers to be mapped into MANAGE and PROTECT use cases.

Table 6. Active account holders' behaviour types (%) by institution

Behavioural distribution													
Country	Malawi		Mexico	Kenya	Peru		South Africa				Ghana		Uganda
Account type ¹	S	T		S	T	S	?	?	T	S	T	S	T
MANAGE	6%	7%	1%	12%	19%	10%	41%	59%	61%	27%	71%	11%	2%
GROW	0%	0%	4%	2%	0%	0%	1%	0%	0%	1%	0%	7%	3%
PROTECT	47%	28%	9%	40%	22%	46%	24%	3%	7%	24%	5%	6%	7%
MANAGE and PROTECT Also referred to as Type D	17%	18%	-	-	-	-	-	-	-	-	-	-	14%
Active but not saving	8%	9%	1%	24%	10%	3%	27%	25%	24%	15%	14%	39%	46%
Balance managers	22%	37%	85%	22%	50%	41%	7%	14%	7%	32%	10%	37%	30%
Account properties													
Minimum balance?	Y	N	N	N	N	Y	?	?	?	?	Y	Y	Y
Unlimited free withdrawals?	N	N	Y	N	N	N	?	?	N	N	N	Y	N
Monthly fee?	Y	N	N	N	N	N	Y	?	N	N	Y	N	Y
Interest?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y

Note: 1 Account types: T = transactional; S = savings oriented.

Annex 5: Detailed steps for analysing transaction and balance data

Python stage

1. Check for completeness and adherence to the Data Specification Template. Are the requested data points captured?
2. Check for indications of file truncations—for example, flat files created from Excel are likely to be truncated (i.e. cut out at about 1 million rows).
3. Check that data columns (fields) are consistent and in the right format (e.g. full date formats, not abbreviated date formats; names are strings and not numbers).
4. Undertake exploratory analysis (e.g. distribution of records per month, number of account records per month). This provides two things: a view into missing data as well as whether data span the target period of 3 years.
5. Process the raw data for each section (client information, savings, credit information) into N number of files based on, say, the last two digits of the anonymized account number. This ensures that you load into computer memory a sizeable amount of data for efficient computing. Typically, N = 00.csv ... 99.csv, taking the last two letters of the anonymized account identifier as the key which is used as the file name.
6. Calculate the average monthly balance per account:

$$\text{Average monthly balance} = \frac{\sum (\text{EndDayBalance}_i * \text{NumDaysWithEndDayBalance}_i)}{\text{TotalDaysThisMonth}}$$
7. Generate transaction summaries—i.e. create a record for each account each month with roll-ups of the number of transactions in each transaction category.

Anonymized account	Year and month	# Txn Type1	# Txn Type2	# Txn Type3
0000001	201601	2	8	2
0000001	201602	1	5	3
0000002	201601	3	1	4

8. Combine the transaction summaries with the average monthly balance information (computed in 6).
9. Compute MANAGE use case metrics based on a repurposed transactions file (from 5 above). Identify GET events that trigger a MANAGE window and calculate metrics of other transactions until the next GET event. The metrics may include the number of payments made, withdrawals made etc.
10. Create a composite file combining the file from step 8 with MANAGE metrics (from step 9).

Stata stage

1. Import the composite file from the Python stage (step 10).
2. Data husbandry: Drop records that are outside the analysis window period, without unique account identifiers or with incomplete key fields.
3. Drop inactive accounts and retain only active accounts.
4. Create use case flags for:
 - GET use case: if account record has at least one GET/CREDIT transaction per month;
 - PAY use case: if account record has at least one PAY/DEBIT transactions per month;
 - PROTECT use case: if account maintains an average monthly balance > PROTECT threshold for 3 consecutive months;
 - MANAGE use case: if account has at least two payments between two GET events (separated by at least 1 day); and
 - GROW use case: if account has an average quarterly balance that is greater than the previous quarterly balance based on a rolling window.
5. Calculate a 90-day active window for all months under consideration; this is the denominator to use in determining the portion of accounts in a use case per month.