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## **Guidelines for Using Process Mapping to Aid Improvement Efforts**

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## **Guidelines for Using Process Mapping to Aid an Improvement Effort**

### **ABSTRACT**

Process mapping is an easy-to-visualize method for people to analyze and agree on the most efficient routes for reengineering or improving a process. It aids in determining redundant tasks, uncovering hidden interactions between processes and people, and focusing on the processes that serve customers, improve quality, and generate income. This paper presents guidelines for using process mapping as an improvement tool. It is based on the authors' experiences in aiding a variety of healthcare, service, and manufacturing companies.

**KEYWORDS:** process mapping, process improvement, reengineering

### **IMPROVING A PROCESS**

Increased competition, need for improved quality, and cost restrictions have resulted in many hospitals implementing process improvement efforts. These efforts are complicated by the complexity of a hospital's organizational structure. Failure rates can be seen as high as 70% in some industries<sup>1</sup>. To increase the chances of a successful project, we will describe how mapping of key business processes is one of the most useful tools for directing and organizing an improvement effort.

The identification of how a process or current system operates is the essential element in identifying improvement opportunities<sup>2</sup>. A fundamental and effective method of studying a system is to make a data flow diagram or flowchart. During the 1980's, early improvement efforts tended to apply the familiar computer programming data flow diagramming and

flowcharting techniques and notation. Unfortunately, these techniques do not meet the needs of an improvement effort (see Table 1). Most importantly, these methods do not model interactions – one of the most significant areas for improvement efforts<sup>3</sup>.

**<< Table 1 Approximately Here >>**

One solution for improving upon a flowchart is to create a process map of a system. A process is defined as a grouping, in sequence, of all the activities involved to accomplish one particular outcome and consists of suppliers, customers, material input, information inputs, transforming activities, inspections, delays, storage, transports, and outputs. The formal APICS<sup>4</sup> definition is: "A planned series of actions or operations (*e.g.*, mechanical, electrical, chemical, inspection, tests) that advance a material or procedure from one stage of completion to another." As such, a process map is a graphical representation illustrating the events and sequences of activities of a process. Although process maps were initially developed for exploring manufacturing environments, they are useful in the analysis of any organizational process<sup>1</sup>. Table 2 summarizes some of the diverse hospital processes that can be mapped.

**<< Table 2 Approximately Here >>**

The purpose of a process map is to provide a mechanism for studying or analyzing a process or portions of a process. The preparation of this tool is not a solution in itself, but provides a compact picture that can facilitate the quest for continuous (either radical or incremental) improvement of a process. Since process mapping can describe a process in varying levels of detail, improvement teams can focus on process characteristics, such as bottlenecks, resource utilization and operation costs. Table 3 summarizes some benefits of process mapping.

**<< Table 3 Approximately Here >>**

There are two common types of process maps. The first is the opportunity map or value-added process map. With this type of map, activities within the process are defined and mapped according to whether they are value-adding activities or non-value-adding activities. A value-adding activity is one that adds value to the final product. In comparison, a non-value-adding activity adds only cost and is often in the process in anticipation of something that will go wrong. For instance, quality control inspection of a product. The second most common type of process map is a process-interaction map or cross-functional map. It shows process steps performed by different functions, key interactions between those functions, and the activities that are performed in parallel by those various functions.

### **STEP 1: DEFINING THE PURPOSE FOR DEVELOPING A PROCESS MAP**

The first step in creating a process map is to develop an understanding of the goal or purpose for the improvement effort. Common goals include reducing customer (internal and external) frustration and complaints, reducing expenses, improving product or service quality, and improving delivery reliability. The purpose of the improvement effort will determine the breath and depth at which process details must be analyzed. For example, if the purpose is to obtain a 25% reduction in cycle time from the time an order is received to the time a medicine is delivered, then all aspects of an order's processing and waiting time must be explored. In comparison, if the goal is to reduce the amount of paperwork in an office, then the flow, interactions, and processing of all paperwork must be explored. Other questions to be addressed during this first step include:

- is the process map to describe a new process, standardize a present process, or improve a process?
- do any existing maps/descriptions exist as a starting point?
- what are the boundaries of the process – where does the process begin and where does it end?
- what are the component parts of the process – people involved, equipment, information systems?

## **STEP 2: ESTABLISHING THE TEAM**

Members of the improvement team should include individuals who have a vested interest, knowledge, and involvement with the process. The team should be cross-functional and have representatives from various levels of the organization. Depending upon the scope of the process improvement effort, key suppliers and customers of the process can be added. Critical for the success of the mapping effort is the team facilitator. This person should be non-threatening and know how to ask the "right" questions. Often it is best to have a facilitator from outside your organization since this individual can often bypass political issues and ask questions that get to the core elements of a process. In addition to being educated in mapping concepts and notations, an improvement team should receive training in team dynamics, consensus decision making and problem solving, and proper meeting conduct. In our experiences, construction of a good team increases the potential success of an improvement effort.

## **STEP 3: MAPPING THE "AS IS" PROCESS**

Developing an "As Is" map is a useful starting point when team members/management:

- do not know the current process
- do not agree on the current process
- do not agree that the current process needs improvement
- want to identify the deficiencies in the current process

The "As Is" map creates a benchmark for the improvement team to compare against future efforts. To get started, the team collects information of how a process "actually" works. Common collection techniques include tracking/shadowing people in their jobs, video taping activities, and employee interviews. One approach we have used to great success is to have a series of meeting of all the key people involved in a process and have them, through interactions with the facilitator, develop a preliminary "As Is" process map(s). For example, in our work to aid a hospital improve the process of how employees move to a new office, we held meetings with people from each of the key areas (*e.g.*, telecommunications, furniture stores, movers, architects) and had them each define how their area interacts with a moving employee. As a result, we created 17 "As Is" process maps describing each area (*e.g.*, one map defined how an employee went about having their computer moved and installed in their new office). Each process map shows:

- each step
- the inputs and outputs of each step
- all decisions
- all people involved
- estimates of the time to do each step

Table 4 presents some example questions that a facilitator can use for leading a mapping meeting. We often construct a preliminary "As Is" process map using a whiteboard and a series

of 3 x 5 inch post-it notes (different colors post-its can be used for indicating value-adding and non-value-adding activities). We use the post-it notes as a square to illustrate an activity in the process and orient them as a diamond for decisions points in the process. We connect each post-it note with lines and arrows. An advantage with this approach is that the post-its can quickly be moved and rearranged during the process definition. Once there is agreement of the preliminary "As Is" process map, we create a copy of the map or take a picture using a camera (digital or Polaroid). Later, we have the map converted into a computer representation using a flowcharting package. Figure 1 is an example of a process-interaction map presenting a simplified view of how a patient is processed in a medical clinic. It divides the process into the people who interact with the patient. All maps should be identified with the process being mapped, who did the mapping, and when was it done.

<< Table 4 Approximately Here >>

<< Figure 1 Approximately Here >>

We should remark that developing a process map is an iterative process and rarely will the improvement team develop a 100% accurate map on its first attempt. It may take many iterations to "bullet proof" the "As Is" process map(s) because all steps, activities, and interactions should be validated by those involved in the process. Development of an accurate "As Is" map is critical because further improvement efforts will be made assuming this document is accurate.

#### **STEP 4: ESTABLISH MEASURES FOR IMPROVEMENT**

The preparation of the "As Is" process map is not a solution in itself – it is only the beginning of the effort. Before process changes can be identified, a target is needed for



measuring improvement. There should be a direct link between the target for the improvement effort and the organization's strategy and competitive position. Examples include: reducing paperwork by 50%, minimizing patient delays to 3 minutes, increasing response rates by 10%, or reducing non-value-adding activities by 20%. Note that each of these examples results in a different "improved" process. Our experience have shown that quantifiable metrics make it easier for all involved to quickly come to a consensus on improvement needs.

### **STEP 5: PROPOSING CHANGES**

With the "As Is" map(s) and established improvement targets, the next step is to look for areas of improvement. Improvement opportunities can often be seen in a process map as flows that are illogical, contribute to wasted time, or are frequently executed incorrectly. Table 5 summarize some common items to look for. Table 6 provides example questions for the team facilitator to ask in leading the team through an improvement discussion. It is critical that changes be reached by consensus.

<< Table 5 Approximately Here >>

<< Table 6 Approximately Here >>

### **STEP 6: MAPPING THE "SHOULD BE" PROCESS**

Once process improvements and changes have been identified, it is often useful to develop a "Should Be" process map. The "Should Be" map identifies an ideal situation for the process being examined. It is especially beneficial to graphically demonstrate the changes when:

- so many changes have occurred that "patching" of the "As Is" system will not be sufficient,
- new demands require a new or radical different process,
- participants/management would rather put their energy into agreeing on the building of something new rather than repairing something old.

This task is often very difficult because it requires the improvement team to think "out of the box" when proposing changes and new processes<sup>2</sup>.

## **LESSONS LEARNED**

Mapping of processes provides improvement teams a tool to look beyond functional activities and rediscover the core processes and essential elements of an organization. It does this by providing a visual technique for highlighting "As Is" processes and showing "Should Be" processes. The results of process mapping is often quite surprising to most individuals since few have an accurate visual representation of how all the activities and processes fit into the big picture. As a result, the use of process mapping will increase the chance of a successful improvement effort.

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**Table 1.** Disadvantages of data flow diagrams and flowcharts

- have a limited vocabulary
- are imprecise about details of sequence and concurrency
- do not show who performs actions or activities
- list only activities that occur if everything functions perfectly
- do not uncover unproductive work due to errors, defects, and omissions
- do not identify activities carried out as a result of failures found during test and inspection
- cannot be used to visualize costs and quality

**Table 2.** Examples of processes that can be mapped

- Processing incoming appointment calls
- Delivering supplies, furniture, and mail
- Speeding up emergency room procedures
- Admitting patients in an emergency room
- Filing paperwork
- Delivering meals and medication to patients
- Moving employee offices
- Filling out expense reports
- Performing monthly supply inventories
- Inspection of incoming materials
- Scheduling of operating rooms
- Routing of pharmacy orders

**Table 3.** Benefits of process mapping

- identify opportunities to significantly reduce expenses
- identify how an organization's core processes interrelate and affect one another
- simplification of process work flows
- elimination of entire steps in your processes
- improved cross-functional communication
- elimination of non-value-added tasks and costs
- understanding internal and external customers and suppliers
- locating process flaws that are creating systematic problems
- identify processes that need to be reengineered
- identify activities that add value to the customer or product
- streamlining and improving processes
- identify root causes of problems
- enhancing the integration of a supplier's role into your business

**Table 4.** Facilitator questions to guide the data collection and map development process

- how does the process begin?
- what happens next?
- who fills out the paperwork at this step and where does it go?
- who makes the decision at this point?
- what operation is performed at this point?

**Table 5.** Common improvement areas

- eliminate duplicate activities
- combine related activities
- eliminate multiple reviews and approvals
- eliminate inspections
- simplify processes
- perform activities in parallel
- outsource inefficient processes
- eliminate movement of work
- reorganize worker teams



**Table 6.** Facilitator improvement questions

- why is this step performed by this function?
- can paperwork be consolidated into fewer forms?
- how does this activity increase patient quality?
- is this document really necessary?
- what are the real goals of the particular task?
- what problems would be caused if this activity was not done?
- can this activity be eliminated without impact to quality or schedule
- how does this activity add value to the product?
- what changes would be required if this document did not exist?
- are these changes feasible?

**Figure 1.** A process-interaction map highlighting the activities and interactions involved in a patient being processed at a clinic.