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LEVERAGING MANAGEMENT IMPROVEMENT TECHNIQUES

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How to understand the various techniques for improving organizations, identify the relationships among them, and merge them so that they become complementary rather than competitive.

Leveraging Management Improvement Techniques

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How many times in the past few years have you heard, "This is not just an improvement program. It's a revolution in management thinking"? Then, after thinking about this specific revolution, you find that, in many ways, it is similar to other revolutions you've recently heard about, such as reengineering, total quality management, activity-based costing or management, just-in-time management, time compression management, employee empowerment, benchmarking, lean manufacturing, economic value analysis, or broadbanding.[1]

How can so many revolutions — similar in many ways — be concurrent? First, some revolutionary improvement techniques are identified with problems that are limited to specific parts of the organization. Second, only a small subset of an organization's members may understand the jargon of each method. Third, different strategies often require emphasis on different aspects of performance to which the specific improvement methods are directed. Organizations face the challenge of choosing from a plethora of methods that claim to effectively and efficiently reduce costs and improve service and value to customers. One way for the whole organization to improve is to merge methods, because each revolutionary method, by itself, may be ineffective or inefficient in parts of the organization. We present a framework that helps managers understand why this failure occurs. The framework also helps managers merge improvement methods. This leveraging of methods makes it possible to produce more significant results in less time than the application of any single approach. Managers can use the framework to create their own management revolution.

Understanding Improvement Methods

Any improvement method has four major components:

1. A particular perspective that defines its approach and objective.
2. A special language or jargon.
3. Analytical tools and techniques.
4. Change tools and techniques.

Understanding the four components of a specific method has several benefits. It provides a basis for assessing the applicability (and likelihood of success) of a method in specific situations. As we will demonstrate, the method's perspective, language, and tools help to identify and define the problem, how to address it, and who should address it. It helps a manager identify and address the potential weaknesses of a specific improvement technique. And it gives a relatively simple, powerful way for finding opportunities to link various methods.

• **Perspective or Frame of Reference.** The perspective of an improvement method can be thought of as an observation platform that allows a manager to focus on the objective and see the route for getting

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Table 1 Focus of Improvements by Functional Group

Functional Group	Improvement Method Most Commonly Used	Focus
Operational Managers, Plant Manager, COO	Just-in-Time	Operational Flow; Eliminating Waste, Delay, and Unevenness
Accountants, CFO, Controller	Activity-Based Costing or Management	Cost of Activities
Design Engineers	Concurrent Engineering	Compression of Development Time
Quality Assurance Managers	Total Quality Management	Identification and Elimination of Defects or Waste
General Managers, Asset Productivity Managers	Time Compression Management	Reduction of Total Cycle Time
Information Systems, CIO, MIS Directors	Electronic Data Interchange	Automated Flow of Information
Human Resources	Employee Empowerment	More Effective Use of People

there. For instance, empowerment allows people to innovate and use their own judgment; thus it focuses on an individual employee's role. Activity-based costing identifies costs with outputs and thus focuses on the work that employees perform and the cost of performing it. JIT management reduces waste, delay, and unevenness and thus focuses on minimizing their impact on the organization.

The perspective of a specific method can identify previously unseen problems. For example, TTI, Inc., a highly successful $370 million distributor of electronic components, is the market leader in distribution of passive components (capacitors and resistors). Consistently dominating customer ratings, TTI has received the highest "share of mind" ratings in its market niche.[2] As part of its continuous improvement efforts, the company evaluated its internal management practices using the Malcolm Baldrige National Quality Award criteria. In the category of customer satisfaction and measurement, the evaluation revealed a need to formalize portions of the customer-service process, to improve measurement of customer satisfaction, and to close the feedback cycle to ensure that the improvement steps had the desired results. CEO Paul Andrews commented, "We built this company by enabling our people to satisfy customers. The Baldrige evaluation provided greater clarity and insight on what other steps we should be taking to remain number one in the minds of our customers."[3] Using the perspective of a single improvement method to reveal problems is valuable. However, the success of one method in one area can turn users into zealots who erroneously conclude that the method is a universal cure-all.

• **Language.** Complementing an improvement method's particular perspective is its language of compatible terms, which provides a means to communicate and make others understand the opportunity. Thus, understanding the language is central to visualizing and comprehending the problem as the method defines it.

A method's language is normally tied to the language or jargon of a particular professional group that is, in turn, identified with a distinct functional area. Therefore, the language will generally reveal the functional group that is likely to advocate the particular method.[4] For instance, operational managers focus on eliminating flow problems in operations, production waste, and bottlenecks. Their language is that of the shop floor, so they discuss materials flow, machine layouts, set-up times, and the operational issues that involve production workers. Thus they are comfortable with JIT terminology; their trade journals, case studies, and professional meetings address the benefits of JIT; and it tends to be their preferred improvement method.

Accountants are likely to prefer activity-based costing or management, which focuses on cost and related activities, because it uses their language. It is the language of accounting trade journals, case studies, and professional meetings. Indeed, activity-based costing and management has become the accounting profession's chosen method for implementing continuous improvement. (For the improvement methods that various functional areas use most often and the methods' focus, see Table 1.)

• **Analytical Tools and Techniques.** Each improve-

ment method uses specific tools to make the existing environment's problems more visible and help managers decide on a specific action. Once managers understand the current environment, they can reapply the tools to identify the desired characteristics for the future. The gap between the present and the future reveals specific opportunities for improvement. (Table 2 lists common tools and techniques of various methods.)

• **Change Tools and Techniques.** Once managers identify opportunities for improvement, they can implement the method. However, many improvement methods fail because managers ignore change tools and techniques. Managers who have been "converted" into true believers of a particular method can fall victim to the "field of dreams" syndrome. Their analysis for the future may seem compelling to them, but what about others in the organization who have different perspectives or use different languages or tools? Although improvement methods give widely varying emphases to implementation, they all imply the necessity of change; that is, until implementation occurs, nothing positive has happened. Indeed, managers can cause great harm if they identify problems without successfully implementing improvements. If they create expectations for improvement but never actually deliver the change, their credibility declines.

Table 2 Analytical Tools and Techniques by Improvement Method

Improvement Method	Analytical Tools and Techniques Used
Total Quality Management	Seven Quality Tools: Flowchart Check Sheet Pareto Chart Run Chart Ishikawa Cause-and-Effect Diagram (fishbone diagram) Histogram Scatter Diagram
Activity-Based Management	Activity Analysis Cost Driver Analysis Attribute Flagging of Activities S-Curve Analysis
Time Compression Management	Cycle-Time Map Bottleneck Analysis
Benchmarking	Process Maps Process Classification Scheme Diagnostic Surveys of Ouput Measures
Electronic Data Interchange	Bar Codes Optical Readers Standards for Communications (e.g., Uniform Product Code)
Concurrent Engineering	Cross-Functional Teams Cycle-Time Analysis Gantt Charts, PERT Charts
Employee Empowerment	Employee Surveys Team Training Group Performance Appraisals
Just-in-Time	Physical Layout Diagrams Setup Reduction Analysis (SMED) Pull Scheduling (kanban) Supply Chain Analysis

Management literature is filled with descriptions of implementation techniques.[5] We discuss a few specific tools to emphasize the importance of the implementation process and to identify the level at which to address the implementation. The most basic tool for implementation is the plan, which should specify what the issue is, what actions to take, expected costs and benefits of those actions, who is responsible for specific actions, and expected completion dates. The plan can be used as both a guide and a scorecard to track progress.

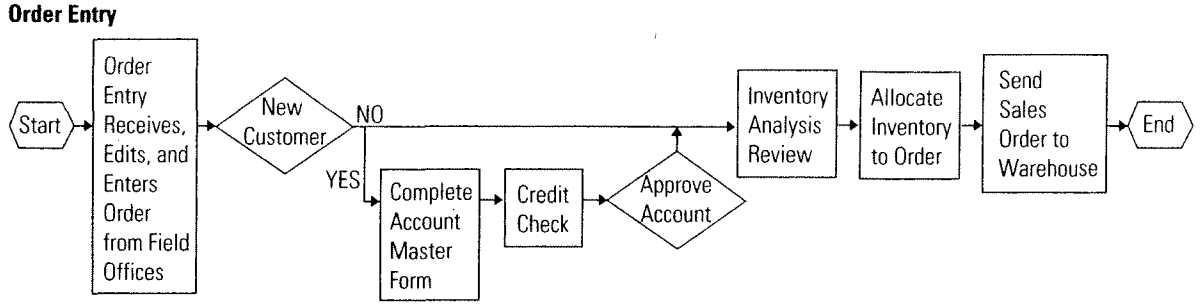
Another particularly useful tool is the awareness, buy-in, and ownership questionnaire, a simple tool to ensure continuing consensus.[6] The questionnaire identifies executives' attitudes as they move from awareness to ownership of a change (the ABO continuum℠). There are also additional tools for assessing people's attitudes toward change, readiness for change, and training needs.[7]

Implementation cannot be ambiguously defined; it must be as clearly focused as the original analysis. If the focus is clear, the choice of tools will relate to both the present and future. The tools can then measure progress toward future goals.

Processing Customer Orders at XYZ Corp.

The process for improving the handling of customer orders illustrates our points. Fulfilling orders consists

Figure 1 Transactional Flowchart — Processing Customer Orders at XYZ Corp.



of two subprocesses: accepting orders from customers and entering orders into the output-generation and delivery process. The sales order department at XYZ Corp. was under pressure to improve. External customers complained that the company took twice as long to process orders as its competitors. In addition, managers were concerned about the increasing costs to run the sales order department.

Mary Jones, the manager of the department, knew that her staff could process orders more quickly and be more responsive to customers if she added more people. Yet such an action would certainly add costs. If she cut back the personnel, costs would drop, but customers would experience even slower acceptance and processing of orders. Jones wanted to improve the department and realized she needed something to help her identify how to improve — a way to focus her efforts.

After investigating possible improvement methods, she decided to take a process view of the department, i.e., process mapping, because she was more comfortable with it than the others, such as TQM or activity-based costing. She had majored in information processing in college, so thinking about, designing, and drawing flowcharts of processes was part of her formal education. Additionally, Jones had spent many hours explaining processes and procedures to new employees and updating her procedures manuals for new systems. With this background, she believed she could not only apply process mapping but also be able to teach it to her subordinates. After discussions of the problem with her direct subordinates, together they easily prepared a simple process map or transactional flowchart in a single storyboard session (see Figure 1).

The process-mapping perspective helped Jones broaden her focus from functional to interdepartmental. Jones and her subordinates now understood that the department was dependent on the field offices for written orders. The warehouse was the department's customer, and its performance depended on the performance of the sales order-processing department. The importance of the coordination among field offices, sales order entry, and the warehouse became obvious.

The process map allowed the department managers to see the current environment clearly. They realized, for example, that orders from new customers required more work than orders from repeat customers. They could also see the sequence of tasks necessary for handling orders. The need to measure the number of new customers as well as the total volume of orders became apparent. Because of the importance of coordination that the process mapping revealed, the department developed a plan to implement additional data collection and process mapping at the interfaces between field offices and sales order entry and between sales order entry and the warehouse. The sales order-processing department also initiated a training program for field staff on how to complete customer orders.

Overall, Jones was pleased with the improvement effort because she had gained insight into the operation and because the execution of customer orders, along with throughput and turnaround time, improved. However, the process mapping tool did not give her sufficient insight to address the cost concerns, and further improvements in service remained elusive.

While the problems were not completely solved, Jones was confident that she understood them better. The staff remained skeptical, but they were encouraged just knowing that management no longer

exclusively blamed them for problems. In general, Jones judged the improvement method a success and advocated its use to others. Process mapping had allowed Jones to focus on the departments interfacing with her department and the sequential activity flow. In particular, it revealed a need to collect additional data on new versus repeat customers.

What would have been the result if Jones had selected a different method? The ultimate recommendations — better coordination with upstream suppliers and downstream customers and more information on key performance data — might have been the same. The route and the emphasis of each, however, would probably have been very different. For instance, given that Jones came from a systems background, she might have selected a technology-based improvement method such as electronic data interchange (EDI), which relies on electronic exchanges of invoices, payment instructions, and funds between suppliers and purchasers. Systems journals advocated the benefits of EDI, and Jones knew that some competitors were investigating its success in other industries.

To implement EDI at XYZ Corp., Jones would first form a task force to investigate its applicability. The team would include only a few department personnel; the information technology group would supply personnel to evaluate current systems and data structures. A team focused on EDI would probably spend much time evaluating customers' abilities to use EDI. The project duration would be longer; gathering and evaluating EDI information takes two to six months or more. EDI would also result in markedly different information, including a profile of existing computer hardware and software used in order entry, a layout of the file structures, and a description of potential communications architectures at the company and at key customers. Ultimately, if the project team recommended that EDI should be implemented, a plan with related costs and expected benefits would be generated. If implemented, a successful EDI project could reduce both costs and order-processing time.

While an EDI project can provide insights and improvements, it has some disadvantages. First, customers often lack the information systems skills for implementing EDI. In addition to consuming time, EDI does not support a shift from functional (vertical) to process (horizontal) thinking. Therefore, it also does not give a clear picture of cross-functional roles and risks a failure to identify the impact that other functions or types of customers can have on processing costs. Finally, Jones's failure to include all the direct subordinates on the process improvement team could cause difficulties in getting all employees to support changes — particularly because a shift to EDI can be seen to threaten some jobs.

Using total quality management might have yielded more insight into the problems at departmental interfaces than the process mapping provided. However, if the customer order-processing team was not proficient in using TQM, it might have been unable to gather and analyze the necessary data or identify the problems' root causes.

Activity-based costing might have helped Jones and her team focus on the cost of credit checks for new customers. Without volume statistics, however, the team would not have known whether the number of new customer orders was significant.

Selecting the Initial Improvement Method

Which method should Jones have used? Which method would have yielded the most useful results? In trying to decide on an improvement method, a manager needs to understand:

- How comfortable the improvement team is with the method's focus or perspective.
- How well the team understands the method's language.
- How much the team knows about the method's tools (or how rapidly the team can be trained).
- How effectively the team can use the tools to convert its output into specific actions and changes.

Improvement efforts have failed because managers have not addressed one or more of these points. For instance, an accounting department staff had been through TQM training but had not achieved sustained benefits from using the method. Despite the training, the staff members did not understand the perspective or the TQM language, thus making it difficult to "buy in." At another company, the new product development department understood the benefits of getting to market faster; however, the managers failed to see how they could use cycle-time maps to speed the development process. The personnel had insufficient

knowledge to apply the tools. And, in another example, an activity-based costing project provided accurate costs to operations managers. While they acknowledged the need to focus on cost and understood how activity-based costing tools work, the managers failed to convert this knowledge into meaningful change and the output into specific actions. The result in all three examples was no positive change.

At XYZ Corp., Jones's background and experience enabled her to apply process mapping and begin the improvement process, thus illustrating the significance of understanding the perspective, language, and tools of a given improvement method. Benefits began when she and her staff shifted their focus from a functional to an interdepartmental focus and as they collected better performance measurement information.

Three basic ways to select the initial improvement method are:

1. *Allow employees to select the method with which they are most familiar.* By capitalizing on their knowledge and background, the employees can begin pilot programs of their choosing that can grow into successful improvement initiatives. While seemingly hit or miss, this is a very low-risk approach because those who must change have selected both the method and area for improvement and are familiar with the focus, language, and tools. People usually support what they help to create. The major drawback to this selection of the initial method is that different functional areas are likely to select different methods. Consequently, the execution of any specific improvement initiative becomes more difficult when it requires cross-functional change.
2. *Mimic the improvement efforts of the competition.* Major competitors may have seized on an approach and pose a threat because of their increased ability to perform. For instance, a major motivation for Ford to select a quality-based method — "Quality is Job 1" — was the outstanding quality improvements in the Japanese auto industry. Mimicking the competition is often effective when it galvanizes the entire company and focuses on critical issues; it is, however, reactive. It may force difficult, if not impossible, improvement initiatives that require radical changes in an organization's focus and language.
3. *Use the customer to identify the method.* This approach, the most proactive of the three, requires understanding what improvements the customer seeks. It also requires feedback on customer needs, on the organization's existing delivery capabilities in relation to those needs, and on converting gaps between customer needs and company performance into improvement opportunities — feedback that is difficult to obtain. If the linkages to the customer are established, the rewards can be direct and powerful.

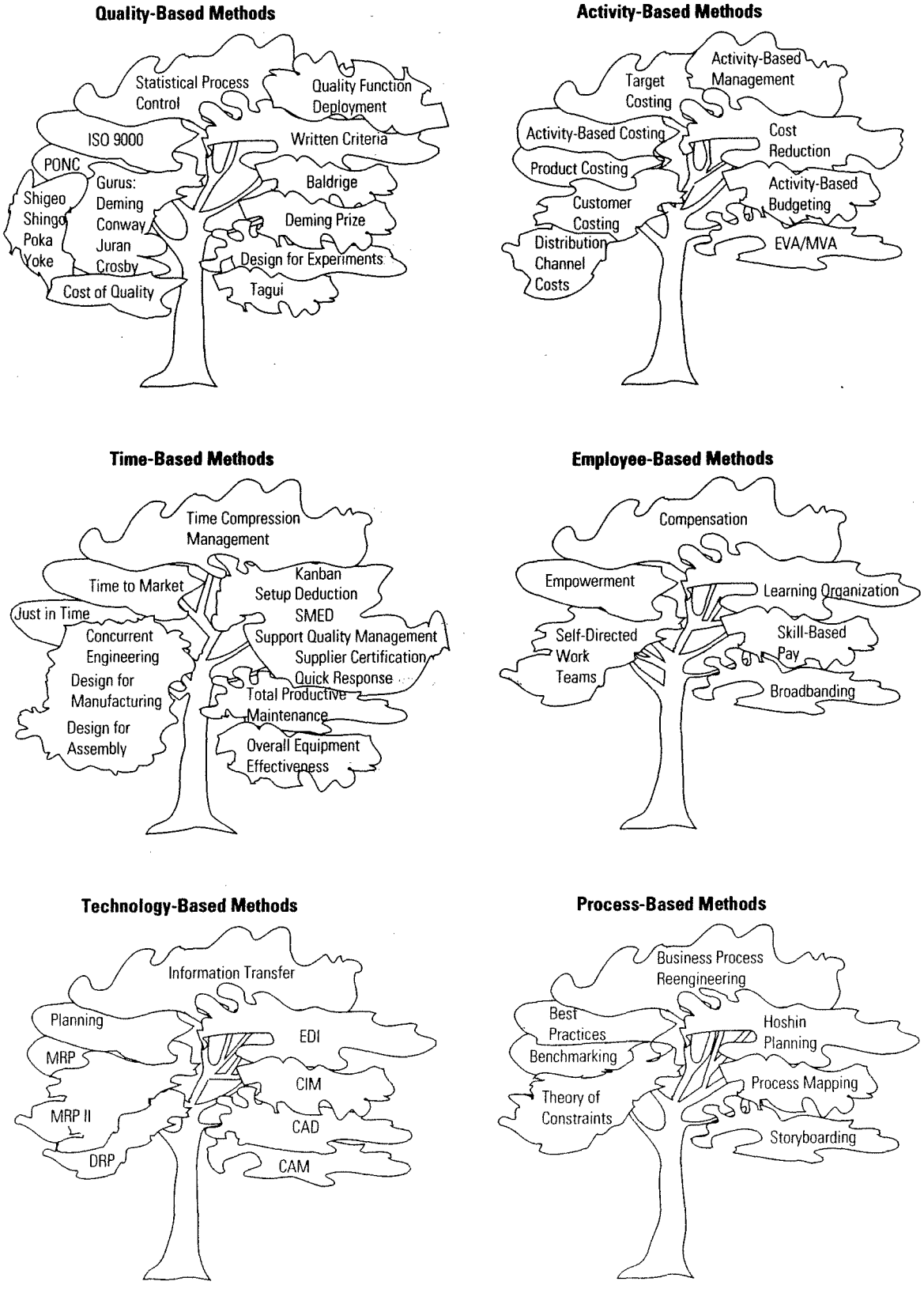
In any case, a manager must evaluate the selected method to ensure that the benefits of the potential change will exceed its cost. Although it may be impossible to predict all the costs and benefits of a specific action, a manager should evaluate the foreseeable qualitative and quantitative benefits relative to the expected costs.

Leveraging the Methods

If managers understand the perspective, language, and tools of various improvement methods and the relationships among them, leveraging the methods will then be possible. They will be able to combine them in complementary rather than competitive ways.

In Figure 2, we depict a number of improvement methods clustered in trees by common perspectives, similar languages, and shared tools. The trees can be thought of as being from the same family — all oaks, for example. Each tree represents a different type; some are more similar than others. In each tree, the methods are more closely related to each other than to those in the other trees. For instance, the time-based methods tree includes JIT, time compression management, and time to market. The quality-based methods tree has branches for "gurus" and for written criteria. A major branch, such as written criteria, divides into smaller branches that include the ISO 9000 standards for internal quality and country-sponsored awards such as Japan's Deming Prize and the Malcolm Baldrige National Quality Award in the United States. The activity-based methods tree includes activity-based costing for identifying the costs of products, customers, and distribution channels and activity-based management for cost reduction, process improvement, and budgeting. Although the figure also includes process-, employee-, and technology-based methods trees, it by no means shows all possible trees.

Figure 2 Family Trees of Improvement Methods



We use the time-based methods tree to illustrate the connections among branches of methods. Although the various time methods employ slightly different language to describe a problem, they are related by a "time" perspective. All these methods use time-based analysis tools, such as cycle-time maps, *kanban*, setup reduction video analysis, supplier audits, and physical-flow analysis.[8] Had Mary Jones been comfortable with time-based improvement methods, she might have selected time compression management for her department. Then she would have used the perspective of time to view the problems; the language and tools of time compression would have required completing a map noting the cycle times of each process step and emphasizing the sources of delay. This method would have provided different insights from process mapping or EDI on why response time to customers was lagging.

Table 3 Methods Trees and Common Tools

Common Tools	Activity-Based	Employee-Based	Process-Based	Quality-Based	Technology-Based	Time-Based
Attribute Costing	•		•	•		
Cause-and-Effect Diagram			•	•		•
Flowcharts or Process Maps	•		•	•		•
Pareto Chart	•			•		•
Process Classification Scheme	•		•	•		
Storyboarding	•		•	•	•	•
Team Building		•	•	•		

The transition — or translation — between trees (between the time-based and the activity-based trees, for example) is more difficult than between branches of the same tree (JIT to concurrent engineering, for example). In some respects, differences between the trees

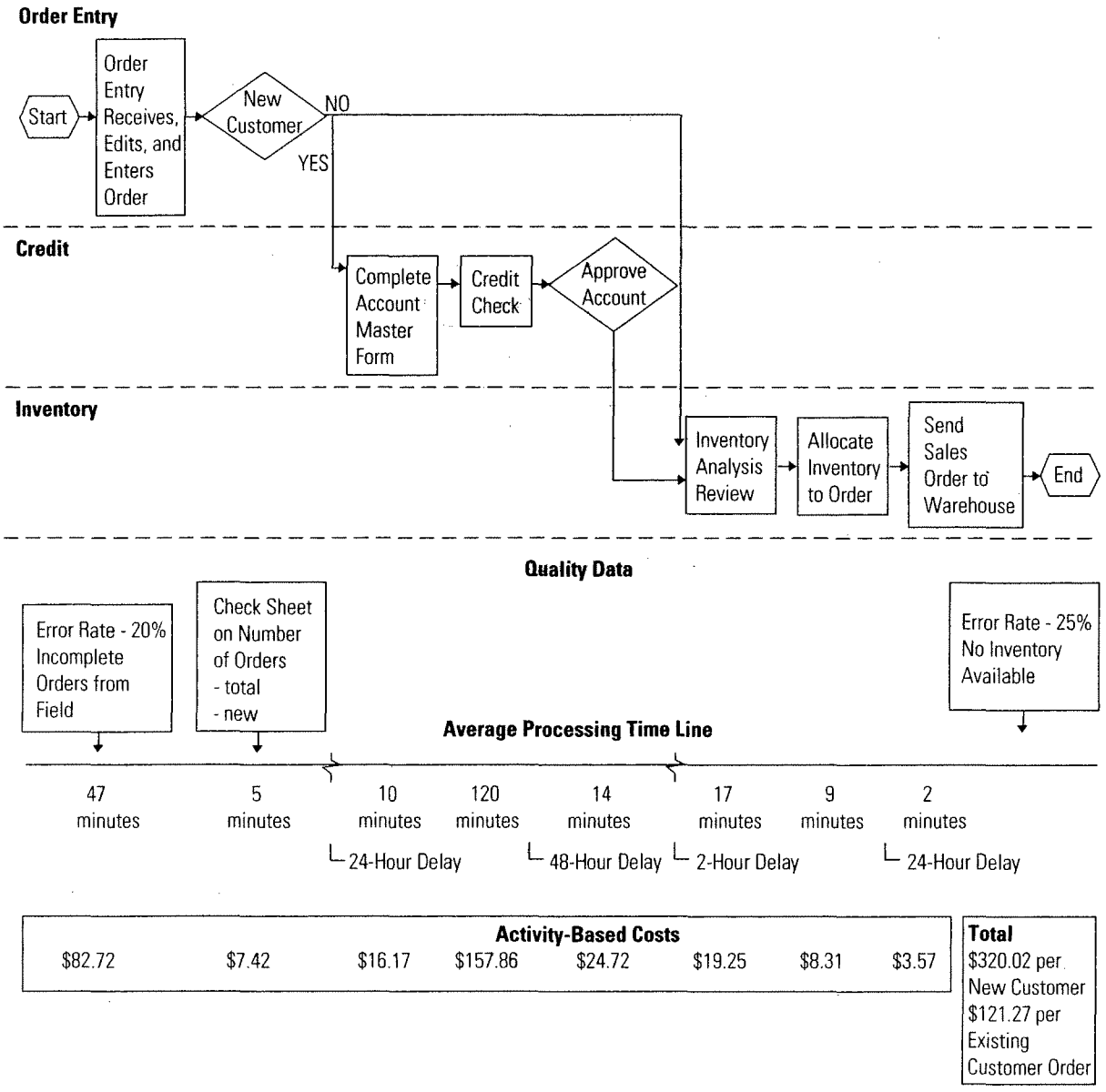
> The tools are, in effect, the "Rosetta stone" for leveraging the improvement methods.

are like differences between languages, and differences between branches are like differences between dialects. A person who speaks Spanish generally has an easier time learning and understanding a dialect of Spanish than learning Italian. However, it is probably easier for that same individual to learn Italian than German because both Spanish and Italian have Latin roots. Similarly, some methods are more closely related than others because they share common improvement tools. (Table 3 lists the six methods trees and some common tools used by multiple methods on different trees.)

Storyboarding is a tool used by activity-, process-, quality-, technology-, and time-based methods. Johnson & Johnson-Medical, Inc., used storyboarding to leverage two improvement initiatives: an activity-based project supported by the accounting organization and a TQM project supported by the quality management organization. Initially, Johnson & Johnson had attempted to implement activity-based costing but failed because operating managers did not understand how the method could help them. They saw it as a typical accounting project. The TQM implementation had not achieved full acceptance because the operating managers could not identify the payoffs from the project. However, with storyboarding, Johnson & Johnson was able to shift the focus to process improvement, thus presenting the two methods to the operations personnel in terms they understood and demonstrating the value of the TQM effort with activity-based costing information.

A tool such as the process classification scheme can translate or tie the results of activity-based initiatives to process- and quality-based methods for greater return.

Figure 3 XYZ Corp.'s Interfunctional Process Map



Pennzoil used the process classification scheme to link an activity-based costing initiative to a process reengineering initiative. By doing so, Pennzoil was able to use activity-based costing information to identify high payoff areas for reengineering.[9] Starting with common tools facilitated the understanding and use of tools from other methods, providing a more powerful analysis than only one method could provide.

The tools can be the key to translating methods. They are, in effect, the "Rosetta stone" for leveraging the improvement methods. For instance, flowcharts or process maps are used in activity-, process-, quality-, and time-based methods. A basic process map presents the steps to produce the output. Adding cycle time identifies the time it takes to produce the output. Adding an activity analysis with activity-based costing to the process map and cycle time analysis provides the cost of each step. Finally, adding a quality analysis identifies the problems that cause rework. At that point, the manager has a complete view of the process, can understand it from multiple perspectives, and can devise improvements to address most of the problems. For example, consider how the merging of multiple methods can help XYZ's sales order department.

Merging Methods at XYZ Corp.

By using the common tool of flowcharts or process maps, Mary Jones can merge one method with the next, thereby leveraging the impact of the initiative. Rather than start a new initiative, she can complement the current initiative by introducing additional dimensions to the analysis. As at the selection of the initial improvement method, Jones must evaluate each additional tool or method added to the effort to ensure that the benefits exceed the cost.

Figure 3, based on the transactional flowchart in Figure 1, shows how the analysis expands by using a different process-mapping tool, an interfunctional process map. The map shows not only the sequence of steps but also which ones are completed by the order-entry clerks, by the credit analysts, and by the inventory analysts, so Jones knows which personnel perform each step.

Jones applies time compression management to merge a second improvement method by using a processing time line (see the figure). The line shows her that the actual time to process an order for an existing customer is only 80 minutes and for a new customer is 224 minutes. It also shows, however, that delays add more than four days to the processing time. This information shifts her emphasis to understanding and eliminating the causes of delay.

With the interfunctional process map and the process time-line data as input, Jones uses activity-based costing to calculate the costs of handling orders. Activity-based costing shows that processing an order for a new account costs $320.02, information that would be helpful in evaluating the minimum order volumes for new customers. The $121.27 cost for processing existing customer orders raises questions about the need to set minimum order sizes. This activity-based information can target costly activities for reduction and generate a search for steps to eliminate, simplify, or automate. (As we discussed previously, a technology-based improvement method such as EDI might yield the same recommendations from a different perspective.) Finally, Jones merges a quality-based improvement method into the analysis by applying it to the activities in the process map, thereby uncovering information on sources and magnitudes of errors (see the middle section of Figure 3). Such errors lengthen cycle times and add costs. The results from the quality-based method complements those from the process-, cost-, and time-based improvement methods. For example, in the figure, the quality data identify a 20 percent error rate on orders from the field, which helps explain why an order took an average of 47 minutes at $82.72 to complete. Much of this time is spent gathering the information necessary to enter the order.

Jones could merge other improvement methods into the analysis. A physical layout diagram could show how workstation location causes delays. A peaking analysis could indicate uneven spikes in work flow. Technology-based methods could identify how workers are sharing information. Using the common tools among the methods allows the use of additional methods *without* starting a new initiative. The improvement effort becomes a seamless process rather than individual functional attacks.

Conclusion

Visualizing a problem is much easier when we apply multiple perspectives; different improvement techniques yield different insights. Individuals and organizations can learn to use methods with different perspectives or multiple methods with the same perspective. Many paths are possible, but all require serious effort and the commitment of resources to be successful. To use multiple methods:

- Identify the tools and techniques that have universal appeal or cross-over capability.
- Create a common organizational language so diverse professional groups can communicate perspectives, methods, and tools (e.g., Motorola's "six sigma" approach to continuous improvement).
- Create cross-functional teams of members who educate each other about various perspectives, languages, and tools from their functional disciplines.
- Establish broad-based educational programs for staff. Finding people who can help staff members understand multiple perspectives and languages may be difficult. Therefore a bottom-up approach may be necessary, starting with the new tools that lead to new perspectives.[10] Simply exposing staff to new tools at seminars is no guarantee that they are learning.
- Exhibit the desired behavior at the top of the organization. Key decision makers must understand and use the multiple perspectives, languages, and tools. (The

challenge of educating the decision makers may be no less daunting than that of educating lower-level personnel.)

Working to understand relationships among the various methods directly helps individuals become more flexible in problem solving. As new revolutions appear, finding their family tree and identifying common tools used in applying the method can help minimize their cost and disruption.

The ability to use any improvement method (and benefit from its perspective) depends on the functional skills and knowledge in a company. We recommend that a manager:

- Assess the improvement methods that the functional groups in the organization currently use.
- Understand the commonality of the tools among those methods.
- Use the tools in combination to gain multiple perspectives.
- Merge the methods to reach a leveraged solution that all groups can support.
- Integrate the change tools to ensure that improvement occurs. ◆

References

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1. Our intention is not to belittle or denigrate attempts to improve management practice and organizational productivity. We are aware of both private- and public-sector organizations in which the improvement methods referred to here have helped to increase productivity dramatically.

2. *The 1994 Buyers Preference Survey* (New York: Electronic Buyers News, May 1994).

3. Conversation with S. Player, 22 January 1993.

4. We based our discussion about the users of these methods on our experience and the comments of the managers, consultants, and academics who have either discussed this issue with us or reviewed this manuscript. For a similar identification of improvement methods with functional groups, see also:
T.H. Davenport, *Process Innovation: Reengineering Work through Information Technology* (Boston: Harvard Business School Press, 1993).

5. Two excellent sources for implementation techniques are:
W.L. French, C.H. Bell, Jr., and R.A. Zawacki, *Organization Development and Transformation: Managing Effective Change,* fourth edition (Homewood, Illinois: Edition, Richard D. Irwin, 1994); and
T.G. Cummings and E.F. Huse, *Organization Development and Change,* fourth edition (St. Paul, Minnesota: West Publishing, 1989).

6. For additional discussion of the questionnaire, see:
S. Hronec, *Vital Signs* (New York: American Management Association, 1993), pp. 57-61.

7. An example of a proprietary tool is the "Change Readiness Survey" used by Arthur Andersen. Other tools are:
A.G. Henkel, C.L. Repp-Bégin, and J.F. Vogt, "The Empowerment-Readiness Survey," in J.W. Pfeiffer, ed., *The 1993 Annual: Developing Human Resources* (San Diego, California: Pfeiffer, 1993), pp. 148-160;
R.S. Wellins and J.M. Wilson, "Team Readiness Survey," *Empowered Teams: Creating Self-Directed Groups That Improve Quality, Productivity, and Participation* (San Francisco: Jossey-Bass, 1991), pp. 95-98.
For an example of tools for assessing training needs, see the training needs analysis in:
J.H. Morrison, "Determining Training Needs," in R.L. Craig, ed., *Training and Development Handbook* (New York: McGraw-Hill, 1976), pp. 9-1 - 9-17.

8. Some of these branches have been given program names, such as the version of setup reduction known as SMED (single minute exchange of dies).

9. Both the Johnson & Johnson and Pennzoil examples are from:
S. Player and D. Keys, *Activity-Based Management: Arthur Andersen's Lessons from the ABM Battlefield* (New York: Master Media, 1995).

10. For an interesting discussion of new tools breeding new perspectives, see:
K.W. Hoskins and R. H. Macve, "The Genesis of Accountability: The West Point Connection," *Accounting, Organizations and Society,* volume 13, number 1, 1988, pp. 37-73.

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