Take it to the next level!

Making Your Data Work

TOOLS AND TEMPLATES FOR EFFECTIVE ANALYSIS

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Contents

CHAPTER

1

Why Data Is So Important

What is data?

Data can be defined as factual information that forms the basis for our reasoning, discussions, and decisions. But that definition assumes that some preprocessing has occurred because data can also be thought of as collected information from our senses or measuring devices that may be either irrelevant or useful, depending on how we process it.

In the paper-and-pencil era, data had a way of being self-controlled—we just couldn't manage too much data, so we were more cautious about what we collected, stored, and analyzed.

In today's digital era, we have tremendously powerful tools for managing data, but we can also collect every trivial piece of information, store it, graph it in six different colors, and e-mail it to hundreds of coworkers.

What, then, is a realistic goal for the collection and use of our data? Why do we do it?

Goal: Use data to cause positive change

Effective data needs to be able to cause change. It needs to be an integral part of the "control loop" for your facility. If the data does not validate or change behaviors, it is not very useful and probably is resulting in the expenditure of time and effort with limited value.

> **TIP:** Data that does not validate or change our behavior is not very useful.

Data also needs to serve us, not make our goals harder to achieve. So who needs to be able to use data effectively? In one way or another, we *all* need to be able to effectively use data. Often the Quality and Performance Improvement, Infection Control, and Risk Management departments are key collectors and managers of data, but the real value of data extends from the clinical and non-clinical frontline all the way through the board.

Who needs to understand data?

The secret to making your data useful throughout the organization is to recognize that not everyone wants or needs the same data (see Figure 1.1). Although we might be tempted to provide the board of directors with a 150-page data report each quarter, that may not be useful if board members get to spend only 15 minutes looking at the report before they meet and then hear a 20-minute overview presentation. That's lots of data—but probably not likely to validate actions or cause change.

Likewise, a comprehensive presentation to the dietary group on the current status of core measures might be interesting, but it probably will not validate their actions or cause change within their department.

One of the key concepts we will discuss in Chapter 4 is the ability to roll up and zoom in on data. This keeps the data linked together and ensures that the detailed inputs from particular departments are part of the big picture, but it also allows the data to be rolled up into more useful summaries as we present our findings to people and departments higher up in the organization.

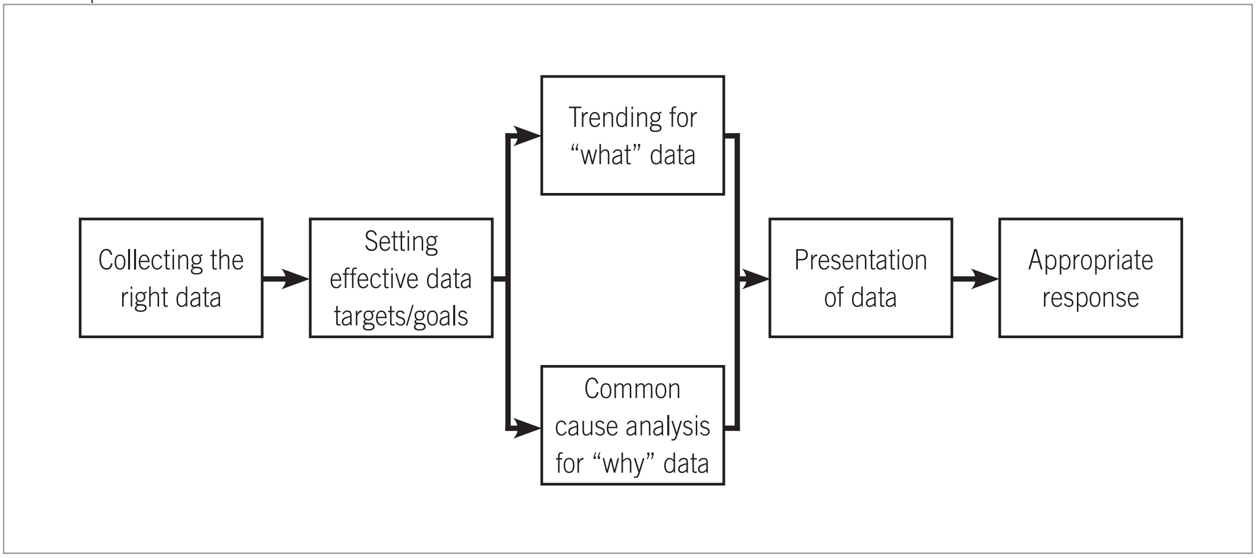
FIGURE 1.1 Match the data to the needs of the user

User	Data Need
Board of directors	• Is the organization meeting our highest-level goals and commitments to the community, employees, and stakeholders? (Stakeholder data) • Does the data validate that we are on an acceptable path, or does it indicate that the organization needs to change direction?
Senior leadership	• Are we meeting our long-term strategic and financial goals? (Strategic data) • Are there major areas of emerging concern that need to be addressed before they turn into major problems? (Early warning)
Directors	• Are we meeting our shorter-term tactical goals this month? This year?
Managers and supervisors	• Are we meeting our daily and weekly operational goals? • What can we do within our department to be safer and more efficient or to provide higher levels of patient and employee satisfaction?
All employees	• How is my job going? • What are the risks I need to look out for? • Is the organization healthy?

The data cycle

The data cycle starts with data collection and storage of that data in such a way that it can be retrieved. Then we need to analyze, mine, and listen to the data so that we can understand what it is telling us. Finally, we need to present and share the data. Figure 1.2 depicts this data cycle.

FIGURE 1.2 The data cycle must result in an appropriate response

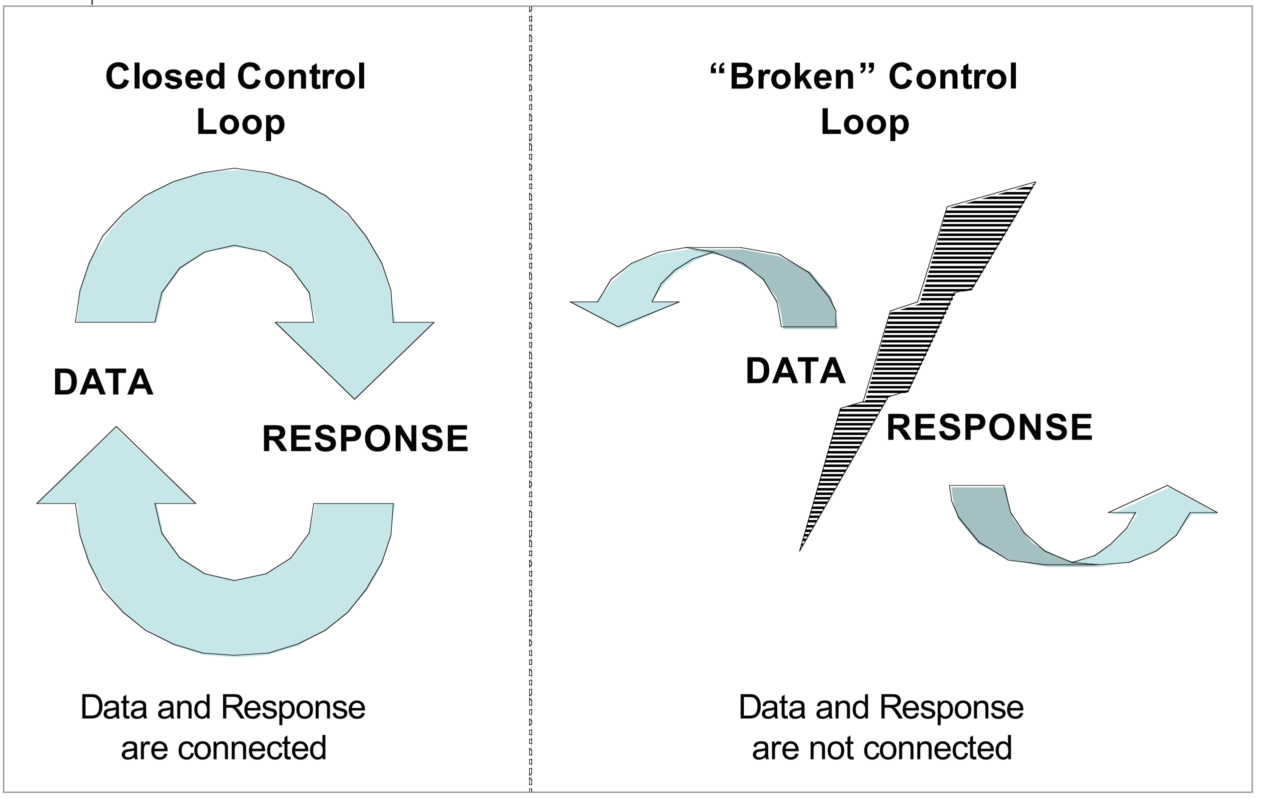


If the data cycle is working well, there is a strong connection between the data that is collected and the system's response. This is called a ***closed control loop*** because the data feeds from the behavior and then validates it or causes the behavior to change; then that behavior feeds back into the data, which then adjusts the behavior, and so on.

A ***"broken" control loop*** happens when we collect data and it has no impact on behavior, or we are measuring the wrong thing so that a change in behavior is not reflected back into the data. Either way, the loop doesn't work. Not only have we wasted all our data collection efforts, but we probably have a process that may be "out of control" or even unsafe.

Figure 1.3 compares these two types of control loops.

FIGURE 1.3 Closed control loops versus broken control loops



Thinking about control loops

Using your electric blanket: A control loop example

A classic example of a control loop is the process of maintaining the temperature of an electric blanket on a bed. A thermostat in the blanket measures the temperature (***data***) and then compares it to the desired temperature (***setpoint***) that the user selects via a controller on the bedside table. Then, depending on the relationship of the blanket temperature (***data***) to the desired temperature (***setpoint***), the controller turns the blanket on or off (***response***).

This can be considered a closed control loop if the electric blanket warms up, the thermostat measures the new temperature (***data***), and the loop continues to work—the user stays at a comfortable temperature all night long.

A closed control loop is the ideal situation, but sometimes a closed control loop is hard to achieve. Take, for example, an electric blanket that has two controllers: one for each side of the bed. What happens if you mix up the controllers and the controller for the right-hand side of the bed ends up controlling the left-hand side, and vice versa?

In such a scenario, the person on the right-hand side gets cold, so he or she turns up what is thought to be the correct controller. That doesn't do anything to that person's side of the blanket, but it does turn up the other side. Now that other person starts to get hot and reaches over and turns down his or her controller. That has no effect on the temperature on the left side of the bed, but it makes the other side of the bed even colder. This keeps going until one person is sweltering and the other person is freezing.

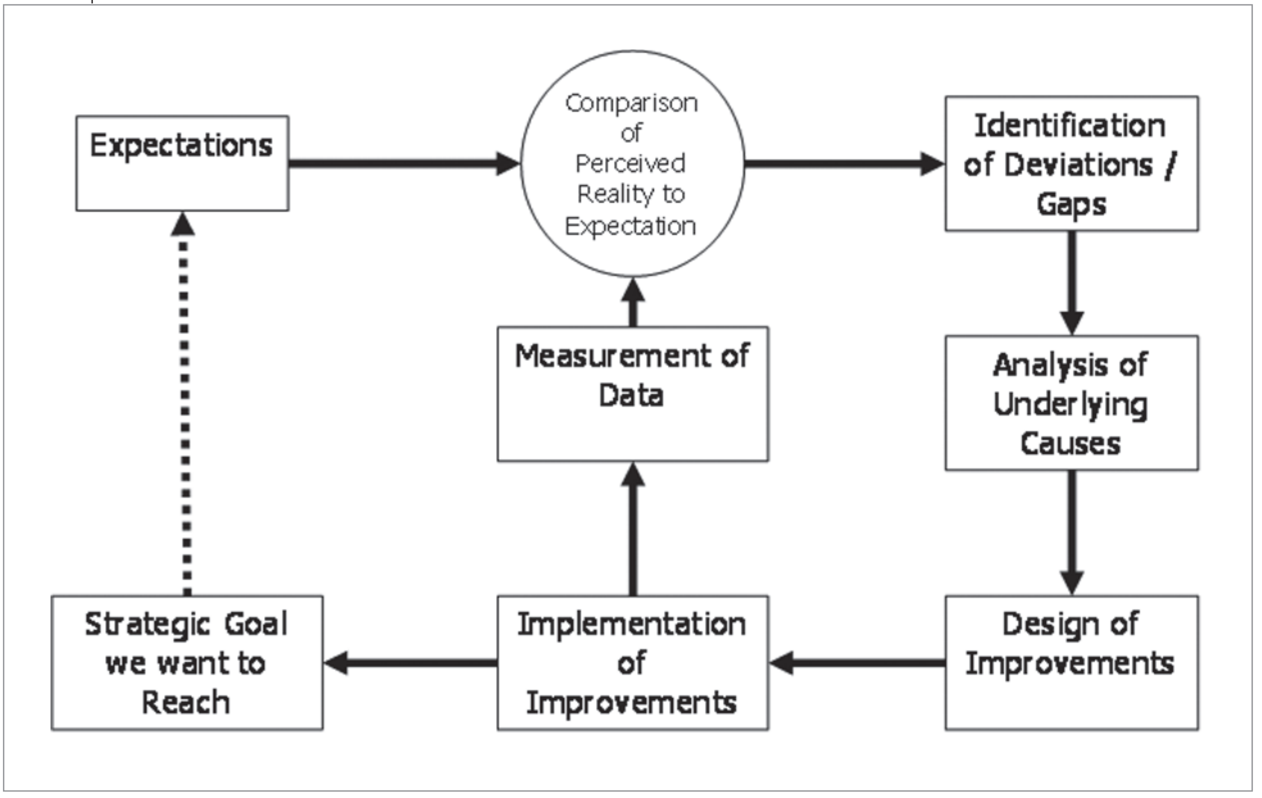
In that example, both of the control loops are "broken," and the responses taken are not connected to the data. In the end, we have a mess.

Can broken control loops happen to your hospital or care facility? Absolutely! For example, one senior vice president might look at a data report and adjust his or her "control" (e.g., finance), which then affects another area that he or she did not recognize (e.g., staffing, patient safety, and purchasing). Then another senior vice president looks at different data and makes another adjustment that he or she thinks will improve the situation, but in reality it causes another department's data to change. Before you know it, both senior vice presidents feel like things are out of control.

Control loops are called that for a reason—they determine how we manage and control our organizations and processes, and they depend on having good data. That means we need to do an excellent job collecting, analyzing, and presenting our data so that the data not only causes change but also changes things appropriately.

Just like pieces of equipment, our key processes are often control loops. For example, we can look at the entire performance improvement/quality process as a big control loop (see Figure 1.4). We set expectations or goals and then collect data to compare against those expectations. Then, based on the differences between our expectations and the data we collect, we identify gaps and design improvements if necessary. Next, the improvements are implemented, and we expect to see a change

FIGURE 1.4 Performance improvement is a control loop



in the data. If we do see a change and the change is in the right direction, we are comfortable that we have made a real performance improvement.

If the data we collect is not connected to the expectations or the response, or if the data is poorly collected or analyzed, we can have a significant breakdown in the performance improvement process. Failures in our performance improvement control loop can result in known problems not being fixed, increases in patient and employee safety events, regulatory or accreditation problems, and ultimately, challenges to the survival of the organization.

Our ability to recognize the ways a control loop fails is a vital part of managing the organization and keeping our processes under control.

Typical failures in a control loop

Good data managers and analysts need to understand how control loops work and, more importantly, how they fail. As Figure 1.5 shows, a control loop can fail in three classic ways:

- **We can have no control.** We set clear expectations, such as for handwashing or for a change in our core measures, but nothing changes.
- **We can be out of control.** We think we are reducing falls, but we end up with not only more falls but also other problems. Our best-laid plans had unintended consequences.
- **We can be oscillating.** Oscillation means that we swing back and forth between two points, sometimes going out of control. An example of this might be the management team starting a program and then two months later stopping it, and then starting it up again. "Program-of-the-Month" problems often are the result of oscillations in our control loops. We keep trying different things, never sticking with one long enough to really see whether it works.

FIGURE 1.5 Typical ways in which control loops fail

Control Loop Failure	What Happens	Potential Causes
No control	Changes in expectations do not result in any change in performance	• Data not connected to expectations • Wrong sample detail or frequency • Overmonitoring and lack of control • Poorly designed changes
Out of control	Control loop results in changes in the organization that were unexpected and unintended	• Bad data • Bad analysis • Wrong sample detail or frequency
Oscillations	Control loop sends signals to management that result in rapid swings in behavior	• Lack of data smoothing • Bad analysis

TIP

Effective data analysis and communication drives a healthy control loop.

Control loop failures are often driven by "data traps" that we need to be aware of and that we need to prevent.

Avoiding data traps: Don't collect your data at the wrong frequency

One of the first data traps is collecting data at the wrong frequency. Consider the gas gauge in your car. You sample the level of the gas tank every time you look at the gauge. Because driving the car is a "real-time" activity, you glance down at the gauge on a regular basis—probably every time you start on a journey and maybe every couple of minutes if you are getting close to running out of gas. That is probably an appropriate sampling frequency.

What if you decided that to meet your household "reporting" requirements, you needed to report on the level of the gas gauge every quarter? Is that a valid sampling frequency? Not at all! Not only is that data useless for controlling the level of gas in the tank, but the quarterly reports are also about as random as you can get—they are completely dependent on when you take the sample. If you sample the gas gauge on only a quarterly basis, you are almost guaranteed to have an event—running out of gas!

In healthcare, outside organizations often require that we report on data, sometimes on a monthly or a quarterly basis. It is vital for an organization to separate *reporting* or *monitoring* data from data used for *control* of processes.

Remember that outside organizations are using the data for a completely different purpose than you are. They are using it to monitor whether you are meeting their requirements or whether they need to intervene or even shut down your facility.

You are using the same data to control your processes to stay within the expectations you have set for your organization.

The frequency for data collection is very different for these two uses. Outside regulators can use quarterly or annual data to meet their needs, but that may not be anywhere close to the frequency you need to control your process.

An organization that tries to control a process using data that is sampled on a *monitoring* frequency is probably going to drift out of control and get into trouble. If you are using data to control your process, choose your sample frequency based on the following:

- How fast does the process normally change?
- How fast could the process go from acceptable to dangerously out of control?
- How much "early warning" do we need to get things back under control?
- What is the risk if the process goes out of control, and what is the cost to increase sampling?

There are problems with oversampling as well. Too much sampling increases costs and puts demands on resources, and if we don't produce meaningful conclusions, oversampling will result in pushback from the people who have to do the sampling.

TIP

Understand the costs associated with data collection and weigh them against the cost of the problem being addressed. Do you know the cost of each data measure that is being collected?

TIP

Collect data based on your processes' control needs, not based on a predetermined reporting schedule.

Avoid misleading conclusions caused by bad data and poor analysis

Bad data is a problem that occurs all too frequently. All data can be inherently biased, and this becomes more of a problem when it is voluntarily reported and not collected using a repeatable sampling process. Although you can use elaborate methods to design your data collection program, at a minimum, consider the following:

- Does your data represent all of the departments and functions that are involved, or is it limited to just one function, such as nursing or physicians?
- Does the collection process bias your data as being good or bad? Do you only collect exceptions, or only successes?
- Do you have a process in place to audit the collection methods and provide confidence that you understand the quality of your data?

Poor analysis is also a frequent trouble spot. Even if we collect the data effectively and are willing to accept any inherent biases, we can end up with misleading conclusions if we use poor analysis methods. Typical areas to consider include the following:

- Did we use an appropriate sample size, or are we basing our conclusions on just one or two samples?
- Do we provide some indication of what is statistically significant so we can separate the “vital few” from the “bug dust”?
- Can we confirm our conclusion using another independent analysis method or different data?
- Have we appropriately used good analysis tools such as smoothing, binning, and time series analysis?

Don't demotivate with your data

Remember that data is just part of your control loop and that the purpose of the control loop is to help you achieve your goals. Make sure that you don't accidentally demoralize your organization by the way you collect and present your data. For example, if people willingly report near-miss issues and then they feel that the data is "thrown back" in their faces, not only will the data suffer, but the whole organization will suffer as well.

Likewise, inappropriate comparisons of data between facilities within a larger system may set up competition or build conflicts that detract from achieving key goals.

Be careful of setting up metrics or goals that are self-defeating. Giving the pizza party to the group that has the best safety record for the month may result in a new employee not reporting a safety issue because he or she does not want to be the one to "ruin the run." That one decision to "not report" may offset the benefit of the entire group's efforts.

TIP

Strive for a non-punitive data reporting process. Don't demoralize with your data.

Don't sacrifice control of your process for more monitoring

We have only a limited number of resources to collect, analyze, present, and use data. Therefore, we need to allocate them appropriately. There is constantly increasing pressure to collect additional monitoring and reporting data. Monitoring data does not change responses or outcomes; it just tells us what they are. Make sure that your organization recognizes the differences between monitoring and control data and is allocating appropriate resources to collect, analyze, and use data that will help you change behaviors and not just report on the ones that exist.

Don't present the data with the wrong level of detail

Data managers spend a lot of their time working with the data, and often they are very familiar with all the subtle variations that it includes. There is often a certain pride in the data and a desire to share the knowledge and insights that it contains. Sometimes this leads to too much of a good thing:

"If a little data is good, 20 more pages of detailed charts must be even better" is not a good assumption to make. The real value of data comes in helping people verify or change their behaviors—there really isn't much value in data for data's sake. Consider the following:

- ❑ Is the presentation useful? Does it help the user make good decisions, or is it presenting data for data's sake?
- ❑ Do we present the conclusions that have already been drawn, or do we force the end-user to try to figure out what the data means?
- ❑ Is it clear what is good data and what is bad data?

TIP

Match your data collection, analysis, and presentation to how you plan to use the data.

Numeric data vs. exception data

The importance of exception data

If we were running a manufacturing machine that was making widgets, we could collect a large amount of parameter and specification data. We could make subtle adjustments to the control knobs on the machine and design experiments to alter the impact of all those changes. This would provide *numeric* data that would in turn enable us to control the manufacturing process to produce the largest number of high-quality widgets.

One of the key differences between manufacturing and healthcare is the degree of automation of the process. Manufacturing is often highly automated; healthcare uses some automatic pieces of equipment, but most of the processes are performed by nurses, physicians, aides, technicians, and even the patients themselves.

In comparison to much of manufacturing, healthcare has a very low level of automation. Therefore, we don't have the luxury of being able to make small adjustments on the "knobs" of the machine and tune our control loop using numeric data. Often, we must rely on *exception* data.

Rather than telling us a specific pressure or speed, exception data tells us when something has gone wrong—someone fell or a particular medication was late. These are exceptions to our smoothly running process (where ideally there would be no exceptions).

A good example of exception data is the occurrence report. Ideally, an occurrence report is written every time our process does not perform in the way we expect. Because we don't have a "medication knob" and a "medication digital readout" on our nursing floor like we might have a "speed knob" on a manufacturing machine, we have to rely on the exceptions to our process as data and use them as a key part of our control loop.

This leads to problems:

- The exception data often is not shared
- The exception data often has a long time lag
- The exception data requires different analysis methods to use effectively

TIP

Share your exception data between risk management and the process control functions.

Use exception data to help control your processes

Historically, the incident or occurrence reports (exception data) were collected and managed by the Risk Management or Legal department because these reports were initially designed to deal with documenting potential litigation or potentially compensable events (PCEs). Sometimes, this led to this data being tightly protected and not shared within the hospital or healthcare facility. If this happens, it eliminates one key source of control data within the organization.

TIP

Healthcare facilities must use exception data (occurrence reports) to help control their processes.

The Risk Management and Legal departments and the performance improvement/quality/infection control functions must collectively recognize how important it is to fully use exception data to improve your processes and thereby reduce risk.

Reduce the time lag on your occurrence and incident data

If the occurrence and incident report data is to become an effective part of your control loop, you need to reduce the time lag in that data collection system. If the results from the occurrence/incident reports are not available until several months after the time of occurrence, the lag makes it very difficult to control the process. If there is no specific numeric data (i.e., no "medication digital readout") and the process relies on exception data (occurrence reports), this lag can be a significant disadvantage and can result in a significant breakdown in the control loop.

Use appropriate methods to analyze exception data

You can use many of the methods we will discuss in the following chapters to analyze exception data. A couple of key methods are particularly useful:

- Weighted significance, which we will discuss in Chapter 3

- Common cause analysis, which we will discuss in Chapter 8