Mapping the Process
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Learning Objectives

Upon completion of this course, student will be able to:

• Define a process and a process map
• Describe the benefits of process mapping
• Describe the differences between relationship maps, swim lane charts, and process maps
• Discuss the three levels of detail used to describe a complex process
• Walk through the five steps of process mapping
• Demonstrate how to apply a process map

Introduction

What is a Process?

To begin, let’s review the definition of a process.

A process is a chain of logical, connected, and repetitive activities that utilizes an organization’s resources to refine an object for the purpose of achieving a specified result for its customers. The customers may be either internal or external.

Because this definition applies to both service and production processes, the object being refined can be either a product or a service. Put simply, a process is a series of activities that transforms a set of inputs into a specific set of outputs.

Process Mapping

A process map is used to show the transformation of materials and resources, called inputs, into a product or service, called the output. A process map shows the sequence of activities and decision points. Process maps can be constructed several ways, ranging from sticky notes on a wall or hand-drawn diagrams, to sophisticated software-generated displays, such as Microsoft Power Point and Visio.

The terms “process flow diagram,” “process flow chart,” or simply “flow chart” are used interchangeably with “process map.” All of these terms refer to mapping tools used to show the flow of materials and products through the transformation process. For simplicity, we will stick to the term “process map” throughout this module. Process mapping is applicable to all types of environments and processes whether they are service, manufacturing, transactional or administrative.
What Can Process Mapping Provide?

A process map shows a process as it currently exists. By providing this fundamental knowledge, a process map enables the team to confirm the scope of the project. It helps the team understand and define supplier and customer requirements; and identify gaps in meeting those requirements. The as-is process map is generated by the process improvement team or a sub-set of its members.

Benefits of Process Mapping

Mapping a process can help a process improvement team in many ways, including the following: it improves team communications; provides an overview of the process; serves as an excellent reference document; facilitates process changes; helps in process planning; identifies inter-relationships between organizations; and aids in troubleshooting.

Process Map Symbols

Although there are many ways to draw a process map, the most basic way is to use symbols to represent activities, and connecting arrows to illustrate the connection and flow between the activities.

The most common symbols used in process maps are shown here.

Three Types of Process Maps

There are several different types of charts or maps that may be used in process mapping. Three of the most common types are relationship map, swim lane process map, and process map. Let’s look at a brief description of each.

A relationship map provides an overall view of a process. It shows the departments of an organization, and illustrates how the departments interact with each other, with suppliers, and with customers. This map provides a very high level view of who does what in a process. It is used primarily as a first step when mapping large, complex processes.
A swim lane process map, also known as cross-functional map, shows which department performs each step of a process, and it identifies the inputs and outputs of each step. This type of map includes more detail than a relationship map, but less detail than a process map.

A process map may focus on a single step from a swim lane map or an overall process involving multiple steps. It allows the mapping team to expand each step to show more detail, based on the defined scope of the project.

Other types of process maps such as a spaghetti diagram and value stream map are covered in another module.

What is a Relationship Map?

Now let’s take a closer look at relationship maps.

As you just learned, a relationship map is a macro-level picture of a process that shows which departments are part of the process and how they relate to each other and the rest of the system. Relationship maps do not describe activities or sequences in as much detail as the other types of maps. However, they can help identify process boundaries, customers, suppliers, information flow, and the major process flow that links the players.

Relationship maps are most applicable to extensive and complex processes that involve many departments. In such cases, a relationship map can be a very good starting point for a team’s process mapping activity. Before it can create a detailed process map for a complex process, a team may first need to create a relationship map to understand which departments are involved and how they relate to the process. It is important to note that we are using the term “departments” very generally, to encompass individuals, departments, organizations, and computer systems.

The Relationship Map

The relationship map example you see here is for a simple sales order process. To create this map, our first step is to identify the various departments involved in the process. In this example, we identify the following departments: Customer, Order Entry, Order
Management System, Sales, and Shipping. Once we have identified the departments, we draw boxes around them.

Our next step is to draw arrows between the departments to show the relationships, or interactions, between them. We label the relationships wherever possible.

**Swim Lane Process Map**

Now let’s take a closer look at swim lane process maps.

The swim lane process map received its name because organizational responsibilities on the chart are separated into zones by horizontal bars, which resemble the lane markings of an Olympic swimming pool. The zones of the chart are divided by function or functional area. Each zone is assigned to a given function, department, group, or individual, and the process steps that are performed by each function are shown in the zone of that function. A swim lane process map makes it very easy to see and identify which steps, within the overall process, are the responsibility of a specific function, department, or individual.

The swim lane process map example shown here is for an order entry process. As you can see, it is divided into three zones, Order Entry, Sales, and Order Management.

The process steps for each function or department are listed within its zone. For example, “verify discount” is listed in the Sales zone because the sales department is responsible for that step in the process.
Boundaries

Process maps are valuable tools for many improvement activities; and they can be a critical element of a process’s documentation. To create an effective process map, it is important for the team to clearly focus on the correct activity. To do this, it must define the boundaries of the process. The boundaries establish beginning and ending points and help clarify process ownership issues. If the boundaries are not clear, the process map will tend to be generalized, and it won’t permit accurate assessment. In addition, clearly defined boundaries allow the process map to focus on the area where the actual variation to the process is happening.

Let’s look at an example that demonstrates how boundaries are determined.

This person is processing and verifying accounts payable. To develop a process map of this process, would the mapping team start at the mailroom and end when the check is mailed? Defining the boundaries of the process will provide the answer.

To determine the start and stop points of the process, the team must first define the boundaries, or the scope, of the project. In this case, it decides to map the process for external accounts payable only.

It then determines that the external accounts payable process starts with the receipt of the bill by the accounts payable department, and it ends with system verification in finance. Defining the process boundaries helps prevent “scope creep.”
Rework Loop

An important feature of process maps is the rework loop. At any decision point on the process map, if the decision forces the process back to an earlier point, and it leads back to the same decision, it is called a rework loop. In this diagram, for example, a bolt and washer are installed into a plate and are torqued to five foot pounds. This torque is critical to the overall assembly, and as a result, it is verified before attaching the plate assembly to the base. If the verification step shows the torque is within specification, the plate proceeds to the next process step. If the torque measures out of specification, the entire plate and bolt assembly is returned for rework via the rework loop path. If the rework is successful, and the torque is verified as OK, the assembly can then proceed to the next step.

Process Mapping Hint

To create its process map, the team may find it helpful to use an erasable white board and sticky notes. When using this tactic, the team places the sticky notes on the white board to represent the process steps, and then draws flow arrows connecting the sticky notes. Because the arrows can be easily erased and redrawn, and decision blocks can be created by rotating the sticky notes, this method is very flexible and allows the team to make changes in a snap.
It is important to remember that a process map is not simply a documentation tool; it is also an analysis tool. When the appropriate information is included on a process map, it can be the primary standard operating procedure for a process. There are three levels of detail needed to create a process map that includes all necessary information.

Level 1 is a high level view of the process flow, with the major processes identified. In Level 2, each of the major processes is broken down into its sub-processes. Additional information is included to show the hand-offs between people, organizations, and systems. Swim lane process maps are an example of Level 2 detail. In Level 3, each sub-process may be further broken down until the team is satisfied that it has adequately documented the process. It should be confident that anyone who reads its process map will understand as much about the process as the team does from walking it.

### Level 1

The process map you see here is a Level 1 view of a national health and fitness company's process for activating membership cards. It provides an end-to-end view, in only three to five steps, that illustrates what the process must do in order to deliver what is needed, and expected, by the customer.

To analyze the problem, the mapping team will drill down into the area it thinks is causing the most problems or defects. In this case, the team believes the problem is in the card production process. Therefore, it will create a Level 2 view of the card production process to see it in more detail.
Let’s take a look at the Level 2 detail map the team created. Here, the team drilled down from the overall membership card activation process to the card production sub-process. As you can see, this Level 2 map shows the process steps within the card production process, and the handoffs from one area to another.

Can you now identify the vital systems that influence the process?

By analyzing this Level 2 map, the team determines that there is an issue in the card embossing step. Next, it must drill down even further to examine the card embossing step. To do this, it creates a Level 3 map.

Level 3

Here you see the Level 3 process map the team created. To create this map, the team drilled down to examine the card embossing step, or sub-process. As you can see, the Level 3 map is very detailed. It provides a lot of information about process performance, including detailed handoffs, all the data sources, and the inclusion of Cycle Time information.

Level 3 process maps highlight rework loops and delays — items that negatively impact the Cycle Time of the process. Mapping teams should pay particular attention to the manual steps, in contrast to automated steps, because manual steps generally have a higher probability of defects and longer Cycle Times.

When creating the Level 3 map, the team can also include data such as Cost of Poor Quality (COPQ), Defective Parts per Million Opportunities (DPMO), and the flow through the decision points.
An organization’s internal and external customers are the ultimate judge of process quality. Because Non Value-Added activity provides no benefit to the customer, it is important that the team identify and eliminate Non Value-Added steps.

During its final analysis of the process, the team must dig deep for answers. Some examples of questions it might ask include the following: What volume is flowing through the process? Does this particular process step occur 30 times a day or 300 times a day? What are the rates of the different options at a decision point? For example, how many times is the decision “yes” and how many times is the decision “no”? These decision rates will give an indication of a process’s effectiveness.

**Five Steps for Process Map Creation**

Next, we will walk though the five basic steps for creating a process map. Those steps are:

1) Plan the process mapping exercise; 2) Determine the process scope; 3) Gather data and information; 4) Create a draft map; and 5) Validate and finalize.

**Step 1 - Plan the Process Mapping Exercise**

Step One is to plan the process mapping exercise. The process improvement team reviews the problem statement as specified in the Project Charter to assure the understanding and expectations are still correct.

The objective of the mapping exercise must also be determined in this step.

Determining the objective allows the team to understand the complexity of the process. Depending on the complexity, the mapping activity may take a full day, or multiple days. All team members must fully understand what their role will be, and they must be willing to commit the time necessary to support the project.
Step 2 – Confirm the Process Scope

Step Two is to confirm the process scope. The process improvement team reviews the process boundaries that are specified in the Project Charter as it begins to develop an as-is process map.

It must determine what triggers the start of the process. There are two ways in which a process can begin. First, a condition can be perceived, such as a low inventory level, that triggers a response. Alternately, the process can be triggered when a demand occurs, such as a request from a customer.

Once it has determined the starting point of the process, the team must determine the outputs or consequences that end the process. During this step, the team must also identify which organizational levels need to be included in the process map. To do this, it may ask itself questions such as, “Does the process cut across organizations, or is it confined to a single organization or business unit?”; “Does the process involve several functions or just one?”; and “How many work groups are involved?”

Step 3 - Gather Data and Information

Step Three is to gather data and information. To begin, all team members should walk through the process as a group. Often, this walkthrough is omitted. Skipping the walkthrough is a big mistake, however, because it is a critical step in developing an accurate process map.

During the walkthrough, the team physically follows the process flow, from beginning to end. The purpose is to understand what is actually being done, and why it is being done. This initial walkthrough should be brief and quick, but should allow the time necessary for each member to gain a good basic understanding of the process flow. To get a good sense of how the process is supposed to work, the team may also find it helpful to conduct one-on-one or group interviews and evaluate existing documentation.
Step 4 - Create the Draft Map

Step Four is to create a draft map of the process. A process map is an analysis tool, but also tells the story. An organization’s process map should tell the story of its process by showing what happens in a way that is clear, even to people who are not familiar with the process.

To avoid confusion, the team should keep the use of symbols to a minimum. To create a draft map, the team begins by drawing out the process in its current state, or how it is happening at the time of the mapping.

As you learned earlier in this module, sticky notes are an easy and convenient way for the team to fill in the additional steps that occur in the process. When creating the draft map, the team should post or draw enough detail to make the map useful. However, it should avoid getting sidetracked with minor activities that may occur, but aren’t really part of the process. If a team were mapping its shipping process, for example, it would include the package labeling detail, but not the activity of filling out the label.

In creating the draft map, the team must be sure to draw connecting arrows to define materials, information, or product movement through each step of the process. It must also include decision points, rework loops, and inspection points, all of which may help identify Non Value-Add steps within the process.

Step 5 - Validate and Finalize the Map

Step Five, the final step of process mapping, is to validate and finalize the map.

Once the team has completed its initial draft of the current state process map, it should walk the mapped process again. Based on the actual data it collects from this walkthrough, the team makes any necessary corrections to its map.

Next, the entire team should review the result. In its final review, the team must determine whether every step has been captured. It also must ensure that all rework loops have been identified. To do this, the team should ask a question relating to each specific process step.
For example, in a shipping process, if a package is leaving the labeling step, the team might ask the question, “Does the package have a label?” If the answer is yes, the package continues on to the next step. If the answer is no, the map must show how the package is returned to a previous step for label placement. This example could be identified on the map by a decision “diamond” symbol, with connecting arrows to indicate the next step of the process, dependent upon the outcome of the decision.

**Rules of Thumb**

Here are some basic guidelines and rules of thumb for creating effective process maps:

1) Process maps are used not only to document a process, but also to analyze it. In other words, a process map doesn’t just show what the team knows about the process, but can also be used to examine what it learned.

2) A process map should be an “as is” representation. For this reason, it is important to label all rework loops.

3) A process map should contain data. Each step should be quantified, if possible, and include things like sigma level, Cost of Poor Quality (COPQ), and defect rate.

4) A process mapping activity should involve a Black Belt or a Green Belt “walking the process.”

5) A process map should be considered a “living document” and therefore, it should be reviewed and revised from time to time as improvements develop.

**Using Process Maps - Blueprint**

A process map provides a blueprint of a process. This blueprint enhances team communication as it works to solve process problems. It is also a very helpful tool during the root cause analysis stage and for identifying which process inputs and outputs should be measured. In the continuous improvement cycle, teams also use process maps to identify areas of the process that might be improved.

Next, we will show you an example of a process improvement team using a process map as it works together to solve a problem. Note that in the example you are about to see, the team refers to its process map as a flow chart. As you learned earlier in this module, both terms have the same meaning and are often used interchangeably.
Using Process Maps

Rob: We are getting customer complaints regarding our invoices. Our customers are frustrated because when their bill arrives, they have less than a week until the DUE DATE. Now I have asked Holly to bring in the current invoice process flow chart so that we have a starting point for our discussion in finding the root cause of our problem.

Andy: That’s good because I haven’t seen the process flow chart in six months. You know as I look at it, I don’t think we’re really doing it this way.

Rob: Well why don’t I just draw up a companion flow based upon what we think is happening today.

As the team draws up what is happening now, it is important to notice that the team is more efficient and focused on the issue. They also are on track to make some discoveries.

Holly: When we are ready to ship the customer’s order we check to see if we can ship any other orders they have with us before we invoice. Sometimes these orders are held a couple of days. I’m wondering when is the invoice dated.

Andy: It appears to me that our process assumes shipment within 24 hours after the order is put together. Now, the system thinks it is complete but the warehouse is still looking for other orders to consolidate it with.

Rob: I think we need to look at that portion of the process more closely. Let’s set up a procedure to measure the number of order consolidations, verify the ship date, the invoice date, and measure our cycle time. I think we may have located the root cause of the problem.

Holly: Yeah, that sounds good to me Rob.

Rob: Holly, why don’t you take the lead and pull the plan together.
**Process Map Perception**

The team has come to realize, as is too often the case, that what they think the process is, may not be accurate. Often, although changes may have been made in the process, the documentation does not always reflect the changes. Comparing the documented flow with the current process flow allows the team to begin to understand what is actually occurring in the process. This new understanding helps the team visualize what they want the process to be. In Lean, this desired vision of the process is referred to as the “Future State Value Stream.”

**Summary**

Process mapping can be a powerful tool for both identifying performance improvement opportunities and determining the underlying causes of performance problems. After a process is mapped, it is easy to spot waste, redundancies, omissions, communication problems, and work flow inefficiencies.