Branching Out

Use measurement trees to determine whether your improvement efforts are paying off

by Brandon Bennett

Just the Facts

A measurement tree is used to break down broad categories into finer and finer levels of detail. The tree is comprised of five parts: outcome measurements, process measurements, process step measurements, balance measurements and plan-do-study-act measurements.

These measurements represent areas of the system that are useful to measure during an improvement project and help teams understand whether the changes they're making are beneficial.

When embarking on any improvement project, there are three critical questions teams must ask to guide improvement efforts:

1. What are we trying to accomplish?
2. What can we change that will result in improvement?
3. How will we know whether a change is an improvement?[1]

Improvement teams across many sectors, such as healthcare, community health, education and social welfare, can usually answer the first two questions with relative ease. Leaders task teams with an aim or goal: seek better performance from a process or the system; improve profitability, safety, access, equity or some other outcome meaningful to the system.

Often, improvement teams are comprised of middle managers and frontline workers who, given their experience, theorize what must change to achieve better performance. Ask any frontline worker, "What would you change about your work and how would you change it to make it easier, more effective, faster, safer and more equitable?" The worker will have an answer waiting.

However, improvement teams often struggle with connecting the ideas they have, which often are specific to tasks at hand, back to the outcome of interest. A question remains: What is the logical link that would allow a team to make a change in the process where it works and see a measurable impact to the process's or system's desired outcome?

The measurement tree is a diagram that can help make those connections:

+ It displays the logical links of measurement related to the desired improvement.
+ It breaks down the complexity of a single outcome into the measurable component parts of the system that are theorized to play a role in creating the outcome.
+ It serves as a bridge between the unproven change ideas workers and leaders have for "fixing" the day-to-day work problems and the improved outcome they desire to see in the system.

Figure 1 is a conceptual view of a measurement tree.

Component parts

A measurement tree has five parts:

1. Outcome measurement.
2. Process measurement.
3. Process step measurement.
4. Balance measurement.
5. Plan-do-study-act (PDSA) measurement.

Each part represents an area of the system that is useful to measure during an improvement journey. The purpose of these measurements is to help a team understand whether the changes it's making are having the beneficial effect it theorizes.

The tree is constructed through a process that brings together subject matter expertise used to inform the team's theory of improvement with possible measurements pulled from information the system already collects. A driver diagram can serve as a good starting point for informing and inspiring what data might be useful to understanding whether improvement is occurring in the system.[2, 3]

Part one: Outcome measurement. The outcome measurement represents the primary focus of the measurement tree. It measures the purpose of the improvement work that has been undertaken and serves as the improvement team's motivating force.

This is the measurement a team uses to understand whether it has achieved its outcome. It measures the quality of the service, product or result that is meaningful to the team's community, student body, client base or workforce.[4]

In some industries, such as education, healthcare and social welfare, it's useful to distinguish between lagging outcome measurements, which can only be collected infrequently, and leading outcome measurements, which are highly correlated to the lagging measurements and available for collection more frequently.

An example from the education field helps illustrate this phenomenon:

+ **Lagging outcome measurement:** The percentage of new teachers retained each year. This measurement can be collected only once per year (at the end of a school year when retention rates are calculated and reported at the school and district levels).
+ **Leading outcome measurement:** The percentage of new teachers reporting a feeling of burnout. This measurement could be ascertained by surveying new teachers in a school or across a district every six weeks during the academic year.

This measurement might be chosen because measurements of burnout are highly correlated with retention. A

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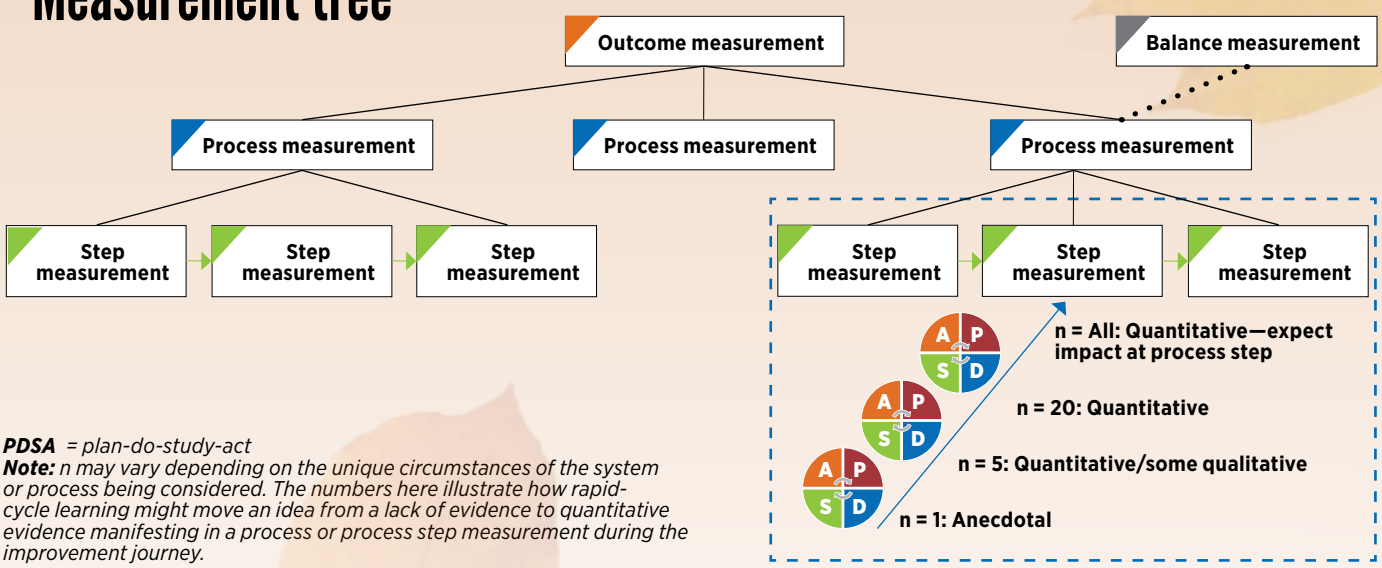
FIGURE 1

Measurement tree



PDSA *= plan-do-study-act*
Note: *n may vary depending on the unique circumstances of the system or process being considered. The numbers here illustrate how rapid-cycle learning might move an idea from a lack of evidence to quantitative evidence manifesting in a process or process step measurement during the improvement journey.*

CASE STUDY

Helping Families Initiative

HOW AN ALABAMA ORGANIZATION USED MEASUREMENT TREES TO REDUCE TRUANCY RATES AT LOCAL SCHOOLS

Situation. Students who don't complete their education successfully are disproportionately represented in the criminal justice system, with African Americans being incarcerated at a rate of five to one compared to their Caucasian peers in the country.[1]

Minority students (particularly African Americans) in the United States are being suspended and expelled at a rate four times higher than their Caucasian peers, leading to an increased likelihood they won't complete their education.[2] Another risk factor associated with failure to complete a high school education or its equivalent is chronic absenteeism, which is a key indicator in predicting school dropouts.[3]

Context. The Helping Families Initiative (HFI) was developed in Alabama as an intervention to address these disparities and the underlying causes that lead to chronic absenteeism in students before they progress to dropping out and potentially engaging in criminal activity.

HFI partners school districts with the criminal justice system to embed social workers and case officers in district attorney (DA) offices. As students become chronically absent (defined as having 10 or more unexcused absences from school) or engage in serious behavioral offenses, they are referred to DA offices, where a social worker offers to help the student's family access any needed social services, such as job training, housing support, food aid or counseling.

Any plan of intervention is co-created with the family and a multidisciplinary team coordinated by the social worker.

Problem. HFI leadership faced a challenge in understanding the ongoing performance of its system. For the first several years, it relied on traditional, after-the-fact evaluations to understand whether its intervention pathway was reducing chronic absenteeism and improving family stability.

As it gained confidence in the utility of the pathway, it decided to scale the work beyond the initial intervention sites: the DA offices in Mobile and Montgomery counties. Scaling required the HFI team to develop a measurement system that could be implemented by DA offices adopting the program.

It was envisioned that such a system would provide information in close-to-real time about the reliability of the intervention pathway as it was implemented. It also would indicate whether the pathway was having the intended effect of reducing chronic absenteeism and improving family stability as the program expanded to new judicial circuits.

Solution. A measurement tree was created based on descriptions of the work and a flow diagram that was created to represent the intervention pathway (see Online Sidebar Figure 1). The flow diagram allowed leadership team members to identify four process step measurements useful for understanding the reliability of the process in practice.

Process measurements were generated to understand the volume of work flowing through the DA offices as well as when the intervention process was successfully completed. Leading outcome measurements were developed to allow monthly insight into the effect that the initiative was having on students, as well as to understand how long it might take to achieve a case closure with a family.

The long-term outcome measurement was created to assess whether a decrease in criminal prosecutions took place in the judicial circuits where the initiative was adopted.[4] By linking these together in a measurement tree, the leadership team could easily communicate the value of each measurement and how each measurement related to another.

Judicial circuits considering adopting the HFI are faced with some key considerations. Chief among them is whether the outcome of intervention warrants investment in the intervention. The measurement tree depicted in Sidebar Figure 1 assisted them in seeing which data were necessary for deciding.

It also clarifies for intervention teams whether the work of the process is happening as intended and along the intended timeline, thus giving early insight into potential failure points that could reduce the HFI's effect. The process step and measures act as an early warning system, identifying when and where in the system the need for continuous improvement may occur.

—B.B.

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leading outcome measurement indicating high levels of burnout early in the year can serve as motivation for leaders to intervene before teachers choose to exit the workforce.

Part two: Process measurement. "All work is a process." This adage, often attributed to W. Edwards Deming, captures the heart of managing systems. It implies that a system's outcomes are the direct result of the work done to produce those outcomes.

Processes can be defined as the step-by-step actions taken to accomplish work. They are influenced by the structural and cultural elements of the system. However, it is in how well, how often and with what fidelity they are accomplished that ultimately determines a system's outcomes. To achieve the outcome, processes must be continually improved.

The process measurements, then, represent the data a team can collect to understand the performance of a system's day-to-day work. While outcome measurements often lag in time, process measurements are more readily available because they are directly connected to concrete work processes happening regularly. The availability of data for process performance can vary from daily to weekly to monthly.

Process measurements in the measurement tree are deeply influenced by subject matter expertise and the theory crafted by the team aiming to achieve a new outcome. Teams readily identify them through connections to their theory of improvement. In cases in which a driver diagram is used to depict theory, these measurements often are connected to the primary and secondary drivers (structures, processes or operating norms) identified as key leverage points in the system.[5-6]

Part three: Process step measurement. The outcome of a system is the result of multiple processes working together. But processes themselves can be complicated. They are made of many steps—small actions taken in sequence—that lead, little by little, to the production or completion of a service or product. These steps are where process step measurements are identified for inclusion on a measurement tree.

Finding a balance is crucial, but from the perspective of improving a whole system, teams rarely want to experience significant gains in one area at the expense of another area.

Process steps happen every day in systems. They represent the work of individuals and teams: from teaching a class to administering a budget to intervening on behalf of a client or family. These steps are the places in the system where applying a change idea can result in improved performance.

Frequently, teams haven't articulated or don't know what the process steps are in a system, or don't measure them. Identifying these steps and collecting measurements about their performance, even if temporarily, can be a huge boost for teams seeking to answer the question, "How will we know a change is an improvement?" Process steps are where performance improvements can be detected or realized first.

Part four: Balance measurement. Balance measurements are used by improvement teams to see whether the improvement work is having an unintended consequence in the system.[7]

Leaders and managers often are asked to make tradeoffs in the performance of their systems. Reducing the cost of providing healthcare, for example, might mean a healthcare provider decreases the size of its workforce, thus limiting its ability to maintain the quality of care provided.

Finding a balance is crucial, but from the perspective of improving a whole system, teams rarely want to experience significant gains in one area at the expense of another area. A team focused on dramatically improving teacher satisfaction, and thus retention, for example, wouldn't want to achieve its goal at the expense of student achievement.

Part five: PDSA measurement. Measurements developed for PDSA cycles, or rapid learning cycles, comprise the final component of the measurement tree.

These measurements are used to answer specific learning questions proposed by teams when testing a change idea in practice. They often are used as part of a single cycle of learning at a small level—with one client, in one huddle, in one school for a month, or across several locations for a week.

They exist to build an improvement team's knowledge and confidence about what might work to improve the system.

PDSA measurements are harder to describe conceptually because often they exist for just a single cycle. They provide the information necessary to propel a team forward in its learning and help it know when and whether to move the trialing of change ideas to a more diverse set of conditions or a larger scale.

These measurements are crafted uniquely for the cycle at hand and can be operationally defined qualitatively or quantitatively, depending on the learning needs of the cycle. Though teams may collect data on these measurements for only a short time or in an ad-hoc way (not incorporate them into the permanent data collection microsystem of the organization), they are incredibly important to the improvement journey.

Data collection tools, such as check sheets, recording forms, surveys and empathy maps, frequently serve the function of data collection for single PDSA cycles. Often, the data from these cycles build sequentially, helping the team tasked with improvement learn what ideas improve the process or system in practice.

Some of these data collection tools and the data they collect are used for several cycles, while the degree of belief a team has in the utility of an idea increases. Some become important enough to be elevated to process step measurements (and thus formalized into the system). Some are used just long

enough to confirm the utility of an idea before being discarded.

A ramp of sequential cycles is included in the conceptual view of the measurement tree to highlight their contribution. Early on, learning may be anecdotal or purely qualitative, but as cycles progress and a change idea is trialed on a larger segment of the process, quantitative impact is noted.

Figure 2 is a populated example of a measurement tree focused on an improvement journey to increase the percentage of students enrolling in a four-year college or university. PDSA cycles can be used to learn whether change ideas designed to decrease the percentage of students with missing documentation during the Free Application for Federal Student Aid (FAFSA) completion process work in practice.

An early PDSA cycle might be in trialing the idea of providing a student with a FAFSA completion mentor, with learning questions (and associated PDSA measurements) focused on the time it takes to secure all necessary documents and the acceptability of mentorship.

Later cycles might focus on learning questions associated with the scale and cost of providing such mentorship across a school district.

See the sidebar, "Case Study: Helping Families Initiative," (pp. 20-21) to learn how measurement trees helped an Alabama organization understand whether its system was helping reduce chronic absenteeism in area schools.

Common missteps

A common error teams make when crafting a measurement tree, or any family of measurements, is to write out their measurements as an aspirational statement, such as, "Increase student enrollment by X%." This language is closer to that of an aim or goal statement and isn't the measurement of interest. It does, however, contain the measurement of interest: student enrollment as a percentage.

It's important for improvement teams to understand that measurements in and of themselves have no directionality and are simply a reflection (adding a voice) of the system's performance. Measurements depict the data that allow a team to understand, empirically, whether a process step, process or outcome is changing, either toward or away from the team's aspirations. Change in performance often is ascertained through a run chart or Shewhart control chart.[8, 9]

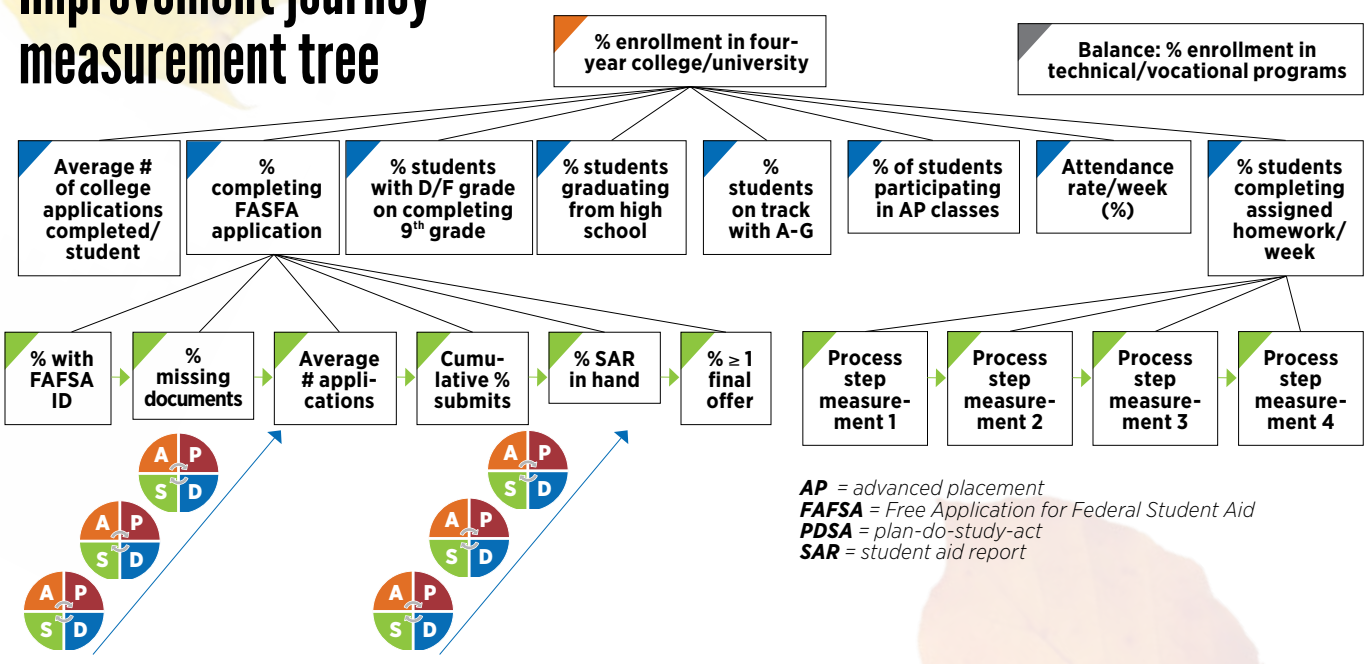
Partnership with rapid-cycle improvement

Whether it's redesigning their order, adding a new structure or resource, or improving how people communicate in the system, process steps represent the actionable moments in time in which a change idea might prove effective in improving the system.

The model for improvement, using PDSA cycles, is one way to introduce change to a system, providing improvers the opportunity to try ideas in practice first before committing to them in a more permanent or sustained way.[10-12]

FIGURE 2

Improvement journey measurement tree



The measurement tree is a visual display of the logical links between the outcome that motivated the improvement journey right down to the individual change ideas being tested to alter the day-to-day work of the system seeking that outcome.

Starting at a small scale with those who work where the change is desired and with those who are willing to try things in a new way, PDSA cycles can be used to test the efficacy, efficiency, acceptability and reliability of a change idea. As evidence is built—first anecdotally, then qualitatively and quantitatively—the frequency with which an idea is practiced or the scale at which it is used can be increased.

At some point, enough evidence is amassed that an improvement idea shifts from testing in practice to implementing for all.[13] It is in this moment that the cascade of impact from process step measurements to process measurements to outcome measurements begins.

A clear picture

The measurement tree is a visual display of the logical links between the outcome that motivated the improvement journey right down to the individual change ideas being tested to alter the day-to-day work of the system seeking that outcome.

For individuals and teams that struggle with understanding how and why measurement fits together to support improvement, the measurement tree can provide a clear picture and assist the communication and understanding of why certain measurements were chosen.

When partnered with statistical tools, such as run and control charts, measurements observed more frequently in the improvement journey, such as those in process steps and process levels, can reveal early improvement. This can boost the energy of an improvement team, revealing whether its theory of improvement is proving true in practice.

Conversely, these same measurements, should they show no improvement when changes are introduced, can support the agility of a team to change course. Altering its theory and updating its knowledge about what does and doesn't work can help the team discover what will improve the outcome it desires from its system. QP

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