

Introduction to measurement frameworks



Acknowledgements

The authors had many discussions and read widely to form the hypotheses and framework presented in this series of notes. To all those who were willing to debate the heart of financial inclusion and share their thoughts, a sincere word of thanks. In particular, we would like to thank our advisory panel members for their valuable comments and guidance: Gerhard Coetzee, Henri Dommel, G. Gilbert Gnany, Fiona Greig, Leora Klapper, David Porteous, Elisabeth Rhyne and Piyush Tantia.

About insight2impact

Insight2impact | i2i is a resource centre that aims to catalyse the provision and use of data by private and public sector actors to improve financial inclusion through evidence-based, data-driven policies and client-centric product design.

i2i is funded by the Bill & Melinda Gates Foundation in partnership with The MasterCard Foundation.

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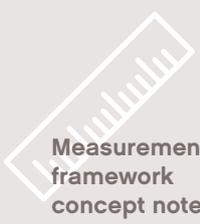
About the i2i measurement framework note series

This note is the first in a series of notes to explore the role of measurement in delivering on financial inclusion objectives and to develop a set of new measurement frameworks to assist stakeholders to achieve these objectives.

The first note introduces the concept of a measurement framework, its purpose and components. The second note outlines a scan of existing measurement initiatives in the financial inclusion space to position our usage agenda in context.

The third note builds a conceptual model of financial device usage and the triggers and drivers thereof as a theoretical underpin to the work of i2i, on the premise that actual usage, rather than mere uptake, is important for financial inclusion impact.

The remaining notes present three new measurement frameworks (MFWs) for policymakers, development organisations and financial service providers to practically measure, and therefore better understand, priority measurement areas for financial inclusion.

	Title	What does it cover
 <p>Umbrella notes</p>	1. Introduction to MFWs	Looks to other fields to explain what a measurement framework is.
	2. Determining our focus	Scan of existing measurement frameworks and indicators in financial inclusion to position our measurement agenda ('gap analysis').
	3. Usage conceptual model	Builds a conceptual model of financial service usage and the triggers and drivers thereof as a theoretical underpin to the work of i2i, on the hypothesis that actual usage, rather than mere uptake, is important for financial inclusion impact.
 <p>Measurement framework concept notes</p>	4. Needs measurement framework	Outlines a measurement framework for how financial service needs are revealed and met through financial service usage.
	5. Financial inclusion depth measurement framework	Outlines a measurement framework for financial inclusion that considers the portfolio of financial devices taken up or used per person (termed 'depth of financial inclusion'), in contrast to a one-dimensional focus on percentage of people reached.
	6. Usage measurement framework	Unpacks the definition of usage, clearly demarcating it from uptake; lays out a set of principles for determining usage indicators and provides examples of how these manifest.

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Executive summary

The i2i measurement notes series explores the role of measurement of financial inclusion in delivering on financial inclusion objectives, and it sets out to develop a set of measurement frameworks to assist stakeholders in achieving these objectives. This note considers measurement frameworks from beyond the financial inclusion field to explain what a measurement framework is and when it is successful.

The common practice to measure body temperature to detect the presence of infection provides a useful illustration of a measurement framework.

By measuring body temperature as an indicator, health professionals can identify whether an individual has an infection and can respond with interventions that contribute to the ultimate objective of a healthier person.

This illustration shows that the heart of a measurement framework is the need to inform or achieve an **objective** (in this case a healthy person) by changing a particular **condition** (such as an infection). Knowing the status of the condition makes it possible to design actions to change it. However, a condition can seldom be measured directly. Therefore, measurement frameworks require **indicators** of the condition (such as body temperature) that can be measured with collectible **data**. A sound **theory**, the veracity of which can be tested, is required to establish the link between the indicators and the condition (such as why fever is indicative of an infection), and the condition and the objective (in this instance: why infection detracts from health).

A measurement framework thus encapsulates five essential components:

01 Objective

The objective is the goal of the measurement exercise or the fundamental question to which an answer is sought.

02 Condition

The condition being measured is the physical state, set of circumstances, behaviour(s) or process that is necessary to achieve the objective. The condition must be relevant to the objective.

03 Theory

A sound underlying theory of which the veracity can be tested is core to the credibility of a measurement framework. The theory articulates how the condition affects the objective, what the manifestations of the condition are and why the indicators used in the measurement framework are an accurate gauge of the condition. A critical step in the development of a new measurement framework is, therefore, to clearly articulate the underlying theory.

04 Indicators

Indicators are proxies for a condition that is impossible or very difficult and costly to measure directly. They consist of, or are based on, observations – empirical data – that reflect the dynamics of a particular phenomenon. Good measurement frameworks rely on good proxies that measure the condition accurately. Over time, changes in the indicator must result in, or predict, the expected changes in the condition. If not, the theory may be wrong and should be adjusted or discarded. Good indicators tend to be indicators that target users are aware of, that are easily measurable with existing resources, simple to interpret and trusted (due to the endorsement or promotion thereof by a credible institution). Depending on the data and condition, indicators can range from single observations (e.g. a body mass of 100 kg) to relative indicators (e.g. calorie intake as a percentage of the recommended daily allowance), an index (e.g. the body mass index or BMI) or a ranking (e.g. the ranking of sports teams).

05 Data

Data is needed to populate the indicators in a measurement framework. For such data to be appropriate, it needs to be of sufficient quality to ensure that the observations in the data and the reflection of the underlying condition be accurate. It also needs to be possible and affordable to collect and process such data within an acceptable timeframe to ensure that the indicators be relevant when populated.

In financial inclusion, the measurement imperative is to equip policymakers and other decision-makers to understand which conditions to measure, through which indicators, to gauge the nature and extent of interventions required to reach their policy objectives, as well as to evaluate the success of such interventions. This is the cause to which the i2i measurement workstream hopes to contribute.

1. Introduction



“Measurement is the first step that leads to control and eventually to improvement. If you can’t measure something, you can’t understand it. If you can’t understand it, you can’t control it. If you can’t control it, you can’t improve it.”

James Harrington¹

The increasing prominence of financial inclusion (FI) as a tool for development and growth has spawned extensive data gathering initiatives to measure, understand and improve it. The result is a variety of new measurement frameworks leveraging this data.

Early indications suggest that the FI strategies developed and guided by these measurement frameworks may not be leading to the results that policymakers want to achieve. There can be a number of reasons for this; however, if the outcomes are consistently different from those intended by the measurement frameworks, it is possible that our current measurement frameworks encourage the wrong interventions. And that should be cause for concern since it can jeopardise the credibility of FI as a policy instrument.

For example, take the well-known Atkins diet. It focuses on controlling the levels of insulin in participants’ bodies by cutting carbohydrates from their diet (Nordqvist, 2014). Participants have to measure the amount of carbohydrates that they consume against the limit set by the dietary plan. The underlying theory is that reduced consumption of carbohydrates will ultimately lead to weight loss and improved health. However, in the short term this diet causes headaches, dizziness, weakness, fatigue and constipation. In the long term, it raises the risk of heart disease (Agadoni, 2015).

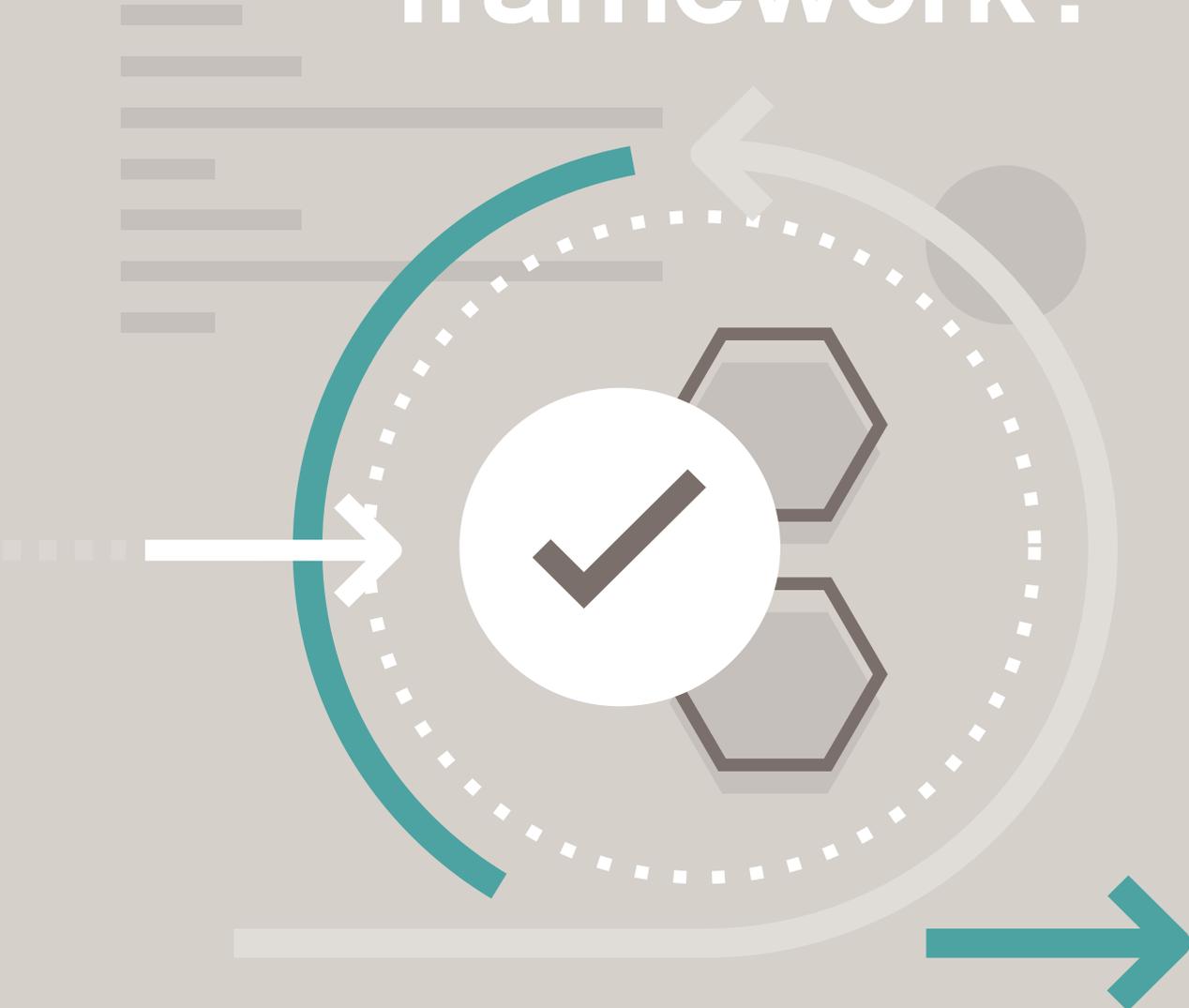
Not only is the Atkins diet as a measurement framework for weight loss likely to fail to achieve the objective of better health through weight loss, but – together with other similarly flawed diets – it can undermine the credibility of diets in general.

As questions are increasingly being asked about the contribution that FI is actually making to the larger policy objectives of economic growth and household welfare, there is a need to reflect on current measurement frameworks used in FI and how they are contributing to or hindering the achievement of these policy objectives.

In this note, we take a step back to look at measurement frameworks from beyond the field of FI. These provide insight into what constitutes a measurement framework and what makes for the success of a measurement framework.

¹ James Harrington (1611-1677) was an English political theorist of classical republicanism. He was best known for his controversial work: *The Commonwealth of Oceana*.

2. What is a measurement framework?



At the heart of a measurement framework is the need to inform or achieve an objective by changing a particular condition. Measuring the characteristics of the condition and how these change over time enables individuals or entities to optimise their actions to change it. However, a condition can seldom be measured directly. Therefore, measurement frameworks require indicators that can be measured with collectable data and based on a theory that links changes in the indicator to changes in the condition.

Let's, once again, consider one of the most common measurement frameworks to measure the health of an individual – body temperature. Measuring body temperature is the most commonly used diagnostic tool to determine whether a person has an infection.

Infections detract from health, and thus the objective of the measurement framework is to determine and improve the state of health of the person. This link between body temperature and infection is based on a proven medical theory that the body responds to infection by increasing its internal temperature. The increase in the body's temperature helps to kill off certain bacteria and viruses sensitive to temperature changes (T.A. Mace, 2011). In addition, the immune system is temporarily enhanced when body temperature rises. Abnormal body temperature is, therefore, a reliable proxy for infection. By using this measurement framework, health professionals are able to identify whether an individual has an infection and respond with interventions that contribute to the ultimate objective of a healthier person.

Figure 1 uses the body temperature example to illustrate the five components or building blocks of a measurement framework.

It connects theory (body temperature rises when an infection is present), populating an indicator (body temperature) through data (observations collected with a thermometer) to measure a condition (infection), thereby influencing the achievement of a predetermined objective (the health of the person).

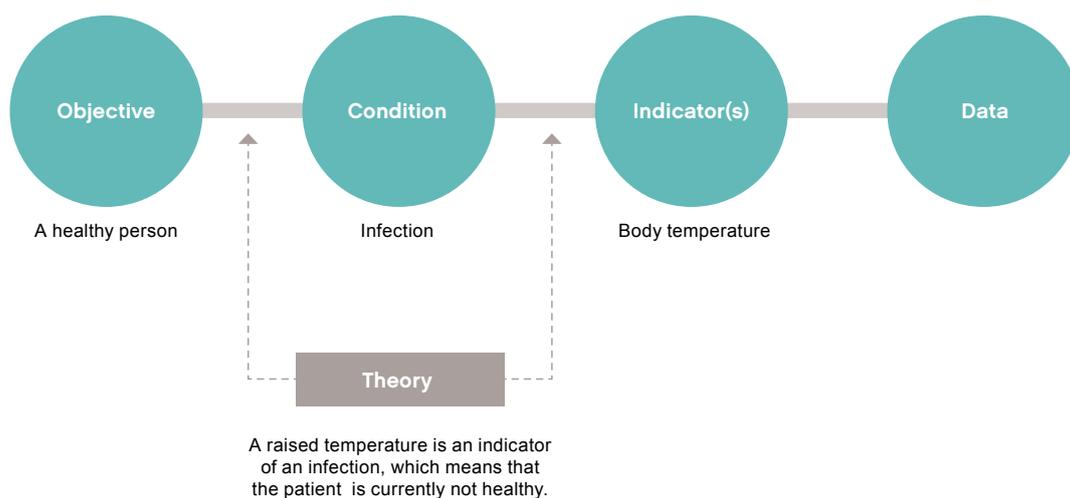


Figure 1.
 Visual representation of a measurement framework (Temperature example)
 Source: Authors' own

We, therefore, propose the following definition of a measurement framework:

A measurement framework combines theory and data to describe a condition necessary to achieve an objective. It consists of an indicator or set of indicators populated by data. The theory explains why the condition is relevant for the objective and why the indicators are valid proxies for the condition and any changes therein.

The following sub-sections unpack the five different components that make up a measurement framework.

01 The Objective

The objective is the goal of the measurement exercise or the fundamental question to which an answer is sought. For instance, we measure body temperature to determine whether a person has an infection and thus how to treat the person to return to health.

02 The Condition

The condition being measured is the physical state, set of circumstances, behaviour(s) or process that is necessary to achieve the objective. The condition must be relevant to the objective. A measurement framework that fails to address a relevant condition will either not be used or will trigger inappropriate decisions by the person or entity that looks to the measurement framework for guidance. It is, therefore, an important first step to clearly articulate the condition and establish how the condition links to the ultimate objective.

²The BMI is a measurement tool designed to measure obesity. It calculates a person's weight in kilograms divided by the square of height in metres.

³A theory is defined as "a set of assumptions, propositions or accepted facts that attempts to provide a plausible or rational explanation of cause-and-effect (causal) relationships among a group of observed phenomena".

For example:

- » **The Net Promoter Score (NPS)** is a measurement framework used in marketing to measure the loyalty of a firm's customers. The condition, i.e. customer loyalty, contributes to the firm's objective of sustainable profits. NPS measures customer loyalty by asking customers how likely they would be to recommend the provider to a friend or colleague (Net Promoter Network, 2016). Subtracting the percentage of 'detractors' from the percentage of 'promoters' yields the Net Promoter Score, which can range from a low of -100 (if every customer is a detractor) to a high of 100 (if every customer is a promoter). The theory behind this measurement framework is that the level of loyalty in the customer base is an indication of potential revenue growth, and is, therefore, an important indicator for businesses to keep track of. NPS has been widely adopted, with more than two-thirds of Fortune 1000 companies now using it (Kaplan, 2016).
- » **The Body Mass Index (BMI)²** is a measurement framework used to measure the obesity of an individual (the condition). It is based on empirical evidence that has shown the level of obesity to be relevant to good health. The challenge is to find an indicator for the condition of obesity able to predict when it becomes a health issue. The theory behind the BMI is that there is a relationship between an individual's height and weight that can ultimately be used to determine whether or not the individual is overweight (Centers for Disease Control and Prevention, 2015).

It is important to note that one objective can require multiple conditions to be measured.

For example, BMI measures the condition of body mass, whilst temperature measures the condition of an infection. These conditions are separate and are hence measured by different indicators, but both contribute to the overall objective of health.

03 The Theory

The credibility of a measurement framework (i.e. its predictive capacity to link changes in the indicators to the achievement of the objective) depends on a sound underlying theory³. The role of the theory is to explain or interpret the dynamics of the condition. The theory articulates how the condition affects the objective, what the manifestations of the condition are and why the indicators used in the measurement framework are an accurate gauge of the condition.

A critical step in the development of a new measurement framework is, therefore, to clearly articulate the underlying theory that shows how the condition affects the objective and how the indicators accurately reflect the characteristics of the condition. This will be further explored in future notes in our i2i measurement framework note series.

The clear articulation of the theory is critical for the credibility of the measurement framework as it enables the theory to be tested, meaning that it can and should be scrutinised through decisive experiments and measurement.

This is core to the scientific method as defined by the philosopher Karl Popper (Popper, 1963) and illustrated by Isaac Newton and Albert Einstein. Newtonian physics was able to be comprehensively disproved by Einstein's General Theory of Relativity because both theories were clearly defined and articulated. Even Einstein himself refused to accept his own theory until it was verified by empirical evidence from a series of scientific experiments. Clearly, articulating the theory therefore enables potential users of the measurement framework to understand when it holds and, more crucially, if evidence emerges, disproving the veracity of the theory to either adjust or stop using the measurement framework accordingly.

For example:

» The **Gini coefficient** resulted from a number of attempts to perfect theoretical definitions of inequality. It measures the condition of income inequality by comparing the distribution of income in a society with one in which everyone earns the same. The indicator is calculated by summing the differences in the distributions to a value between 0 and 1, where 0 is an indication of complete equality and 1 of complete inequality. By understanding the level of income inequality, governments are enabled to design policies to contribute towards the overall objective of a more equitable society. A theoretical search for perfection enabled first Max Lorenz, and later Corrado Gini, to derive an improved (and better articulated) theory, setting out the measurement of inequality. Interestingly, although the Gini coefficient is often interpreted to have normative implications today, neither Lorenz nor Gini harboured any normative ideals in their study of inequality. They were purely in search of theoretical validity, a motive that has provided the Gini coefficient – as a measurement framework – with a sound theoretical foundation.

This has allowed it to surpass other measures of inequality in popularity, even though these alternative measures rely on the same underlying data as the Gini (Scheidner, 2000), (Xu, 2003), (Lampard, 2000), (Santos & Guerrero, 2010), (Cerani & Verme, 2014), (Brandolini, 2015).

- » In contrast, the **Atkins Diet** fails to provide a credible, robust, evidence-based theory that sets out how the reduction of insulin levels in people's diets improves their health. It has been labelled by health professionals as 'pseudo-science', making people falsely believe that certain foods are dangerous or unhealthy. Susan Jebb, head of nutrition at the US government-funded medical research council, said, "There is nothing to persuade me it is a good way to improve your health. It is not even an experiment... Nobody is evaluating what is happening out there to millions of people who are following it" (Lehmkuhl, 2016).
- » The **BMI**, on the other hand, does rely on theory, but its theoretical validity has been widely questioned. Its inability to take the distribution of body fat into consideration and to distinguish between lean muscle and fatty mass means that two individuals with the same BMI score may have very different health risks. Therefore, a poor theoretical foundation has meant that the BMI is very rough, if not completely ineffectual, an indicator of the health impact of obesity (McKay, 2009), (Lewis, et al., 2009).

04 The Indicator(s)

Indicators are proxies for a condition that is impossible or very difficult and costly to measure directly. They consist of, or are based on, observations – empirical data – that reflect the dynamics of a particular phenomenon. Good measurement frameworks rely on good proxies that measure the condition accurately. The theory explains why the indicators are good proxies, but this also continually needs to be empirically tested. Over time, changes in the indicator must result in or predict the expected changes in the condition. If not, the theory may be wrong and should be adjusted or discarded.

An indicator could be based on a single data point, or it may be constructed using two or more data points. Measurement frameworks may be based on only one indicator or a group of indicators, which together provide an accurate depiction of the underlying condition. For example, health vital signs measure an individual's body temperature, pulse, respiration rate and blood pressure. As single indicators they give an idea of only one aspect of health, but as a group they provide a more comprehensive indication of an individual's health.

The indicators are the practical tools available to users of the measurement framework. An important consideration is therefore that the indicators must be easy to use. Several factors determine an indicator's ease of use:

- » **Easily measurable.** The indicator utilises a simple measurement process.
- » **Simple to interpret.** The indicator is easy to interpret or use. Fewer indicators are used where possible.
- » **Capacity.** The resources required to obtain, analyse and apply the indicator are available.
- » **Awareness.** Potential users know the indicator exists and what it can be used for.
- » **Credibility.** The indicator is trusted due to the endorsement or promotion of the indicator by an institution broadly considered credible.

The types of indicators used to populate a given measurement framework will depend on both the condition and the available data. Different types of indicators have different strengths and weaknesses. Therefore, the nature of the condition and the targeted behavioural change amongst users will, to a large extent, determine which types of indicators are most appropriate for each individual measurement framework.

Box 1. Common types of measurement framework indicators

The review of existing measurement frameworks identified four common types of indicators:

*Single observations

These are the easiest indicators to populate and to understand, as they simply consist of the observed data. However, this also means that single observations may lack the nuance or context provided by more complex indicators. For instance, the revenue of a company is a good indicator of its size and ability to sell its products, but it cannot reflect the productivity levels of the business.

*Relative indicators

These provide a level of contextual nuance, unlike single observations. A single indicator may misrepresent the condition when the condition is reliant on the context. For example, body mass is a poor indicator of the condition of obesity in a given person, as it does not take into account the height of an individual. A body mass of 100 kg may be considered 'obese' for an individual that is only 1.6 m tall, but 'normal' for someone who is 2 m tall. Relative indicators, therefore, provide some self-adjustment or calibration to the specific context. As such they are reliant on at least two data points. Another example of such an indicator would be Return on Assets (ROA). Where profit as an indicator includes no contextual information, ROA attempts to measure the level of productivity of assets by estimating the amount of profit that each unit of asset generates.

*An index or indices

Indices are effective at turning a large amount of complex information into an easily digestible form, such as a single indicator. However, the flip-side is that indices can be difficult to interpret. Users often cannot use the index to design interventions for improvement. The development of most indices relies heavily on assumptions in the weighting of the different components that make up the index. This requires a robust theory and objective methodology or runs the risk of being constructed subjectively and arbitrarily. For example, the results from the consumer price index (CPI) are often heatedly debated, because it relies on a basket of goods based on what the "average" person consumes. However, in reality, each individual experiences a different level of inflation due to the fact that baskets of goods vary between consumers. Therefore, even though the national CPI is a useful indicator at aggregated level, it is less so at an individual level.

*Rankings

These are effective in competitive environments. Professional sport, for example, relies heavily on rankings to measure how good teams or individual athletes are relative to others. Rankings naturally create a competitive environment. Creating a ranking indicator is therefore likely to drive behaviour to improve rankings. However, their weakness is that the indicator is not necessarily a good indicator of the scale of improvement or deterioration. The closer participants are in their initial rankings the more likely it is that small improvements to a condition will show up as a large improvement in the rankings. Conversely, if there are major differences between ranked participants, a large improvement in conditions may not result in an improvement to their ranking indicator.

The description of indicators and examples are summarised in Table 1 below:

		Types of indicators			
		Single observation	Relative observation	Index	Ranking
Description		One directly measured data point	One data point in relation to another	Weighted, a mathematical combination of variables, which in itself has no meaning except through comparison or by looking at change over time.	A relative comparison based on other indicators
	Examples	<ol style="list-style-type: none"> 1. Body temperature as an indicator of health 2. Revenue 	<ol style="list-style-type: none"> 1. BMI 2. Return on Assets 	<ol style="list-style-type: none"> 1. Human Development Index 2. Consumer Price Index 3. Business Confidence Index 	<ol style="list-style-type: none"> 1. Ease of Doing Business Indicators 2. FIFA World Ranking

Table 1.
Different types of indicators
Source: Authors' own

Data can be either subjective, such as survey respondents' opinions, or objective, such as the temperature of a human body. Data should not be excluded simply on the basis that it is subjective. However, subjective data does require a higher bar of transparency in the collection.

05 The Data

The indicators in a measurement framework are populated by data. The development of robust and reliable indicators is therefore predicated on the requisite data existing or it being feasible to collect.

Some of the critical factors relating to data include:

- » **Availability.** Appropriate data exists or can be collected.
- » **Affordability.** It is feasible to collect the data from a cost perspective.
- » **Good quality.** The observations captured in the data are accurate reflections of the condition measured.
- » **Timeliness.** The data can be collected and processed sufficiently and quickly so that the indicators are still relevant when populated.
- » **Benchmarking.** Indicators are often more powerful when a baseline already exists against which to compare them. Some methods of data collection explicitly require certain data to already be available. For example, a national survey can only be weighted if there already exists reliable population level data, such as a census.

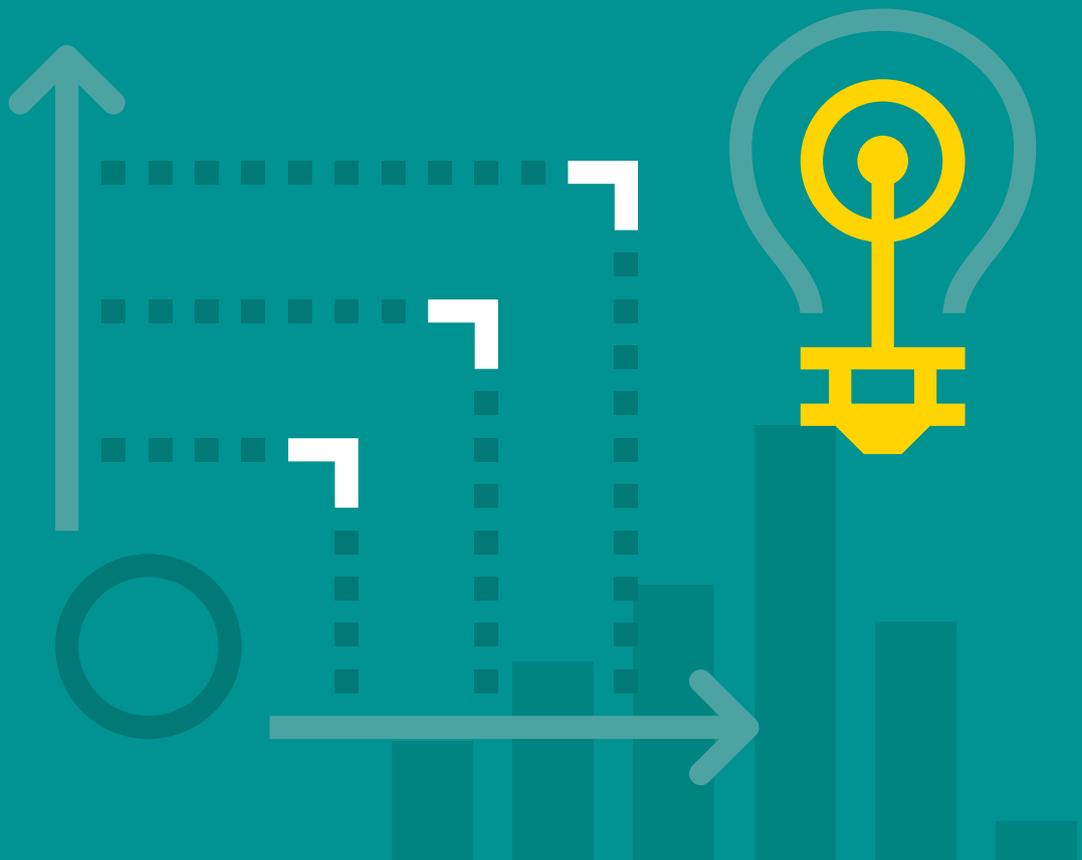
Box 2. Examples of the role of data in measurement frameworks

Box 2 provides examples that highlight the important role of data in measurement frameworks:

* Prior to 1976, **pregnancy testing** techniques were unreliable and only carried out by doctors. The best method for self-diagnosing the condition of pregnancy remained careful observation of physical indicators. A major drawback of relying on this kind of data, apart from the initial lack of certainty, was the amount of time it took for physical indicators to manifest. In 1976, a new technology emerged which saw the first home pregnancy test kit placed on the market in the United States. These test kits, although still somewhat unreliable, made testing easier and cheaper for women since it relied on different data. It allowed them to test for pregnancy within days of falling pregnant. The advance in technology has meant that testing for pregnancy has developed from being technically impossible to test to becoming cheap and easy enough for individuals to do it themselves (National Institutes of Health, 2003). Further advances mean that today's home pregnancy tests are also much more reliable.

* The Ease of Doing Business Index, on the other hand, is derived from data that is often very difficult to capture. This has led to much discussion on the merits of the index. In this instance, users are less concerned with the theoretical validity of the index (although that has also been debated) and more cautious of the comparability of the data that feeds into its construction.

3. What drives the success of a measurement framework?



Success is determined by how useful the measurement framework is in assisting the users to achieve their objectives.

The success of a measurement framework has two elements:

The measurement framework must be adopted. Adoption is a prerequisite to success. A measurement framework that is not used cannot, by definition, achieve any impact (positive or negative). However, adoption is not the sole measure of success.

The measurement framework must influence decisions that cause a change in the condition that contributes to the achievement of the objective. As with the Atkins diet, a measurement framework can be widely adopted but not deliver on its ultimate objective, due to the lack of a robust and verified theory. Such measurement frameworks may not only be deemed unsuccessful but in some cases deemed harmful to the credibility of the entire sector or field of research.

Social, cultural, historical and serendipitous factors shape a measurement framework's adoption trajectory. The use and popularity of a particular measurement framework could, therefore, be limited to what has been used in the past (known as "path dependence").

There are two main drivers of path dependence with regard to measurement frameworks:

Cost. It is easier or more cost-effective to stick with an existing measurement framework rather than switch to a new alternative, even if it is more relevant for the objective of decision makers. Thus, in order to be adopted, it needs to be affordable to both collect and process the requisite data to populate the indicators.

Comparability and credibility. A critical mass of adoption amongst practitioners can ensure the continued use of a measurement framework. The implication is that comparability is often an important driver of adoption. Thus, measurement frameworks that are used only in a single jurisdiction will have a much greater struggle to achieve the critical mass of adoption than those used in multiple countries. Some measurement frameworks achieve a critical mass of adoption because they are mandated by law, codes of conduct or results frameworks.

Path dependence can limit the adoption of more appropriate new measurement frameworks and can result in the continued use of inappropriate frameworks.

Circumstances and theories change, and measurement frameworks should change with them. A measurement framework only remains useful as long as the empirical evidence shows that the underlying theory continues to hold. A change in the environment or individual behaviour may render a previously successful measurement framework obsolete. In this case, it must be either adapted or discarded.

4. Conclusion



The starting point when developing a measurement framework is to clearly determine and articulate what the ultimate objective is you want to achieve given the condition you wish to change.

Measurement frameworks should ideally be developed from the top down (with the end goal in mind), as opposed to from the bottom up (starting with the data that is available). Articulating the objective clearly sets the purpose for the measurement framework and, therefore, helps to guard against the development of a measurement framework that will potentially start a race in the wrong direction.

Good measurement frameworks require a sound underlying theory that explains both what the practical symptoms of the condition are (i.e. that the indicators are effective proxies of the condition) and what the implications of pursuing the condition are, i.e. that an improvement in the condition will contribute to the overall objective. The theory must also be clearly articulated to ensure that ongoing empirical verification of the theory is possible over time. This means that when the empirical data no longer supports the theory, it is easy to see that the theory needs adjustment or even to be discarded. This both reduces the risk of pursuing measurement frameworks that no longer hold, or indeed, has never held, and increases the potential to build on and improve the existing theory and measurement framework.

It is critical to clearly and carefully define and articulate measurement frameworks because of their potential to create incentives. This is fundamental to the beneficial power of measurement frameworks as they drive change in the behaviour of stakeholders to target interventions that lead to positive outcomes. However, inherent in this power is an enormous risk, as inappropriate measurement frameworks can equally change behaviour and incentives in a direction that can leave stakeholders in a far worse position than where they started.

It is critical to clearly and carefully define and articulate measurement frameworks because of their potential to create incentives.

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