QUALITY TOOLBOX

Understanding Processes with Hierarchical Process Mapping

In my work, I spend a lot of time talking to people about hierarchical process mapping. It strikes me as funny that whenever I mention this term, everyone has a different vision of what I am talking about.

Exhibit 1 lists a number of different diagramming and mapping terms that sometimes are used interchangeably with "process mapping." No wonder there is confusion about this very important process improvement tool!

Hierarchical process mapping differs in important ways from the other approaches listed in Exhibit 1. In particular, none of the other mapping methods show relationships with supporting processes, nor do they provide links for presenting important process documentation, such as accounting sheets. Process mapping does both.

My intention in promoting the use of hierarchical process mapping is not to minimize the importance of other mapping techniques, but rather to emphasize the usefulness of a unique process characterization methodology that many people are not yet familiar with.

Why Process Mapping?

When discussing hierarchical process maps, the second reaction I often hear from people is, "Why do I need process mapping? I already understand the process!" Despite these declarations of assurance, however, many companies do not have a complete understanding of how their processes operate, or how they interact with one another in a systems manner.

Processes often contain duplication, inefficiencies, and wasted effort that can be easily corrected once the process is clearly documented and understood. But people need to take a closer look at how processes work in their "as is" (or present) state before they realize how little they really understand.

It is also very common to find processes that are implemented in different ways across different departments of the same organization—with no "rhyme or reason" indicating why the same process should be done differently in different locations. It is difficult to recognize this anomaly just by walking around. No amount of direct observation allows you to see the relationships among work items in different parts of the organization. For that, you need process mapping.

Many companies view hierarchical process mapping as too complex and say, "It sounds expensive!" But a solid understanding of the process is the foundation upon which all management initiatives for process improvement and program integration must be built. It will ultimately prove more expensive to embark on a program of process improvement without the understanding that process mapping can convey.

Managers who use process mapping to characterize their processes can also leverage their improvements by extending their "lessons learned" throughout the organization's processes. This

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- Arrow Diagrams
- Block Diagrams
- Causal Loop Diagrams
- Cross-Functional Diagrams
- Eco-Maps
- Event-Driven Process Chains
- Flow Charts
- *Hierarchical Process Maps**
- Integration Definition Diagrams (IDEF)
- Knowledge Maps
- Mind Maps
- Piping and Instrumentation Drawings (P&ID)
- Process Flow Diagrams
- Process Maps
- Relationship Maps
- Systems Dynamics Road Maps
- Value Stream Maps
- Work Flow Diagrams

*The specific meaning of "process mapping" as that term is used in this column.

moves them from the "incremental" mode to the level of "breakthrough improvement."

The process mapping tool also keeps the emphasis on the process itself. It takes what is called a "process focus." Most quality management systems (e.g., ISO 9000) require organizations to maintain a process focus throughout the organization.

Most people who actually use hierarchical process mapping find it very valuable. They often remark, "I can really see the value of this work now that I am doing it" or "I wish I'd used the tool when I first learned about it!"

Finding a reliable way to improve processes is the key to achieving a more efficient and robust organization. Anything that encourages an organization to look at how it functions is a positive step and represents a real opportunity to strengthen the business.

Those who use hierarchical process mapping soon find that it is not actually creating anything new. The tool simply allows them to "calibrate" and relate things that they are already working on.

A hierarchical map of a work process is a picture of how people do their work. A good map can serve as the foundation for continuous quality improvement efforts, allowing you to analyze a process and determine the most efficient routes toward enhancing it. With a hierarchical process map, you can improve your way of thinking about the process.

This column examines how hierarchical process mapping can help managers motivate themselves and their employees to achieve process improvement. Readers can also find additional information on hierarchical process mapping in my prior columns.[1]
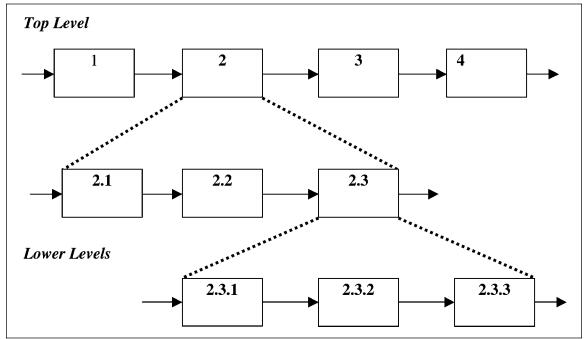
What Is Hierarchical Process Mapping?

A hierarchical process map creates a visual representation of the work flow within a process or within an entire operation. The work flow depicted can be either an operational process (such as a resource flow that results in a product or service) or a business process (i.e., things people do).

Process mapping offers an organized way to record all the activities performed by an organization. A key benefit is the tool's ability to help managers gain an overview of complex processes. Common examples of process complexity include multiple work steps, involvement by several different departments, numerous supporting processes, and input from multiple suppliers who contribute parts or services at many different points in the process.

A process map presents a process in a top-to-bottom structure or "hierarchy." The map's diagrams depict the process in more detail as you descend through its levels. See **Exhibit 2** for a graphical representation of hierarchy in a process map. Using hierarchies allows you to capture successive levels of detail in all the processes involved in your business.

Exhibit 2. Hierarchical Arrangement of Work Flow

Top Level

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 → [ 1 ] → [ 2 ] → [ 3 ] → [ 4 ] →
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 → [ 2.1 ] → [ 2.2 ] → [ 2.3 ] →
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Lower Levels

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 → [ 2.3.1 ] → [ 2.3.2 ] → [ 2.3.3 ] →
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Analyzing your business from top to bottom with an "as is" process map provides an efficient way of capturing all the detailed work that is being performed. The process map enables you to obtain comprehensive macro- and micro-views of operations. This increased visibility improves communication and understanding, as well as providing a common frame of reference for those involved with the work process.

The process map is a "snapshot" that shows the specific combination of work flow that provides value to your customers. Analysis of the processes depicted by the mapping tool can help increase customer satisfaction by identifying actions that reduce process cycle time, decrease defects, reduce costs, establish customer-driven process performance measures, eliminate non-value-added steps, and increase productivity.

Every process performs some type of "transformation"—starting with an input, and eventually creating a product or service (the output). The process consists of a progressive series of events or activities that are intended to add value to the product or service being produced.

Process maps offer a logical representation of the process that describes the stream of value-generation activities provided by the process. This visual representation of a process is much easier to understand and more tangible than words. It is also much less complex looking than other mapping methods currently in use.

Getting Started with Process Mapping

Before beginning the process mapping exercise, team members should clearly understand the scope and boundaries of the process that is being mapped. It is very easy to go off track if the scope of the process is not clearly defined. Here are a few things to consider:

• What event or activity causes the process to start?
• How do you know when the process is complete?

- What is the perspective of the process that leads from the initial input to the transformed product or service?

Because processes often cross organizational boundaries, the hierarchical process map depicts the work that each department does, as well as the handoff of work and the communication between departments.

The map starts with the point at which the process is initiated. It then traces work as it passes from department to department, until ultimate deliverables are produced. The work flow is traced to the point at which the product or service is purchased by the customer.

Typically, a preliminary top-level process map can be prepared from existing process information, or with the assistance of a cross-functional group of people, each with their different views on how the process works and their own ideas on the proper perspective for the map. In addition, other types of diagrams and maps can readily be converted into hierarchical process maps.

In creating process maps, you must be careful to distinguish between a main process (i.e., a core process that supports the mission of the organization and creates a product or service for the customer) and supporting processes (i.e., those that support the operation of the main process).

Process Mapping Conventions

In hierarchical process mapping applications, it is important to establish some conventions prior to the start of the effort. Such conventions make it easier to create more consistent process maps and help promote uniformity with respect to how the process maps are implemented across the organization. **Exhibit 3** outlines some of the important conventions that should be considered.

Using a standardized approach offers a number of benefits. Such an approach:

Exhibit 3. Hierarchical Process Mapping Conventions

- Select a main process that supports the organization's mission.
- Top-level main processes should contain three to six work steps.
- Use boxes for work steps.
- Use arrows to represent process flow.
- Define the boundaries of the process.
- The sequence goes from left to right (printing out in landscape format is recommended).
- Keep the drawings visually simple, with boxes all the same size and about the same distance apart.
- Use lower-level maps for work steps, with three to six sub-work steps for each level.
- Use a fourth level of maps only if absolutely necessary.
- Number work steps in outline fashion.
- Name work steps with verb phrases.
- Maintain the perspective of the main process throughout the process map.
- Link accounting sheets at the lowest (most detailed) level.
- Link supporting processes to the main process with accounting sheets.
- Prepare a preliminary "as is" process map first.
- Verify the accuracy of the process map by talking to employees who are involved in the process.
- Computerize the hierarchical process map and the supporting process documentation.

- creates a consistent document format that is easier to read and understand, and that uses a common language for communication;
- makes it easier to "roll up" data for purposes of reporting and applying measures of performance;
- allows for integration of process maps created by different groups within the organization; and
- facilitates compliance with regulatory or internal business standards.

The process mapping conventions are not rigid and allow some level of flexibility. The guiding principle should be: Make your process maps easy to understand and implement, and use them in a consistent manner.

Remember, the hierarchical process map itself is only a tool to help people understand the process and reach consensus. It allows everyone to see how their roles and interests can be integrated with other company operations to create a single, unifying vision.

Involving Employees in Process Mapping

Once the preliminary process maps are prepared, they should be verified by sharing them with employees who perform the work tasks represented by the maps.

Anyone preparing hierarchical process maps needs to involve the people who have to perform the process. Employee involvement can promote lasting change. When the process mapping exercise is completed, the knowledge that has been unlocked can be spread throughout every level of the business organization. This leads to real competitive advantage for the company.

If prepared properly, hierarchical process maps can be a very powerful tool. They can break down organizational barriers and achieve higher levels of cross-functional conversation simply by helping people reach a common understanding of how processes work.

"Future State" Mapping for Process Improvement

Process maps can also be used to illustrate potential process improvements and to show how you want work to be performed. A "to be" (or "future state") process map can depict the pathways you want to create to provide greater value.

Process maps thus are important prerequisites to a process improvement program.

Utility of the Process Map Hierarchy

Hierarchical process mapping can be used to view an entire business system, including all of its main and supporting processes, graphically at any level of detail and complexity.

From the top-level (i.e., least detailed) perspective, the company should have an understanding of how its main processes work as a complete system, cross-functionally across whatever organizations are involved, to achieve the company's business objectives.

When the process mapping exercise is completed, the knowledge that has been unlocked can be spread throughout every level of the business organization.

The top-level process map (often referred to as the "30,000-foot overview") should be differentiated from the lower-level process maps, which start zooming in to show the process in more detail. The top-level view is useful in scoping process improvement projects and establishing boundaries. By contrast, more detailed process maps are useful when analyzing potential causes of problems and preparing action plans to improve processes.

Many of the mapping techniques listed in Exhibit 1 limit their view to the top level. The same is true of many widely used management techniques, such as lean and Six Sigma.

With process mapping, the top level is broken down into greater levels of detail with each suc-

cessive level of the hierarchy, thus allowing team members to fully describe the overall process structure.

At the more detailed (i.e., lower) levels of the process map hierarchy, the company creates a picture of how the main processes are actually implemented. These depictions can offer various levels of detail so that all departments and individuals participating in the process can understand how they fit into the overall system.

Using a hierarchical approach allows team members to focus on the individual components of the system, and how they interact with each other as part of the overall system, without needing to understand the detailed workings of each work step at the same time. This reduces complexity and makes process maps easier to use.

Together, the various levels of the hierarchical process map provide all employees with a unifying vision of how their process helps meet the mission of the organization.

Lower-level maps depict subsystems that exist within the context of the role they play in the overall system. Processes can be shown at various levels of detail to fit with different levels of interest.

For example, senior managers might be interested in a top-level view of the core processes and how they fit together. People working within the boundaries of a particular process generally will be interested in a more detailed view of the activities they perform. Together, the various levels of the hierarchical process map provide all employees with a unifying vision of how their process helps meet the mission of the organization.

How Many Process Map Levels?

The number of hierarchical process map levels needed and the level of detail required to describe the process at the lowest level of detail will depend on the nature of the process. Even within an individual process, the level of detail may vary from one part of the process to another.

The key factor to consider is this: Will adding more detail add value and make the process map more effective? In general, the level of detail and complexity of the process map should be proportionate to the degree of risk and variability in the process. Remember, too much detail and unnecessary complexity can obscure important process improvement opportunities.

Linking Supporting Processes

Traditionally, the cost of supporting processes has been hidden in company overhead. Their true cost therefore has not been apparent, and other processes often are not "charged" for their use.

With the current emphasis on cost management, however, many organizations now require main processes to pay for supporting processes in proportion to their use. An accounting of the linkages between the main and supporting processes is a critical element for any such chargeback system.

Supporting processes can operate in a "hierarchical" fashion as they provide capability to a main process. For example, consider steam that is used to run a turbine, which then generates electricity at a power plant. The steam is produced by a supporting process (the operation of a boiler). In turn, the boiler itself relies on another supporting process—the fuel-handling system that feeds it.

All these processes can be linked to the main process map and viewed in detail as you "drill down" to determine what resources, activities, and information are needed to support any given work step in a set of process linkages. Remember that because process mapping is hierarchical, it allows you to do this without the visual confusion and complexity created by other mapping techniques.

Suppliers can also be viewed as supporting processes. After all, if their parts or services are not delivered in time, your process may come to a halt. By including them in process mapping, and directly linking their processes with your own main process, you will be better able to manage the impact that the supply chain has on your operation.

As discussed in the next section, resource accounting sheets can be an effective way to link supporting processes to main processes.

Linking Process Documentation

It is important to keep the hierarchical process map as simple and understandable as possible without compromising its effectiveness. You should avoid cluttering it with excessive detail.

At some point in defining a process and the activities it entails, you will want to provide more detailed instructions on how to perform those activities. But entering these details into the process map might make the map confusing, and can obscure the primary objective of depicting the major activities. It is much more effective to simply link to this information at the relevant work step level, while maintaining the information itself in a computerized database.

Accounting sheets can provide the relevant information. These sheets are maintained separately from the process map but can be linked to the appropriate work steps at the lowest, most detailed levels of the map. Accounting sheets can help with the following tasks:

- tracing resources used and lost with each work step;
- linking the main process to supporting processes;
- defining activities that take place in the process, and their sequence and relationship to one another; and
- adding supporting information as needed to complete the definition of the process.

More information on the format and content of accounting sheets can be found in my previous columns.[2]

Accounting sheets provide valuable process documentation for workers. With hierarchical process maps and a computer database, employees can obtain all relevant information for their own work steps, as well as for steps that precede and follow theirs. They can also obtain information on all the supporting processes that interact with their work.

Managers also benefit since they can use process maps and linked computer databases to pinpoint every work step that uses a certain resource or creates a certain waste. They can also learn how to better manage suppliers and internal supporting processes.

Remember that process documentation should never be seen as an end in itself. It is only a tool to help the company manage and perform more effectively. All decisions on documentation need to be made with that context in mind.

It is very easy to get consumed with creating process documentation and lose sight of whether it will add value or help achieve the higher-level business objectives of the company. The key issue here is effectiveness: In developing documentation, you should focus on improving the effectiveness of the business and its operational and business processes.

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Next Time

My next column will continue the discussion of process mapping, with some ideas on how you can put hierarchical process maps to work for your organization.

Notes

1. See Pojasek, R. B. (1997). Practical pollution prevention: Understanding a process with process mapping. Pollution Prevention Review, 7(3), 91–101.

See also Pojasek, R. B. (2005). Quality toolbox: Improving processes: The traditional approach versus the systems approach. Environmental Quality Management, 15(1), 91–100 (outlining a variety of tools, including process mapping).

2. Pojasek, R. B. (2003). Quality toolbox: Selecting your own approach to P2. Environmental Quality Management, 12(4), 85–94.

Pojasek, R. B. (2004). Quality toolbox: Mapping information flow through the production process. Environmental Quality Management, 13(3), 89–97.

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