
Lean Healthcare Metrics Guide

This Lean Metrics Guide is a resource to help organizations understand and select metrics to support their implementation of Lean and Six Sigma—two powerful and proven methods to improve organizational performance. Metrics are the cornerstone of successful Lean and Six Sigma improvement efforts. When used effectively, metrics can be powerful mechanisms for helping organizations to achieve, assess, and communicate results.

This guide includes the following sections:

- Introduction to Metrics Used in Lean Initiatives
- Lean Process Metrics
- Lean Organizational Metrics
- How to Select Lean Metrics

Introduction to Metrics Used in Lean Initiatives

Lean and Six Sigma place a strong emphasis on measuring, evaluating, and communicating performance results. In this context, metrics enable organizations using Lean and Six Sigma to:

- Identify and target the right problems during Lean and Six Sigma events and projects
- Evaluate potential process improvements and select appropriate actions for implementation
- Establish baselines for process performance and track progress over time
- Understand and communicate the results (outcomes) of Lean and Six Sigma efforts
- Inform and monitor efforts to deploy Lean and Six Sigma throughout an organization

This guide explores two major categories of metrics relevant to Lean and Six Sigma: *process metrics* and *organizational metrics*. *Process metrics* address a specific process or program and provide information on key attributes of the process such as time, cost, quality, outputs, and process complexity. *Organizational metrics* address characteristics of the broader organization, providing information on the status of Lean deployment and employee satisfaction/engagement.

It is important to remember that the Lean and Six Sigma metrics discussed in this guide should ultimately support progress toward achieving the organization's mission. It is often helpful to consider goals and objectives that may be outlined in the organization's strategic plan to ensure that Lean and Six Sigma metrics are aligned to measure and drive progress toward the organization's mission and desired outcomes.

To select measures that matter, it is first important to clarify how the targeted process or service is intended to advance the organization's mission and objectives. Logic models provide simple but powerful tools for describing how process or program activities produce outputs that (at least in theory) translate into desired short-term, medium-term, and long-term outcomes.

The Lean process and organizational metrics described in this guide are grouped into the following subcategories.

Process Metrics

- Time: Time metrics evaluate the time to produce and deliver a product or service to customers, the portion of time that is spent processing the product or idle time, whether customers receive products or responses on time, and other time-related considerations.
- Cost: Cost metrics measure cost savings and the costs of products or processes, such as the amount of full-time-equivalent employees needed for a process.
- Quality: Quality metrics examine the quality of products or services, such as customer satisfaction and whether patient information/data are complete and accurate.
- Outputs: Output metrics track the production or activity of the organization’s processes.
- Process complexity: Process complexity metrics describe the complexity and nature of a process, such as the number of handoffs and steps in the process.

Organizational Metrics

- Lean deployment: Lean deployment metrics measure the status of Lean implementation at an organization, such as the number of Lean events or trainings conducted.
- Morale: Morale metrics pertain to employee satisfaction and staff retention, including responses to staff surveys and turnover rate.

Table 1 lists examples of metrics that organizations can use in Lean and Six Sigma efforts. Each of these metrics is described later in this guide. The next section describes how to think about identifying metrics that are most appropriate for your organization.

Table 1: Overview of Lean Metrics

PROCESS METRICS		
Time Metrics	Cost Metrics	Quality Metrics
⇒ Lead Time	⇒ Labor Savings	⇒ Customer Satisfaction
⇒ Best and Worst Completion Time	⇒ Cost Savings	⇒ Rework
⇒ Percent On-Time Delivery	⇒ Cost per Product	⇒ Percent Complete and Accurate
⇒ Processing Time		⇒ Rolling First-Pass Yield
⇒ Activity Ratio		
⇒ Value-Added Time		
⇒ Non-Value-Added Time		
⇒ Percent Value-Added Time		

PROCESS METRICS	
Output Metrics	Process Complexity Metrics
<ul style="list-style-type: none"> ⇒ Production ⇒ Backlog ⇒ Work in Process ⇒ Inventory 	<ul style="list-style-type: none"> ⇒ Process Steps ⇒ Value-Added Process Steps ⇒ Decisions ⇒ Delays ⇒ Handoffs ⇒ Loops ⇒ Black Holes

ORGANIZATIONAL METRICS	
Lean Deployment	Morale Metrics
<ul style="list-style-type: none"> ⇒ Lean Events Conducted ⇒ Lean Event Participation ⇒ Lean Training 	<ul style="list-style-type: none"> ⇒ Employee Satisfaction/Engagement ⇒ Turnover

Lean Process Metrics

Process metrics—metrics that address a specific process or program—enable organizations to achieve, assess, and communicate compelling process improvement results. Lean process metrics support several objectives, including:

- Measuring wastes (non-value-added activity) in processes (e.g., comparing processing time or value-added time to the total time to produce a product, including idle time)
- Informing the selection of specific process improvement actions
- Evaluating progress made to address those wastes and the benefits of Lean and Six Sigma projects (e.g., cost savings, reductions in process steps, etc.)
- Assessing the overall performance of a process (e.g., customer satisfaction, percent of services delivered on time, etc.)

Organizations can use Lean process metrics to answer the following types of questions:

- **Time metrics:** How long does it take to produce an output or deliver a service? How much of that time is processing time, and how much is idle time?
- **Cost metrics:** How much does the process cost to operate (e.g., the number of full-time-equivalent employees)? What cost savings did the team identify in the Lean event?
- **Quality metrics:** How often does the process lead to mistakes (e.g., incomplete or inaccurate forms) that require rework? How do customers view the process?
- **Output metrics:** How many products are completed or processed each month or year? What backlogs exist in the process?

- Process complexity metrics: How many steps are in the process? How many times during a process is key information, materials, or the customer handed off among individuals, offices, or departments in the process?

It is important to note that some types of metrics will likely be of greater interest to certain audiences, although all types are useful for understanding the varied dimensions that affect process performance and outcomes. For example:

- Lead time, customer satisfaction, and other measures of product or service quality may be of particular interest to key “customers,” those who receive and/or benefit from the process outputs and outcomes; and
- Other process metrics, such as those related to process complexity and efficiency, may be of particular interest to internal audiences such as managers of the process.

Table 2 below presents a range of Lean process metrics. The table provides the metric and a brief description of each metric. A special discussion of time metrics is included after Table 2, as several aspects of time metrics may be particularly new to those who are not familiar with Lean.

Table 2: Definitions and Examples of Lean Process Metrics

METRIC	DESCRIPTION
Lead Time (a.k.a. Elapsed Time)	Total time (from start to finish, from the customer’s perspective, including waiting time) to develop a product or deliver a service to a customer. Typically expressed in days.
Best and Worst Completion Time	Estimate of the shortest (best) time and longest (worst) time to complete the process (lead time is the average). <u>Note</u> : Lead time is more relevant to the customer.
Percent On-Time Delivery	Percent of time the product/service is delivered on time, from the customer’s perspective.
Processing Time (a.k.a. Cycle Time or “Touch Time”)	Time to complete a process or process step, excluding wait time. (Lead time > total processing time > value-added time)
Activity Ratio (or Process Efficiency)	Processing time divided by lead time, expressed as a percentage.
Value-Added Time	Processing time that adds value from a customer’s perspective (i.e., when information and materials are transformed into products or services a customer wants). ¹ Typically expressed in minutes or hours.
Non-Value-Added Time	Time that does not add value from a customer’s perspective (i.e., when information and materials are not transformed into products or services a customer wants). Typically expressed in minutes or hours.
Percent Value-Added Time	Value-added time divided by lead time, expressed as a percentage. ²

METRIC	DESCRIPTION
Labor Savings (or Freed Capacity)	<p>Change in the number of full-time-equivalent (FTE) employees needed for a process (i.e., FTEs that can be reassigned to other tasks/positions because of efficiency improvements).</p> <p>FTEs required = (Sum of processing time [hours] X # of occurrences/year) ÷ 2,080 work hours/year</p> <p>Freed capacity = FTEs needed for current state – FTEs needed for future state</p>
Cost Savings	<p>Dollar savings from Lean or Six Sigma projects, such as:</p> <p>Dollar value of FTE savings (e.g., from staff attrition and avoided need to hire)</p> <p>Other office cost savings (e.g., energy/utility costs, consolidating office space, avoided costs such as new equipment)</p>
Cost per Product	Labor, material, and overhead costs to produce a product (or service product).
Customer Satisfaction	Qualitative or quantitative results from customer satisfaction surveys (e.g., about a service or product).
Rework	Percent of products or work in process that needs to be redone.
Percent Complete and Accurate (C&A)	Percent of occurrences that work in process released to the next step does not require a downstream customer to make corrections or request information that should have been provided initially. This is another way to measure rework.
Rolling First-Pass Yield (or Rolling Throughput Yield)	Percent of occurrences that the service or document passes through the entire process without needing rework. This is the product of the C&A percentages for each process step, expressed as a percentage.
Production	Number of products or service products produced.
Backlog	Number of products or service products that have not been started or entered the process.
Work in Process (WIP)	Amount of products or transactions that are being processed or waiting to be processed.
Inventory	A supply of raw materials, finished products, and/or unfinished products in excess of customer demand.
Process Steps	Total number of steps in a process where a task or activity is performed.
Value-Added Process Steps	Number of process steps that add value from a customer's perspective (i.e., steps where information and materials are transformed into products/services a customer wants). This number typically does not change with Lean.
Decisions	Number of points in process where a choice is made about a course of action.

METRIC	DESCRIPTION
Delays	Number of points in process where time is wasted by waiting for something to occur.
Handoffs	Number of times work is passed from one entity to another.
Loops	Number of times when there are a series of steps that loop backwards and repeat themselves at least once.
Black Holes	Number of extreme combinations of loops, delays, decisions, and handoffs from which no further progress is made or where a significant amount of time has passed before proceeding with the process.

¹ Value-added time is widely used in Lean manufacturing, but difficult to define in administrative contexts. Processing time is easier to measure for office processes, so it can be used as a substitute.

² Value-added time is widely used in Lean manufacturing, but difficult to define in administrative contexts. Activity ratio (processing time divided by lead time) can be used as a substitute for percent value-added time.

Special Considerations about Time Metrics

Lean methods give special consideration to various aspects of process time. By examining how time is spent within a process, one can find important clues that reveal waste (non-value-added activity) and improvement opportunities. Keep in mind the following considerations about time metrics:

- Lead time is greater than total processing time which is greater than value-added time. A common goal of Lean initiatives is to reduce lead time and total processing time to be closer to the value-added time.
- In some cases it may even make sense to increase value-added time (e.g., to improve quality) while simultaneously reducing overall lead time and processing time.
- Some Lean office publications suggest using “processing time” (also referred to as “touch time”) as an alternate metric to “value-added time,” since processing time is easier to measure. The activity ratio (ratio of processing time to lead time) then becomes the substitute metric for the value-added percentage (ratio of value-added time to lead time).

Lean Organizational Metrics

Organizational metrics—metrics that address topics such as Lean deployment and morale at an organizational level—help organizations to sustain and expand results that contribute to its ability to fulfill its mission. Lean process metrics support a key objective:

- Inform and monitor efforts to deploy Lean and Six Sigma throughout an organization.

Organizational metrics can help answer the following types of questions:

- Lean deployment metrics: How many Lean events have we completed this year? How many employees have participated in Lean training classes?

- Morale metrics: How satisfied are employees with the organization? What is the staff turnover rate, and how does it compare to the average for organizations?

Table 3: Definitions and Examples of Lean Organizational Metrics

METRIC	DESCRIPTION
Lean Events Conducted	Number of Lean events conducted (e.g., value stream mapping events, kaizen events, etc.). Some organizations only count implementation-oriented events (e.g., kaizen events).
Lean Event Participation	Number of employees who have participated in Lean events. This can be broken down further, such as the number of employees who have participated in: <ul style="list-style-type: none"> 1-5 Lean events 6-12 Lean events 13-25 Lean events More than 25 Lean events
Lean Training	Number of employees who have undergone formal Lean and/or Six Sigma training.
Employee Satisfaction	Qualitative or quantitative results from staff surveys.
Turnover	Percent of staff who leave the agency over a certain time period (e.g., month or year). <p style="text-align: center;">Turnover = # of employees leaving in a certain period ÷ total employed that period</p> It can also be useful to distinguish between voluntary and involuntary turnover.

How to Select Lean Metrics

This guide presents a menu of options for Lean metrics. Not all of these metrics may be relevant and useful for your organization, however. It is important to choose metrics that make sense for you, given your organization’s overall goals and objectives. Consider these guidelines when selecting metrics:

- *Determine the purpose of the metrics.* Measures can drive behavior and focus attention in powerful ways. As a result, it is important to think about behaviors that are likely to be encouraged by use of specific metrics. In selecting metrics, consider questions such as:
 - ✓ What is the purpose of the metric? What aspects of the process are we trying to improve? What wastes are we trying to eliminate? What behaviors are we trying to reinforce?
 - ✓ Who are the key audiences for the metric?
 - ✓ How will we use the measurement data?

- *Use just a few metrics.* No more than a few metrics per category are needed. Having too many metrics dilutes the focus of the improvement efforts and can create unnecessary work.
- *Use only the most appropriate metrics.* Ask whether there is something important about a targeted process related to each category of process metrics, and do not worry if the answer is “no.” Also consider which metrics would be useful to evaluate across the agency, depending on the overall status and goals of the Lean or Six Sigma initiative.
- *Focus on customers and organizational leadership needs.* While a range of metrics can show improvements made during Lean events (e.g., reductions in the number of process steps), only a few metrics matter to customers, including the time it takes to receive a service or product (lead time) and the quality of the service or product. Make sure to include some metrics that reflect key interests of customers, along with metrics that will resonate with agency leadership and support the agency’s strategic goals.
- *Engage data users in the design of the metrics.* It’s important to engage people who are familiar with the process in the design of metrics and the development of a system for collecting and reporting performance data. Without consulting frontline employees, organizations risk choosing metrics that are poorly understood, irrelevant, or inconsistently used by the people who do the work.

A widely used framework for choosing metrics is the “SMART” model—metrics should be Simple, Measurable, Actionable, Relevant, and Timely.³ This framework includes the following considerations:

- **Simple:** Make sure that metrics are transparent and simple enough to be easily understood by everyone in the agency. Metrics should also be hard to fool or game (e.g., avoid situations where people could show results even when nothing had actually changed).
- **Measurable:** Select metrics for which you can relatively easily collect performance data; don’t rely on estimates or assumptions. In some cases, you may need to set up a system for collecting input, such as a customer satisfaction or voice of employee survey.
- **Actionable:** Metrics should provide information that managers and staff can use to take actions to improve the agency’s operations and outcomes.
- **Relevant:** As is often stated, what you measure is what matters and gets managed. Select metrics that support the agency’s strategic objectives and that specifically relate to the process or task at hand. For Lean efforts, this often means using metrics that correspond to the seven “deadly wastes” targeted by Lean (defects, overproduction, transport, motion, inventory, over processing, and idle time).
- **Timely:** Consider the “just-in-time” model for metrics—provide the right information to the right people when they need it for making decisions.

³ There are several variations on this model, which is consistent with the principles for performance measurement outlined in Peter Drucker’s 1954 book, *The Practice of Management*. Alternate terms for the SMART mnemonic include: Specific, Meaningful, Attainable, Reliable, and Time-bound.