

# What's **YOUR** Theory?

Driver diagram serves as tool for **building and testing** theories for improvement

by Brandon Bennett and Lloyd Provost

## In 50 Words Or Less

- A driver diagram is an applicable tool for many contexts, from improving process reliability to redesigning a service to creating new products to generating enhanced user experience.
- The tool visually represents a shared theory of how things might be better, building upon knowledge gleaned from research, observation and experience.

*At least it appears that we must accept a kind of double truth: There are certainties, such as those of mathematics, which concern directly what is only abstract; and there are the presentations of our sense-experience to which we seek to apply them, but with a resultant empirical truth which may be no more than probable. The nature and validity of such empirical knowledge becomes the crucial issue.*  
—C.I. Lewis<sup>1</sup>

**IN THE NEW ECONOMICS**, W. Edwards Deming articulated “a view from outside” that he believed was a high-level complement to subject matter expertise in the pursuit of improvement—his system of profound knowledge.<sup>2</sup> Deming outlined four elements—appreciation of the system, understanding variation, psychology and the theory of knowledge—which provide insight into how improvement can occur.

CONCEPT

ANSWER

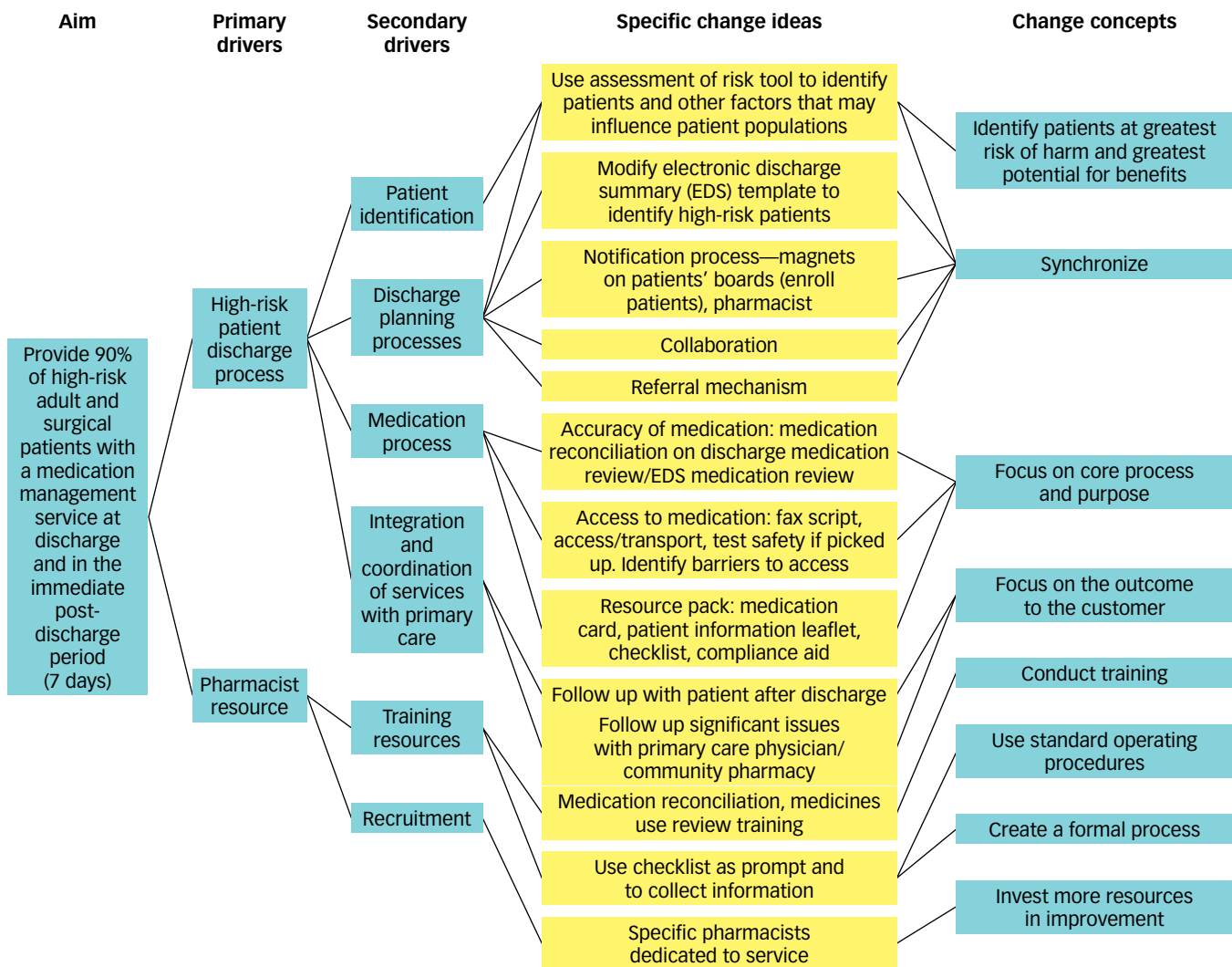
IDEA

THEORY

RAIN-STORM

SOLUTION

# Completed driver diagram / FIGURE 1



For most practitioners of improvement, appreciation of the system, understanding variation and psychology of change are natural foundations for their work, with known applicable tools and plenty of case examples in which the impact of each was important in achieving some organizational aim.

Except for the widespread use of the plan-do-study-act cycle (PDSA), the theory of knowledge has been applied and written about much less often. Instead, those tasked with improvement often move forward solely from the perspective of subject matter knowledge or with unexamined assumptions about their system.

A theory of knowledge can be defined as a view

of what theory and ideas are empirically relevant for managing and improving the system of interest.<sup>3,4</sup> In a practical context, this knowledge is best articulated as a testable prediction of the activities and infrastructure necessary to achieve a desired outcome.

Knowledge becomes useful when partnered with a method for testing and learning its validity in practice. For years, the PDSA cycle has been a practical method for applying the scientific method in an operational space. Today, the model for improvement (MFI) has emerged as a key learning method, incorporating the PDSA cycle and three questions to focus improvement efforts:

**1. Aim:** What are you trying to accomplish?

**2. Measurement:** How will you know a change is an improvement?

**3. Theory of improvement:** What changes can you make that will result in an improvement?<sup>5</sup>

A driver diagram serves as a tool for building the testable hypothesis.<sup>6</sup> It consists of a team’s shared theory of knowledge—which is developed by consensus—and includes relevant beliefs of team members about what must change and which ideas about how to change may result in improved outcomes. Figure 1 shows an example of a completed driver diagram for a healthcare improvement project.<sup>7</sup>

For an improvement project, the driver diagram illustrates what structures, processes and norms are believed to require change in the system as well as how these could be changed through the application of specific ideas. This tool has been applied to varied contexts, from the improvement of a single process to the redesign of an existing service to the creation of new products aimed at enhancing user experience.<sup>8,9</sup>

**Setting up an improvement project**

The intended outcome of an improvement project is articulated in the form of an aim statement, which typically outlines the following:

- Outcomes of the system desired to be improved.
- The intended magnitude of the improvement—with a direct link to an outcome measurement of interest.
- A timeframe for completion.

On a driver diagram, everything to the right of the aim statement identifies a theory about what must change and how it must change to achieve the desired performance or outcome. Because the driver diagram represents an overall theory, it is essentially a broad prediction of the changes required to accomplish a given aim or outcome.

A driver diagram is often used because the evidence about how to accomplish the aim is not well established in the system of interest. The driver diagram is, therefore, best used as a tool for initiating or accelerating learning in an improvement project.

There are a variety of formats for a

driver diagram. Figure 2 shows a generic format that will be the focus of this article.

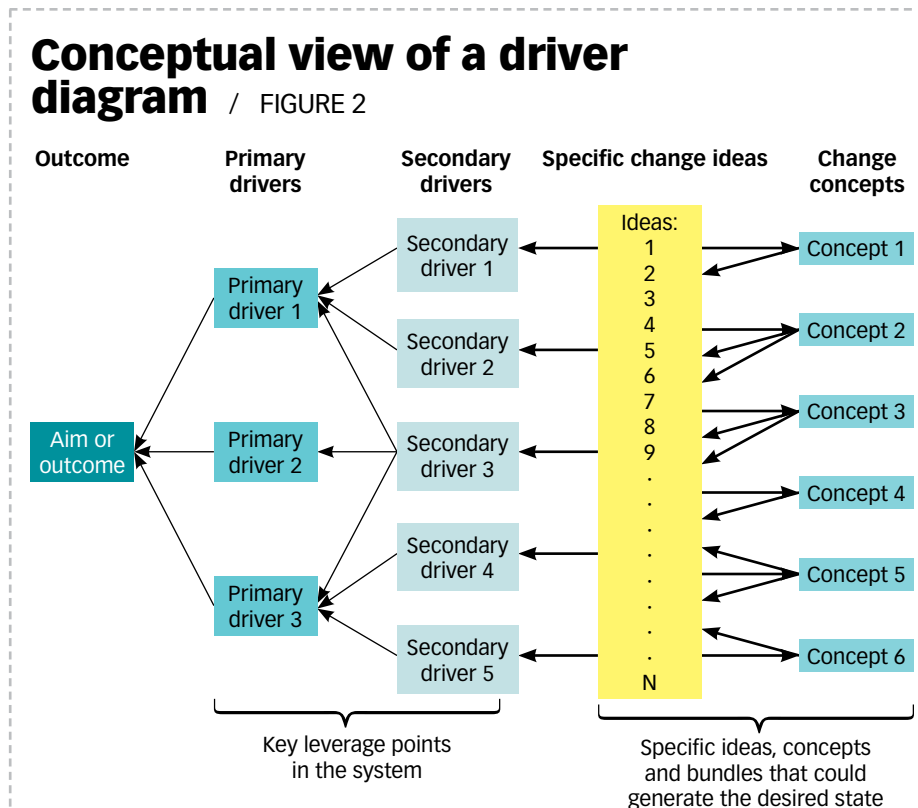
**Key leverage points**

The primary and secondary drivers from which the tool derives its name are intended to identify the elements in the system that are necessary and sufficient for achieving the intended outcome.

They include three elements: structures that comprise the system, processes that represent the work of the system and operating norms that demonstrate the explicit and tacit culture of the system.<sup>10</sup> These are typically theorized by working closely with subject matter experts who work directly with the system of interest.

Structures may include the physical design of a space or product, technological elements (such as equipment), the overarching architecture of software, departments and other groupings in an organization and organizational policies. Management systems, such as financial, administrative, improvement and leadership structures, are also often included.

Processes refer to the system’s workflow: how things are accomplished, what steps are taken and



in what order. In some organizations, processes are named and most employees know which processes they work in and for which steps they are responsible. Note that these are often where the greatest improvements can be made given existing resource constraints. In other organizations, processes are vaguer concepts that must be studied and mapped to be improved.

Operating norms include written and unwritten rules that govern the behavior of members of the system. These norms reflect the organizational psychology of the system and are, therefore, critical elements when considering the introduction of change to any status quo.

The primary drivers are high-level elements in the system that must change to accomplish the outcome of interest. Nested below them are secondary drivers, which are more actionable approaches, places or opportunities within the system where a change can occur. An overarching process is identified at the primary level, for example, and individual steps within that process are outlined at the secondary level.

The secondary level articulates the physical places, time-bound moments and norms that can be acted on

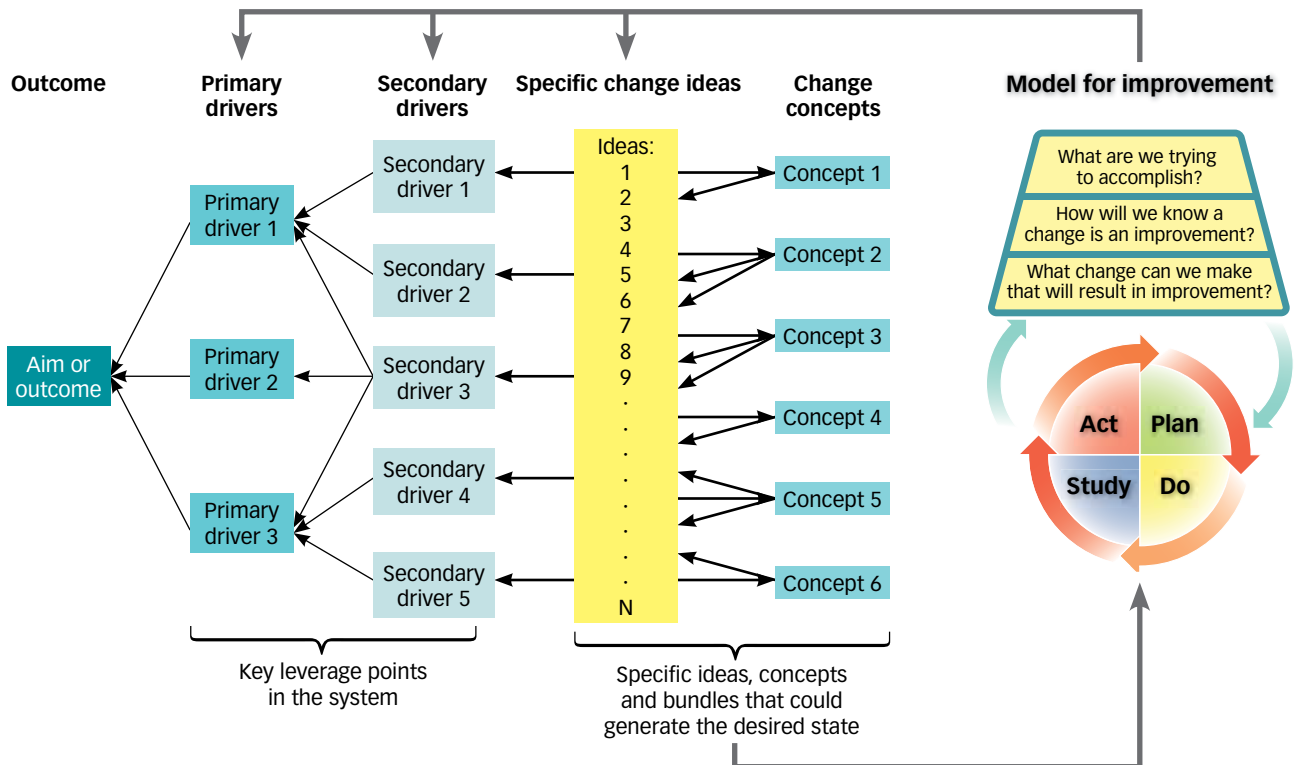
when introducing new ways of doing things, whether it is replacing a tool, introducing a new step, reordering a sequence of events or maintaining a beneficial behavior. These second-level items can be thought of as the switches within the system that must be flipped on or off to achieve the outcome of interest.

For some improvement efforts, moving from the primary to the secondary level with drivers is unnecessary because the aim may be to improve a single process or step within a micro system. In these cases, it may be best to omit secondary drivers.

Conversely, there may be times when the theory being developed is quite complex, which would require the addition of a third level in the driver diagram. This adaptation is not recommended for practical reasons: The diagram is intended as a clear and simple visual depiction of theory, so if it includes too many drivers or associated changes, its utility may be compromised.

In such circumstances, teams may instead make multiple driver diagrams, each with only primary and secondary drivers. Each respective diagram will be more useful to teams tasked with testing change ideas.

## Driver diagram informs testing, testing refines theory / FIGURE 3





# In some organizations, **processes are named** and most employees know which **processes they work in.**

If and when there is a need to communicate the overall improvement effort, these nested driver diagrams can be aggregated into a parent diagram that indicates where more detail can be found.

## Specific ideas and concepts

The next section of the driver diagram has the specific focus of listing all of the actionable changes that can be tested on the system of interest to accomplish the stated aim. It consists of two parts: change ideas and change concepts.

**Change ideas** are tangible and specific. They articulate how a tangible and specific change is intended to take place in a system. The statement “implement assessment X for condition A” is too vague, for example, because it misses how the implementation will actually occur.

While the underlying theory might be, “If the system can reliably assess X, action can be taken to create an efficacious plan to address the risk of condition A,” it still lacks clarity on how to perform and complete the assessment.

The change idea must incorporate more detail, such as a description of a newly designed process that will allow the system to reliably complete the assessment of a given tool. It may be appropriate to include an appendix link to a process map or flow diagram that can be tested, refined and, ultimately, made a permanent part of business as usual.

Note that there may not be a one-to-one relationship between change ideas and the drivers the ideas might affect. The complex nature of many systems means a single idea may affect multiple drivers. Conversely, many ideas may work together to affect one or more drivers. These interactions can be captured in the diagram and subsequently tested as bundles of change ideas.

**Change concepts** represent abstract forms that underlie change ideas. They can enhance the improvement journey by reflecting an abstract form that can

manifest through a variety of specific change ideas.

An improvement effort focused on increasing the reliability of process Y, for example, might theorize that setting an ongoing calendar reminder—a specific change idea—will improve reliability in execution of the process by X%, but when tested, the calendar reminder might fail to deliver the intended outcomes.

In this case, the change idea did not result in improved performance. As the team considers the underlying concept (reminders), however, it might formulate other types of reminders (other specific change ideas) that might work. Other change ideas could be: automatically send a text message at the appropriate time, call someone who initiates process Y or send an email.

If none of these work, the team may consider revising its theory to reflect the learning that reminders of all types do not provide the intended effect before moving to other concepts and associated change ideas that might prove more useful in achieving the outcome of interest.<sup>11</sup>

In some circumstances, teams will develop driver diagrams that include change ideas with strong empirical evidence to support the idea’s efficacy. In these situations, it would not make sense to include ideas associated with change concepts, which ultimately serve the purpose of helping to identify an ever-increasing number of change ideas which might be experimented with in the system.

Another approach would be to use the space where a change concept would normally sit to create a direct link to the reference materials for the evidence indicating the efficacy of or need for the change idea being included on the diagram.

## Partnering a mechanism, driver diagram

Deming wrote:

The theory of knowledge teaches us that a statement, if it conveys knowledge, predicts future outcome, with risk of

being wrong, and that it fits without failure observations of the past. Rational prediction requires theory and builds knowledge through systematic revision and extension of theory based on comparison of prediction with observation.<sup>12</sup>

A driver diagram is most useful when it depicts a theory that can be tested empirically. Without learning through testing and continual revision, a driver diagram becomes just an interesting picture or, at best, it simply represents an unproven implementation plan.

To maximize its effectiveness, a driver diagram must be partnered with a mechanism for learning. The MFI, which includes PDSA cycles, is one such tool for this partnership.<sup>13</sup>

PDSA cycles can be used iteratively on individual change ideas or to organize orchestrated testing of several ideas through planned experimentation. The aim always being to learn whether the overall theory articulated by the driver diagram can generate the quality improvement desired.

When change ideas fail to achieve the impact predicted by the diagram, either the leverage points identified or the specific ideas articulated (or both) can be updated to reflect the learning derived from these iterative test cycles (see Figure 3, p. 40).<sup>14</sup>

The aim of bringing together the MFI and the driver diagram is to discover knowledge that is useful for achieving ever better outcomes from a system. Through this process of prediction, testing, learning and revision, a system can continuously evolve toward the aim of any improvement project.

In healthcare, this might mean continuous learning about how to improve the health of a local population. In education, it could mean learning the best ways of increasing teacher effectiveness. In software development, it could simply mean learning how to quickly respond to the ever-more-fickle demands of clients and users.

A driver diagram also can help craft the measurement strategy of an improvement initiative. One of the three core questions of the MFI is, “How will you know a change is an improvement?” This can be easily linked to the primary and secondary drivers and to the aim statement.

Outcome measurements should be embedded in the aim statement for most driver diagrams, though this may vary if a team is building nested diagrams or using the

diagram to illustrate a theory in a purely conceptual way.

Other measurements designed to illustrate the voice of the system can be linked directly to the primary and secondary drivers. These can include specific process measurements, financial measurements, or measurements of staff and client satisfaction. Some teams will place these measurements directly on the driver diagram as an annotation, while others might choose to develop a comprehensive measurement strategy in a separate document.

Figure 4 provides a simple example of the iteration that takes place when a theory of improvement is tested and refined using the PDSA cycle.

## Informing improvement

The use of a driver diagram by improvement teams recognizes change is required to improve a system, and theory is used to articulate the knowledge about how to achieve an aim of interest.

Improvement takes place in dynamic environments where barriers, resources, cultures and attitudes are often in flux and are therefore unpredictable. As such, the tool presents the best information and most informed beliefs a system has about why things are the way they are right now, and how they might be improved.

After being visualized, the tool can and should be used to refine knowledge of a system as learning takes place. **QP**

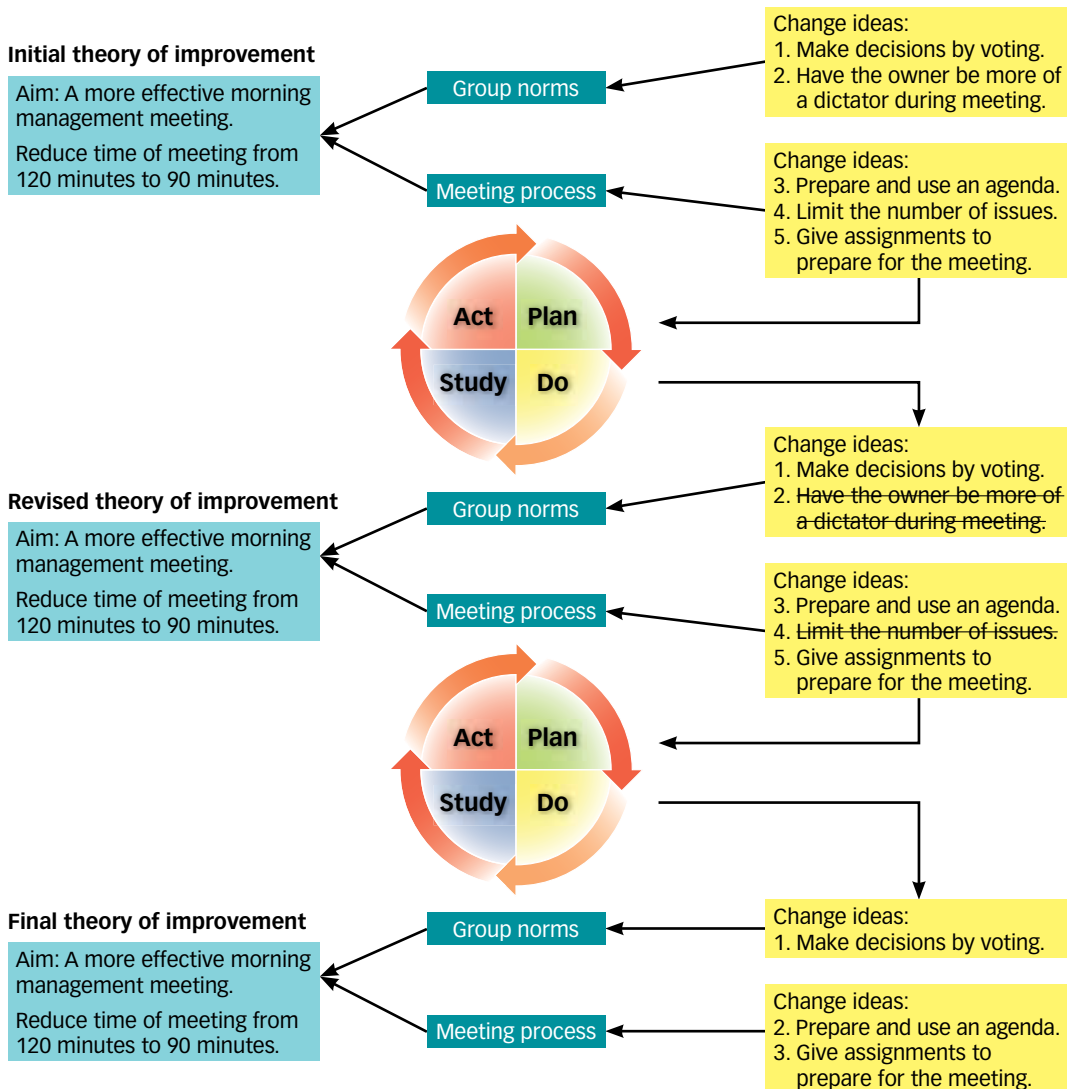
### EDITOR'S NOTE

The authors thank Tom Nolan for his original work in the creation of this tool. They also recognize Cincinnati Children's Hospital, where the driver diagram was first used and has become a standard part of its improvement framework.

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10. Langley, *The Improvement Guide*, see reference 5.

# Iterative refinement of a theory of improvement using a driver diagram and PDSA / FIGURE 4



- 11. A useful list of 72 change concepts for this purpose has been published in *The Improvement Guide: A Practical Approach to Enhancing Organizational Performance*, see reference 5. While improving teams might like to leverage this list at times, the concepts underlying specific change ideas may be apparent and can be identified simply through group discussion.
- 12. Deming, *The New Economics for Industry, Government, Education*, see reference 2.
- 13. Langley, *The Improvement Guide*, see reference 5.
- 14. For more detail on how this is accomplished, read Langley, *The Improvement Guide*, see reference 5.

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