1.1.26. The Holistic Perspective—Claude Monet

1. BACKGROUND

1.1. INTRODUCTION

1.1.27. FUNDAMENTAL CONCEPTS III

1.1.27.1. Even More General Concepts Defined Quickly

1.1.27.2. Define Integrator

The integrator is a role a person plays in practicing the systems approach to optimize the whole. The integrator has authority over the parts of the system and understands the working of those parts and their effect on the working of the system.

In an organization, we need a person to orchestrate the parts of the organization into a blend that produces true harmony among the parts yielding the best the organization can do. Leadership can come from anywhere in the organization. Doing integration must come from someone in the organization who has authority over the parts of the organization and the relationships and interactions among those parts. Therefore, the contribution to leadership for finding synergy and optimizing the whole comes from someone with authority. Without authority, the best you can do is conceptual integration. That's why empowerment is important. The organization needs more than one person to make integration happen.

Being an effective integrator is needed for a leader. Integration supports doing strategic endeavors—those endeavors for figuring out what the problems are. Leaders must also be role models. As such, leaders aren't necessarily in positions of authority. People in positions of authority in organizations today have so many demands up and down the organization, there's little time for leadership. However, some people in authority know how to delegate and retain time and effort for effective leadership. These people must be good integrators; and integration is one vehicle through which they exercise leadership.

An integrator is like a stage director. The stage director must orchestrate all phases and functions in the play. Stage directors set the stage, the actors, and support people by producing, coordinating, and directing all props, cues, script, lighting, sound, and rehearsals for a successful production. They have the ultimate feel for what the play should mean to and do for the audience. When the director pulls all the tools and arrangements together with the ability and talents of the actors, their audience and critics respond favorably.

An effective integrator in an organization must integrate along at least four dimensions. First, they must differentiate and select between the urgent and the important. Second, they must balance and address the priorities of the needs of all their stakeholders. Third, they must distinguish and implement activities and resources through the five groups of functions in the system life cycle: analysis, design, implementation, follow-up, and follow-through. In this dimension, the integrator is using the engineering process. Fourth, they must build and use a wide range of management tools to provide information for decisions. In this dimension, the integrator is using the management process.

The purpose of the integrator is to bring all the appropriate pieces together to form a system so each piece does its job and together the pieces meet the aim of the system. The steps are 1) figure out what is moving the system (precipitator), 2) figure out which are the right pieces (participants), 3) figure out the aim of the system (purpose), 4) figure out how the pieces work together (participation), 5) figure out what the system does (problem), 6) set up a process for the system to meet its aim (process), and 7) verify the product of the system (product).

The Effective Integrator Practices Integration and More.
Webster defines integrate as "to form, coordinate, or blend into a functioning or unified whole; to unite with something else; to incorporate into a large unit" and integration as "incorporation as equals into society or an organization of individuals of different groups; coordination of mental processes into a normal effective personality of with the individual's environment; the operation of finding a function whose differential is known; the operation of solving a differential equation." (*Webster's Ninth New Collegiate Dictionary*) I'll discuss the actions of forming, coordinating, blending, and more for being an integrator soon. Now let's focus on bringing the parts into their rightful roles in a system, the coordination of processes into the personality of a system, and differentiation. The integrator must know and address the roles each resource in an organization must play to get the best from the resource and from the organization. Organizations have personalities too. These personalities are significantly affected by the processes of the organization: direct work processes, support processes such as hiring and job definition, and the management process. Now, let's discuss differentiation.

Integration is summation—the integral under a curve. The integrator is more. Integrators bring things together and get them to work their attributes (differentiation) through their mutual relationships toward the aim of the system. Integrators are able to filter (differentiate) and find patterns. They are able to maintain balance and to blend for many components, activities, approaches, issues, and functions in an organization. These activities focus on the parts of the system; and, therefore, are part of the system perspective.

Integration and differentiation are part of the systems approach and are imbedded in the system perspective. The integrator has to integrate and differentiate to do strategic endeavors—know what the problem really is. *The integrator must integrate and differentiate the needs of all stakeholders of the organization.*

The industrial engineering profession addresses and certifies people to be systems integrators. They describe the systems integrator as, "The system, as used here, can refer to one isolated system, or an integration of two or more subsystems. Regardless of system type or size, there are particular functions and processes that should be completed to ensure successful implementation and operation. The Systems Integrator must possess the knowledge and skills necessary to ensure completion of system planning, design, implementation and control activities. This individual may not personally complete every activity himself, but rather must manage the entire project with the knowledge of the activities to be completed, the information, personnel and materials required for completion, and the interface of all involved functional areas to ensure total communication and integration. Along with the functional areas of the organization, the Systems Integrator must be aware of major issues including technical and physical issues, managerial issues, strategic/financial issues, and operational and functional issues." ("IIE Certification Program in Systems Integration," David W. Hess, in *Guide to Systems Integration*, Joe H. Mize, Editor, The Institute of Industrial Engineers, 1991, p. 4) The integrator must know the system life cycle, including planning (analysis), design, implementation and control, follow up, and follow through. *Integration must follow the engineering process.*

Integrators provide continuity, comprehensiveness, and completeness for a system. Through integration, managers reduce redundancy and capitalize on synergistic benefits. The integrator is a catalyst for making the necessary interactions in a system happen. Integrators are good at setting priorities. Integrators are loop closers. In closing process loops, integrators provide for systems thinking, organizational learning, creativity, and empowerment.

If I had to classify integrators, I'd say the types of integrators are coordinators, interdigitators, blenders, and matchers. Distinguishing the contributions of each part of a system and coordinating the interactions of the parts is relatively easy. To interdigitate means to make the parts of a system interweave properly, like your fingers interdigitate when you clasp your hands. Matching is like fitting. Finding the right fit for the parts of a system is relatively hard to do. I've discussed how crucial it is to find the fit of an information system to the decision maker and to his or her responsibilities. The most difficult part of integration is finding a blend. A blend implies that the parts are so well coordinated, iterdigitated, or matched that each part is indistinguishable from the others. Each part is lost in the functioning of the whole.

Industrial engineers aren't the only people good at integration. But, industrial engineers profess to know integration and, therefore, are expected to understand integration. The Institute of Industrial Engineers addresses systems integration. "The term 'systems integration' means different things to different groups of people. To an aircraft design team, system integration deals with the problem of assuring that all major sub-systems (airframe, propulsion, hydraulics, electronics, etc.) are properly inter-related, such that the overall aircraft performance is optimized. .... The major difference is that the industrial engineer must deal with very large and ill-structured systems. Indeed, the entire organization is the 'system' being studied, analyzed, rationalized, and hopefully optimized. Rather than combining electronic components into a functioning system, the industrial engineer must combine functional organizations, equipment, material handlers, policies and procedures, workers at all levels, computer/information systems, suppliers, etc., into a harmoniously working total system." (*Guide to Systems Integration*, Joe H. Mize, Editor, The Institute of Industrial Engineers, p. 25)

Integration Brings the Parts Together into the Whole.

Integrators integrate the interdependencies. They see potential interrelationships among all the parts of the system. Integrators know connections and can see potential connections in an organization. They know unique attributes and contributions of each part of the system. Perhaps the integrator's key job is balance. The integrator blends components and gains harmony among components. The integrator finds links among the components and focuses the linked components on the needs of the system for system improvement. Suzaki address this issue for manufacturing. "Since the problems in organizations are often found at the organizational boundaries, understanding the linkages among different groups within the organization becomes critical for streamlining operations." (Kiyoshi Suzaki, *The New Manufacturing Challenge: Techniques for Continuous Improvement*, The Free Press, 1987, p. 4.)

They can mix so the components are still distinguishable and mix so the components aren't distinguishable. "Scientists sometimes speak of two kinds of qualities—*extensive* and *intensive*—according to what happens to the quality when the system is divided into parts. If we break a chocolate bar in two pieces, each piece has a different mass than the original: thus mass would be called an *extensive* quality, since it depends on maintaining the full extent of the system. On the other hand, when we break the chocolate bar in half, each piece retains the same 'chocolateness', which is therefore said to be an *intensive* quality. Or, to take a more physical example, each half has the same density, so density is said to be an intensive quality." (Gerald M. Weinberg, *An Introduction to General Systems Thinking*, John Wiley and Sons, 1975, p. 152)

An organization often brings a large number of parts together and then has a gap. In this case, the parts don't completely satisfy the needs of the whole. The integrator has to recognize the gaps and then to learn whatever is needed to fill the gaps. Then, the integrator must not only practice the systems approach for finding the gaps, but must be able to learn enough about the specific knowledge relating to the gap to be able to communicate the need and fill it.

Integrators must integrate the management process into the organization's daily work activities. The integrator must decide what resources to spend on administering the management process and on managing brushfires. The functions and rules of the management process can make this balancing job easier by giving the integrator visibility and control in supporting decisions.

The role of the integrator is one of the most difficult, important, and ill-defined roles in managing major projects, programs, and organizations because of the multiplicity of activities at various levels needing to be coordinated. Consider the competing needs for time and resources of the various stakeholders and of individuals in any stakeholder group. Consider the different functions and activities of the organization. Blending all these activities and needs to serve each one and to optimize the whole organization takes profound knowledge, the right information, and a real caring and trusting attitude with people. Recognize that if you optimize the whole, you suboptimize at least some of the parts. The integrator must get people to appreciate and commit to suboptimize their part for the good of the whole.

The Integrator Practices the Systems Approach.

"W. Edwards Deming provides some insight as to how organizational improvement might best be achieved when he defines the three primary roles of a top manager:

1. Provide the theory upon which the individual components of the system can relate to the purpose of the system.

2. Transform the basic structure of the system to one which uses more responsibly the components available to the system.

3. Keep the purpose of the company in harmony with the broader aspects of a healthy, prosperous community and society."

("Fundamentals of Systems Integration," James A. Bontadelli and Kenneth E Kirby, in *Guide to Systems Integration*, Joe H. Mize, Editor, The Institute of Industrial Engineers, 1991, p. 47) Clearly, to do integration, you must view the organization from the systems approach.

The manager must differentiate and balance the urgent and the important and decide what resources to spend on administering the management process and on managing brushfires. The methods and rules of the management process can make this balancing job easier by giving the manager visibility and control in supporting decisions.

The integrator must see cause and effect across dissimilar activities. Seeing cause and effect in one part of a system or among similar parts is relatively easy. Seeing cause and effect across dissimilar parts is relatively hard. An example of dissimilar activities is: How does the installation of a new software package affect the motivation of the worker and the success of the organization? Integrators are able to carry over what they know from one activity or event to another activity or event and to selectively fit (match) solutions to needs in whatever situation arises.

An integrator practices the systems approach with the three perspectives (system, holistic, and generalist) and sets up, operates, implements, maintains, and dismantles systems. An integrator is an agent for systems. Systems come from somewhere. Person-made systems come from integrators. The idea of integrator goes with the systems approach. Integrators are generalists and transfer lessons learned. Therefore, they need to be quick learns.

The Role of the Integrator Requires Information.

The role of integrator in effectively implementing the management process is the key to reducing brushfires to provide time needed to improve performance and advance the organization in the face of a changing decision-making environment. The management process helps you select, use, and integrate management tools. In getting the tools to work synergistically together to support your decision making, you assume the role of integrator. The integration role is critical for reducing the number and disruptive effects of controllable disruptions.

Integrator roles are difficult because of the volume of information integrators must sift through to make decisions. Integrators can't integrate if they don't have the right information in the right place in the right format at the right time. Part of the solution to that problem is mechanical and the other part is human. It's the human part that distinguishes this discussion of the role of the integrator.

Integrators have two information tasks that compete for the same time and resources. One information task is to reduce equivocality so the organization shares a common view of events and alternatives. We call this task external interpretation (Weick, 1979). The other task is to process enough information to coordinate the organization's activities and manage performance. We call this task internal coordination (Galbraith, 1973). People in the role of integrator provide media high in information richness to reduce equivocality and large amounts of information to handle interdependence in the organization. Effective integration and portrayal of information facilitates both external interpretation and internal coordination.

In considering the information needs of the organization and the need for improvement, Powers and Liotte address the idea of an integration engineer. "If you think we have been describing an expanded role for the Industrial Engineer, a role as a partner with the IS [information systems] community in support of the customer, you are absolutely right. Manufacturing and business process improvement requires the power of data analysis and information technology. And the new role of the Industrial Engineer is that of an INTEGRATOR. As a matter of fact, we have written a theoretical job description of the Industrial Engineer as an INTEGRATION ENGINEER. THE INTEGRATION ENGINEER: AN INDUSTRIAL ENGINEER WITH THE ABILITY TO INTEGRATE, POSSESSING THE BACKGROUND AND THE CAPABILITY TO THOROUGHLY ANALYZE AND DEFINE A PROBLEM WITH THE CUSTOMER; TO ACT AS AN INTERFACE BETWEEN THE CUSTOMER AND THE SYSTEMS COMMUNITY; TO SELECT AND COMBINE VARIOUS TECHNOLOGIES INCLUDING INFORMATION TECHNOLOGY (THE BEST FIT SOLUTION FOR THE CUSTOMER). This Integration Engineer is change oriented; and agent of change, sensitive to the customer's social and business system with a specialty BUT willing to get out of the functional silo. (S)he is willing to test new theories and willing to seek out and partner to fully utilize the skills of others and look at the entire process." ("The Integration of Work Redesign and Information Technology," John J. Powers and Anthony T. Liotti, in *Guide to Systems Integration*, Joe H. Mize, Editor, The Institute of Industrial Engineers, 1991, pp. 134-135) As you think about the idea of an integration engineer, think about the fundamentals of the engineering process. Then, an integration isn't necessarily part of the engineering profession. I'd hope we could help engineers learn to be good integrators.

Finally, how might we approach systems integration in an organization? Badiru suggests some questions that can help us with an approach. "Systems integration is particularly important when introducing new technology into an existing system. It involves coordinating new operations to coexist with existing operations. It may require the adjustment of functions to permit sharing of resources, development of new policies to accommodate product integration, or realignment of managerial responsibilities. Presented below are important questions relevant for systems integration:

- What are the unique characteristics of each component in the system to be integrated?
- How do the characteristics complement one another?
- What physical interfaces exist between the components?
- What data/information interfaces exist between the components?
- What ideological differences exist between the components?
- What are the data flow requirements for the components?
- Are there similar integrated systems operating elsewhere?
- What are the reporting requirements in the integrated system?
- Are there any hierarchical restrictions on the operations of the components of the integrated system?
- What are the internal and external factors expected to influence the integrated system?
- How can the performance of the integrated system be measured?
- What benefit/cost documentations are required for the integrated system?
- What is the cost of designing and implementing the integrated system?
- What are the relative priorities assigned to each component of the integrated system?
- What are the strengths of the integrated system?
- What are the weaknesses of the integrated system?
- What resources are needed to keep the integrated system operating satisfactorily?
- Which section of the organization will have primary responsibility for the operation of the integrated system?" ("Achieving Systems Integration through Project Management Techniques," Adedeji B. Badiru, in *Guide to Systems Integration*, Joe H. Mize, Editor, The Institute of Industrial Engineers, 1991, pp. 376-377)

1.1.27.3. DEFINE HOLISTIC PERSPECTIVE

"The significant problems we face cannot be solved at the same level of thinking we were at when we created them." Albert Einstein

For technically-oriented people from western cultures, the holistic perspective requires a way of thinking we aren't conditioned for. We can learn the holistic perspective from people from eastern cultures and from the indigenous peoples. To engineer or manage the significant problems we face today, we must think at a different level from before. We must push the systems approach (something we're not too familiar with) to higher levels of philosophical understanding.

Of the three perspectives I've identified within the systems approach (system, holistic, and generalist perspectives), the system perspective is more analytical and more in line with our cultural and educational experience. The holistic perspective deals with ideas like meaning, purpose, essence, and soul.

A few years ago, I was facilitating a group of people representing a widely-varying range of interest groups who were commenting on the Department of Energy's five year plan for environmental management. The representative from one of the American Indian groups spoke to the group with great concern and passion. He said, "This plan has no soul!" Somehow the plan didn't include the essence of the earth and its creator. The plan failed to reflect not only the culture of the Indian nations but the culture of the environment itself. The plan didn't deal with the essence and the values of the environment. The plan didn't have the holistic perspective.

Being an engineer from a western culture, I was struggling to understand. My problem was that I thought, no I knew, he was right. But, I wouldn't know if the plan had soul if I saw it. And I certainly wouldn't know how to put soul in the plan. Yet, I believe if we can't get soul into our work, like the plan, we won't solve the significant problems we face today.

Webster defines soul as "the immaterial essence, animating principle, or actuating cause of an individual life; a person's total self; a moving spirit." (*Webster's Ninth New Collegiate Dictionary*) The soul of an organization is its spirit. We're familiar with the importance of esprit de corps as the common spirit the members of a military group have for the group and its aim. The spirit inspires enthusiasm, devotion, commitment, dedication, and a regard for the honor and the values of the group. Can a plan have this kind of spirit among its components, attributes, and relationships? I've made the definition of system in Module 1.1.11.5. more inclusive and more general by including the notion of spirit in the system.

For the holistic perspective of the environment (and consequently a level of understanding necessary to solve environmental problems), I look to the Native Americans. They make a unique contribution to our understanding of the cultural perspective of the environment because of their traditional norms, values, and traditions regarding the environment. Indian culture is rooted in environmental culture, whereas the dominant culture in the United States today is not. The holistic perspective of the environment must include at least cultural, technical, and institutional views of the environment.

Delia Grenville in my management systems engineering class extended the range of my holistic thinking discussion. She writes, "I come from Caribbean culture (very rooted in African traditions). As a child, I was allowed to say that my spirit did not agree with someone elses, and that was enough. That was wholly acceptable as a reason not to like or get along with the person. There are so many aspects of holistic thinking in Caribbean culture. African Americans have had to unlearn that to survive in the western world." As our organizations reach for global markets and resources, we must recognize, understand, respect, and make room in our perspectives for the traditions, norms, and values of other people. Holistic thinking is an example of an extension those of us who practice analytic thinking must make if we want to be systems thinkers.

In my search for understanding of the holistic perspective, I found Kosaku Yoshida, who studied under W. Edwards Deming. In the abstract to his article, *Deming Management Philosophy: Does It Work in the US as Well as in Japan?*, Yoshida says, "Japanese business success began when Western ideas were grafted onto the traditional holistic orientation of the Japanese. The success of Deming's philosophy in Japanese business cannot be understood in isolation from the Japanese environment." In discussing the holistic approach and the Japanese culture, Yoshida says, "Understanding the essential difference between Japanese and American thinking processes requires some understanding of Japanese culture. The common heritage and value system of the homogeneous Japanese population meant that the way one Japanese thought tended to resemble how another Japanese thought. This foundation of similar thinking provided the basis for a culture which implicitly encourages individuals to 'read between the lines.'

For example, in high school every Japanese studies haiku, the traditional Japanese short poem with only seventeen Japanese letters, equivalent to seventeen syllables in English. In a few phrases, haiku tries to express a deep feeling or thought. By studying haiku, Japanese students are trained to perceive an entire atmosphere or feeling by reading between the lines, that is, by paying attention to subtleties such as context and what is merely implied or suggested. A study has shown that Japanese magazines devoted to haiku or waka (another form of short Japanese poem) are widely circulated among workers who have bought over a million copies. The spirit of haiku has had such a tremendous impact on Japanese writing in general that even scientific papers and legal documents tend to be short and terse, similar to haiku and very unlike American scientific and legal documents.

Furthermore, the Japanese are educated to pick up more meaning from blank spaces than from written words. Indeed, this ability is the hallmark of the Japanese. According to the Japanese critic and philosopher Hideo Kobayashi, this characteristic is largely the result of the influence of Basho, the most famous haiku poet of seventeenth-century Japan, who considered silence to be the most eloquent expression of poetry.

Consequently, people accustomed by heritage to these societal traits do not need detailed specification of a corporate philosophy. This heritage is also the major reason why corporate philosophies exist in most Japanese companies but in few American companies, although a number of American companies have established corporate philosophies in recent years. Unlike many Americans, the Japanese are comfortable with far-reaching, broadly encompassing, abstract statements unsupported by specific examples or elaboration.

Eastern brush painting is another aspect of Japanese culture that has influenced the Japanese in ways apparent in Japanese business today. The Eastern brush painter traditionally works quickly, his concern being to capture the total feeling about the perceived object rather than individual details of the object itself. By contrast, the emphasis in traditional Western art has been upon accuracy of detail. In Western civilization, painting has gone through a history of detailed drawing. Similarly, Western scientific development began with the analytic approach, in which most statements are detailed and specific." (*Columbia Journal of World Business,* Fall 1989, pp. 12-13.)

I've discovered one of the key elements of the organization today is its MVP, or mission, vision, and guiding principles. MVP is a statement of the present and future and beliefs all the people in the organization buy into. Through the MVP, the organization can achieve a constancy of purpose and a consistency of purpose needed for success.

In the holistic perspective, we have to be able to read between the lines; interpret empty space (blank space on a page or silence in discussion); understand the flow and feeling of a single line, word, or image; and realize the meaning or essence of the system. In this way, a word, line, or image isn't necessary to meet the aim of the system. The meaning, essence, flow, or soul is. The meaning comes as much or more from what isn't apparent than from what is. So, changing one tangible part of a system doesn't necessarily change its meaning.

In the system perspective, each part of a system is necessary to the aim of the system. All components play an important role. In the holistic perspective, we deal with the system at a higher level than the components, thus rendering the components to be contributors to the essence of the system. Each component can add to the essence, but the essence so permeates the system, removing a component doesn't hurt the aim. We form closure around the empty space.

We show a process as a flow diagram connecting components, activities, and resources. In truth, the process is invisible. What you see is the individual worker, the individual machine, the individual product. You must look beyond the physical into what the workers, machines, and products are, what they do, and what they do it for. That's the totality. You must see the forest rather than the individual trees.

In the systems approach, we need both the system perspective and the holistic perspective—and one more perspective: the generalist perspective. With the three perspectives, we recognize the importance of each component, the supremacy of the aim or purpose, and the significance of learning.

1.1.27.4. A Holistic Model Has Human Components and Results in Synergy.

If we try to include the holistic perspective in a model, we must include humans who can smell out the situation.

Those of us who are rooted in Western, or European, culture and are analytically trained (e.g., engineering, accounting, sciences, law, and medicine) have great trouble even conceiving of how to go about holistic thinking, let alone understanding holistic thinking well enough to model it. But, even the most devoted analytic thinkers may slip into holistic thinking a time or two, when dating or buying a house or a car, for example. As Dr. Kosaku Yoshida says when illustrating the holistic approach: "When you go out on a date, would you evaluate whether your date has intelligence: 95 points; Appearance: 96 points; Emotional stability: minus 20 points? Do you evaluate your partner like that? If you get a date, turn off the light and get the smell and get the total understanding. You [are] not going to analyze. You're going to capture the entire feeling. That I call ultimate understanding." (transcript of the videotape *Made in Japan "Whole"-istically*, Petty Consulting/Productions, Cincinnati, Ohio, 1990, p. 11.) In holistic thinking, we strive for ultimate understanding. I believe a successful management process or engineering process requires holistic thinking through the holistic perspective and, therefore, ultimate understanding.

Have you ever ranked alternatives when buying a car or house or choosing a school to attend. You carefully list all the criteria important to your decision and even consider the relative importance of the criteria. By intuition or calculation, one car, house, or school clearly excels over the others. But you buy a different car or house or choose a different school instead, just because it feels right! Analyzing the date, car, house, or school doesn't work. You can't or don't list all the criteria and their importance. You don't want to admit a gadget in the car or the personality of the salesperson affects you. Or, for holistic thinking, you really aren't hiding anything from yourself; you just, in your heart, prefer a particular car.

Industrial engineers call the process for identifying, weighting, and ranking criteria multiattribute utility analysis. They argue that in complex evaluations you should decompose the object of your evaluation into more and more detailed parts. The assumption is that "the decomposition will lead to more accurate solutions than direct or holistic methods." (Young Jin Cho, *Effects of Decomposition Level on the Intrarater Reliability of Multiattribute Alternative Evaluation*, Dissertation at Virginia Tech, July 1992, p. 2.) The problem here is that we have to define what we mean by accurate. Cho describes accuracy as repeatability. How would you like to operationalize the idea of accuracy when you tell your date that holistic thinking is inappropriate and you rank him or her a six out of ten?

Consider an example of setting priorities for distributing limited funds to a wide range of waste clean up needs. The top government or company official for environmental management could turn off the lights (like in the Yoshida example) and come up with the priorities for the agency's or company's environmental management funding. That would be an holistic approach. He or she could either forget the analytic model for priorities or compare the results of the analysis to the holistic result. But, the top official's analytic-thinking constituents wouldn't accept the result of his or her individual holistic thinking. (The constituents drive different cars, don't they?) If any one constituent turned off the lights, he or she would come up with priorities somewhat different from the top official. So how can all the constituents collectively come up with holistic priorities? Not through an analytic model and not by tallying up all our individual results. The constituents need to come together and work as a group so they get synergy through the holistic perspective, and we get more for our environmental management money.

The way I know of for how to come up with priorities as a group is to bring everyone, or their representative, together who has a stake in the priority decision and collectively derive holistic priorities. That's the holistic perspective. So far, only the human mind can come to a conclusion with incomplete or missing data. The human mind can come to a gestalt with some criteria and importances clearly defined and others only in their hearts, undefinable. (I'll describe gestalt in the next module.) A group of human minds can consider things no analytic model can and the group can render a synergistic answer. So, we have to figure out how to effectively bring stakeholders together to come up with the best answer through holistic thinking.

I believe the holistic model requires human minds rather than equations, algorithms, or computers because only the human mind and heart can bring together and relate all the issues, characteristics, nuances, meanings, essences, alternatives, and importances needed for the holistic perspective. My understanding is that only humans can deal with soul. Animals can't; and computers certainly can't. (However, at a meeting I attended in the Netherlands, researchers from the University of Miami discussed computer systems with a survival instinct. At times like those, I'm glad I'm as old as I am.) The group of participating stakeholders must include everyone (or their representative) who will gain or lose by one alternative being selected or ranked over another. This holistic model allows the emphasis of perception over reality. Analytic models can't deal with perception. We must accept that in endeavors like environmental management a perceived barrier can be as effective as a real one. Until we include perception, we'll not get acceptable answers when solving environmental problems.

Consider a note here on how decision makers use the results of a model, whether it be analytic or holistic. The model results aren't answers, they're only suggestions. However, information is the difference between a guess and a decision. The decision maker will have to use holistic model results just like they do analytic model results--as input to their decision. The decision maker knows an analytic model's results are only as good as the variables and their relationships in the model, the boundary conditions, and the data put into the model. Likewise, an holistic model's results are only as good as the representativeness of the stakeholders thinking and feeling together, the data or information they have to work with, and the process through which they interact. The decision maker can use the holistic model as support for their decision just like he or she would use an analytic model. The decision maker can show the results of the model and describe the makeup of the model and how it works, describe the strengths and weaknesses of the model, and state the decision. The advantage of the holistic model duplicates the advantage of holistic thinking—synergy. Synergy is what you get when the holistic perspective is working. In synergy the whole is greater than the sum of its parts.

Deming uses the example of an orchestra. Each musician can play his or her part perfectly and the orchestra doesn't sound right. After much practice, the orchestra sounds better and better until one day the orchestra soars—

it's wonderful. On that day the orchestra achieved synergy. You can analyze the music and technique of each musician and all musicians together and never get synergy. Something you can't analyze, clearly hidden deep in the hearts and minds of the musicians one day clicks and you get synergy. The same thing is true with a basketball team or the cast of a play or movie. If the humans involved click together you get a championship or an oscar. Otherwise, you have an okay team or movie, but no synergy.

If we consider the holistic model to be getting the right human minds together to solve a problem, we need a uniform value system among participants and a vision for the group to build or implement the model successfully. For an analytic model, we need correct variables and relationships and we need accurate data for input. The holistic model tends to be qualitative or human—a meeting of the right people with mutual respect, good communications, a good process for participation, and a shared purpose. The analytic model tends to be quantitative—a computer with algorithms. If we use an analytic model to support decision making on the significant problems we face, 1) it can't incorporate a vision, 2) we'll spend more time than we have debating acceptability in criteria and importance, and 3) probably we'll never get data everyone agrees on to put in the algorithm.

The answer is to optimally blend holistic and analytic thinking and to trade off individualism and technology against unified values and management. Holistic thinking is in itself oriented toward this blend. The significant problems of today deserve a profound understanding of the harmonious blend of science and management.

1.1.27.5. The Holistic Perspective Includes Gestalt.

You use gestalt when you fill in the blank spaces and read between the lines to apply the holistic perspective.

Webster defines gestalt as "a structure, configuration, or pattern of physical, biological, or psychological phenomena so integrated as to constitute a functional unit with properties not derivable from its parts in summation." (*Webster's Ninth New Collegiate Dictionary*)

The idea of gestalt has been studied by psychologists as gestalt psychology and gestalt therapy and has been applied to organizations. Gestalt involves interactions among the parts of the whole that we don't understand. But, the key to gestalt is the interactions. The interactions are what makes the whole work, and most of all work synergistically. Likewise the holistic perspective must key on interactions, interactions among the minds, feelings, and perceptions of the stakeholders of the activity being managed. In the gestalt idea, you're dealing with characteristics and variables you can't put into words. You have to experience the system you're managing. That's why those who have experienced the system, in the whole, have the gestalt to help us apply the holistic perspective to the system.

Not only should we borrow from psychology concepts that help us learn about the holistic approach, we can probably borrow from other disciplines. Gestalt psychology has been around for years and getting information about gestalt psychology is relatively easy. Consider a more modern issue affected by gestalt. Consider the holistic perspective around the death bed. When sustaining body function for the terminally ill, hospitals today bring together the physician (technical approach), the lawyer (institutional approach), and the clergy (spiritual, or cultural, approach) to help the family make the holistic decision leading to removing the patient from life support systems. This subject is new, and getting information is difficult.

I'm going to ask you to do something in this paragraph. If you look ahead to the next paragraph for the answer, you'll destroy the fun. Look at Figure 1.1.27.5.1. What do you see?

If you said you saw a circle, you formed closure. What you really saw is a ring of ten dots. The principle of closure is a gestalt principle. If you sense something in incomplete form you'll give it closure (jump to conclusions, resolve the problem). In seeing a circle you've formed closure based on incomplete information. This is a strength of the human mind necessary for holistic thinking that if misunderstood can cause us to jump to the wrong conclusions (smell out the wrong date, car, house, or school). What I had in mind when I put the dots in the figure were opposing five-pointed stars. Now, does your mind form closure on the stars? Of course, what I had in mind was a more complex idea than a simple circle.

The Holistic Approach Requires Vision or Fundamental Philosophy

Part of the holistic perspective is establishing an overarching fundamental philosophy or aim of the system. Once we have a long-term philosophy we set a constancy of purpose so everything can follow the philosophy, including goals, objectives, priorities, and task specifications. In analytic thinking, we can't function without clear-cut objectives and detailed task specifications. The holistic perspective then asks us to first agree among all stakeholders on an overarching philosophy for the system—a philosophy for both the goals and the process of our management activities. A difficult requirement for using the holistic perspective is the need for ultimate understanding and for dealing with the logic of the informed. The significant value of this perspective is that holistic thinking focuses us on what is desirable, whereas analytic thinking puts acceptability first. Figure 1.1.27.5.2. illustrates the difference between the acceptability and the desirability concepts. (Yoshida, Kosaku, *Deming Management Philosophy: Does It Work in the US as Well as in Japan?*, Columbia Journal of World Business, Fall, 1989, p. 12.) In analytic thinking, anything inside a given boundary is acceptable. In holistic thinking the most desirable is the center of the area of interest. As we get farther from the center, the result is less desirable.

When common ground is limited, we reach for acceptability, not desirability. In a management system, when stakeholders have different value systems (cultures) we tend toward analytic thinking. Therefore, trying to get holistic thinking from people of different value systems is difficult. Analytic thinking supports science, individualism, and discovery. Science and discovery certainly are important for corporate goals. Holistic thinking supports management, consensus, and optimization. Management, consensus, and optimization are also important for corporate goals. For dealing with significant problems today, clearly we want to blend both holistic and analytic thinking in a situation where before our differences force us toward analytic thinking.

We don't have to define desirability precisely. A rough estimate will do. So defining the area's center is easier than precisely defining the area's boundary. When judging whether an activity is acceptable or unacceptable we define the boundary exactly and argue over the definition and whether the activity in question meets the definition. So a rough definition of desirability is not only easier, it's better. Furthermore, when we define exact boundaries, people will focus on the boundary and meet lower requirements.

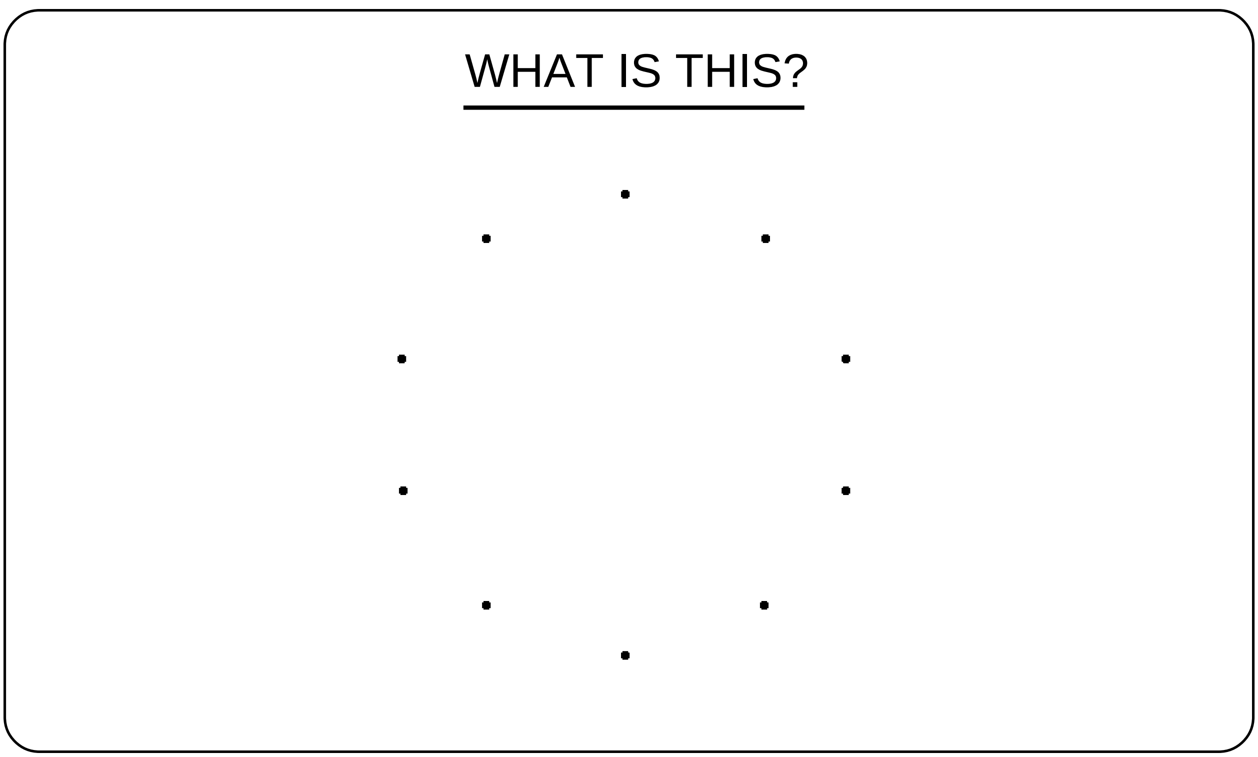

Figure 1.1.27.5.1. *What do you see in this figure?*

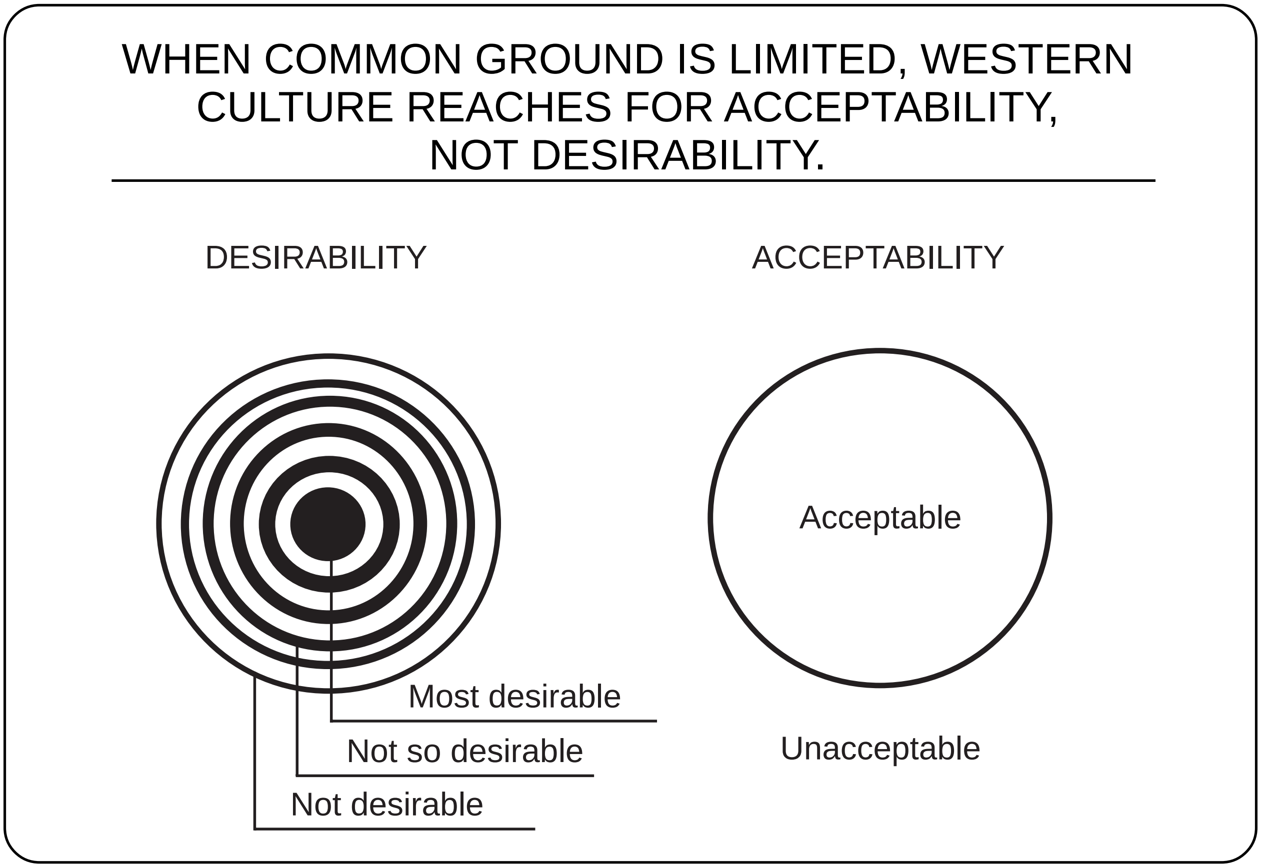

Figure 1.1.27.5.2. *When common ground is limited, society reaches for acceptability, not desirability. (taken from Yoshida)*

1.1.27.6. The Importance of Reading between the Lines—Japanese Art

1.1.27.7. DEFINE GENERALIST PERSPECTIVE

Mother nature is consistent.

How is a frog like a snowflake? How is poetry like mathematics? From the generalist perspective, the similarities are extreme. For example, I know that capacitors in electric circuits, radioactive decay, heat transfer, the propagation of muskrats, and the world population problem are really the same issue—at the heart of the matter. All of these things display exponential growth and decay. Once I understand the exponential character of one of these things, I understand the exponential character in all of them—only if I can make the leap from capacitors to muskrats. Isn't it interesting that Pareto developed a curve for income distribution that industrial engineers think is specifically suited for inventory analysis and Juran finds applicable to customers. The Pareto curve has become known as the 80-20 Law and means that 20% of your customers give you 80% of your business. Some years ago, I found that 20% of the engineering professors at Virginia Tech were responsible for 80% of the research funding in the College.

The generalist perspective makes the systems approach a learning approach. We can learn about management by applying what we know about the laws of nature and engineering analysis to management activities. Two such laws are the First Law and Second Law of Thermodynamics. The First law says we don't manufacture energy in our organization, we convert energy from one form to another. Max DePree says of the Second Law, "I am using the word 'entropy' in a loose way, because technically it has to do with the second law of thermodynamics. From a corporate management point of view, I choose to define it as meaning that everything has a tendency to deteriorate. One of the important things leaders need to learn is to recognize the signals of impending deterioration." (Max DePree, *Leadership is an Art*, Dell Publishing, 1989, pp. 110-111.). The only way to decrease entropy (chaos) is by putting energy into the system. The manager can decrease entropy in an organization by inputting energy.

Two examples of engineering analysis are the control loop for the dynamics of an organization and stress-strain diagrams for understanding strength of culture.

Because engineers are application oriented, they must think like a generalist. You want to bring the lessons learned from one application to another application. You don't want to start from absolute scratch for every problem you try to solve. Applying lessons learned from building one bridge to building another bridge is one level of the generalist perspective. Applying lessons learned in electrical circuit analysis to heat transfer is another level. Applying lessons learned in art and physics to management is yet another level. When you're dealing with this level, you're ready to see a frog in every snowflake.

Because engineers must deal with technology, they must think like specialists. I believe engineers experience specialist thinking during most of their education. Generally speaking, each course and professor offers to the student a set of tools representing one specialty that is advertised to be applicable to anything. Many people have their favorite tool and spend their lives searching for something to apply that tool to. The specialist perspective is just as important to the engineer and the manager as is the generalist perspective. I emphasize the generalist perspective because of my perceived vacuum in the background of engineering students.

A specialist has a tool in search of an application. A generalist has an application in search of a tool. The engineer must be both. Balance is the answer to everything.

A generalist builds bridges between disciplines and different ways of thinking. A generalist is good at metaphors and functional relationships.

To understand the generalist perspective, we can consider the act of generalizing. How do we generalize from a frog to a snow flake? "We say a finding has generality, or it can be generalized, if the finding holds in situations other than the one in which it was observed. By definition, then, generalizing always means extrapolating to conditions not identical to those at the time original observations were made..." (Alphonse Chapanis, *Some Generalizations about Generalizations*, Human Factors, 1988, 30(3), 253.)

From the article by Chapanis, I conclude that the key to generalizing one situation to another are the areas of similarity between situations or phenomena. We can generalize from a frog to a snow flake only in the way a frog is similar to a snow flake. Neither is made by humans. Both are affected by gravity. For widely differing situations, similarity is usually confined to qualitative measures rather than quantitative ones. The similarity, or dissimilarity, can be in origins, processes, characteristics, results, observer, purposes, and many more concepts. We can generalize within the concept where we find similarity. In short, a generalist focuses on similarities, not differences. Therefore, to a generalist, a frog is more similar to a snow flake than it is different from a snow flake.

I can remember times when I learned the most important lessons from the darndest places. In graduate school, I needed something different in my life, so I took a course on how to upholster furniture. Thirty years later I don't remember too much about the details of upholstery. But I do remember a lesson I learned. When you work on something, most of your effort makes the thing look worse. In upholstery, you strip the paint or stain, you tear off the covering, and you watch the springs fly in all directions. You take off the loose arm and nail back the missing part. Then the last little effort makes the thing beautiful. The lesson is that you have to persist through seemingly fruitless effort, or even seemingly destructive effort for a long time before you get to feel the joy of the effort coming together in a beautiful result. I'm sure farmers learn this lesson a thousand times over, but not in an upholstery course. I find that this lesson of upholstery applies to everything I do. I can generalize the lesson because the lesson is fundamental. The lesson applies both to engineering and management. The generalization often occurs as an ah-ha in discovering connections, as I described in Module 1.1.23.8.

Summing up the three perspectives

I've taken the traditional analytical approach to explain the systems approach, which is much more than the analytic approach. Therefore, I've kind of contradicted myself. The systems approach is holistic and I've divided and analyzed the systems approach. My only hope is that for people who aren't raised from childhood understanding the systems approach holistically, they can gain an awareness of what's involved in the systems approach. Also the three types of thinking provide skills for continuous performance improvement.

According to Webster, a perspective includes the capacity to view things in their true relations or relative importance. I believe this kind of perspective includes *all* perspectives. At the moment, I've identified three perspectives for the systems approach. When someone sees things from all perspectives, we say that person has their stuff together. Each thing they do or believe works toward their aim. (The system perspective includes an aim.) They have meaning in their life. (The holistic perspective includes soul.) They learn from each part of their life to improve other parts of their life. (The generalist perspective includes learning.) With the three perspectives taken together, they always learn from everything they do and everything they do plays an important role in their total life to reach their aim and to have meaning in their life. An individual is a one-person organization. An organization with more than one person can have its stuff together too.

1.1.27.8. What's the Difference Between a Specialist and a Generalist?

A generalist plows between furrows, while a specialist plows a furrow deeper. You need both to get the most out of the land.

To a generalist, there's not one right way to do a thing. There are any number of good ways to solve a problem. Sometimes we spend so much time and effort trying to find the absolute best way to solve a problem we don't end up with enough time and effort to use any one of the good-but-not-best ways to get that problem behind us and move on to the next problem. Depending on the application, you can find a solution that will fit the situation. You can't always optimize. Make one of the good ways work. Waiting to discover the optimum isn't always worth the time and effort to find the optimum. Simon says we often should satisfy rather than optimize.

A generalist looks between disciplines or crosses disciplines. I've always believed that plowing between the furrows is more lucrative than plowing the furrows deeper. The reason is that nobody's been between the furrows in a while, if ever. There's no telling what you'll find. But you better be prepared for anything and flexible enough to deal with it. My analogy is that a generalist plows between existing rows looking for fertile ground. The specialist plows existing rows deeper. Of course, you need both to get the most out of the land.

Jane Fraser describes the importance of generalists in solving today's significant problems. "What specialist can solve society's energy problem, the inflation problem, or the problems of the cities? ...These problems are simultaneously technical, economic, political, sociological, and ethical. Perhaps a team of specialists could do better than any individual specialist, but even a team lacks the perspective necessary to integrate specialized knowledge. We need generalists: people who can combine knowledge from many specialties into a comprehensive attack on a problem." (*In Respect of Generalists*, Research Memorandum 84-14, School of Industrial Engineering, Purdue University, 1988, p. 1.) The Three Mile Island and Challenger problems were only partly technical. To deal with those problems, we needed technical knowledge integrated with much more. We needed the generalist's perspective.

Jane Fraser expands the difference between specialist and generalist into a description of the generalist perspective. "But a specialist doesn't know just facts about his field, he has a point of view, a way of perceiving problems, methods for solving them, and an overall perspective. ...A generalist then is someone who can use concepts from more than one field. ...A generalist doesn't simply sum fields, he combines them. He is able to stand outside of, comment on, and combine his fields of expertise because he has a broader perspective that integrates the fields. ...A different type of generalist is someone who <u>challenges</u> the existing framework of knowledge by combining fields that haven't been combined before. If this kind of generalist is successful he becomes the first specialist in a new field. A generalist who combines economics and sociology creates the field of economic sociology or sociological economics. Indeed, the goal of such a generalist is to challenge the existing structure of knowledge, the traditions boundaries of specialties. ...The broadest type of generalist is someone who <u>ignores</u> the existing structure of knowledge. Sometimes there emerge people who combine such a large number of fields that they seem to be "super-generalists"; da Vinci is the obvious example. ...All these types of generalists have in common the trait of combining fields in a perspective that transcends any one of the fields. It is this trait of using a larger perspective that identifies the generalist in comparison with the specialist. ...The generalist provides something a specialist or a nonspecialist cannot provide, the integrating perspective. ...The generalist thus is valuable not just because he contributes new answers, but also because he asks new questions." (pp. 1-3.)

I believe the management systems engineer asks new questions and approaches the time-honored fundamental management questions with different insights in non-typical ways. The management systems engineer asks questions like, "What does the comparator in the control loop tell us about how to resolve bias in the information we get and bias in the way we use the information to make decisions?" The management systems engineer approaches the question of how to motivate people with the insight of how the principles of stress and strain affect strength of culture.

If we need more generalist thinking in management systems engineers, how do we put that thinking there? Jane Fraser answers by quoting J.M. Ziman's book, *Public Knowledge*, Cambridge University Press, 1986, p.62.) "It is much easier to join a specialty, and satisfy its cosy internal criteria (however tough these may be, in a strict professional sense) than to create interests embracing a number of these little villages of the mind... It requires a deliberate and intellectual effort to make an appraisal of a large science and to direct one's attentions towards serious problems that are not being studied by other people. ...Once generalist students are gathered, how and what should they be taught? Since a generalist knows many fields, a generalist education must be wide ranging. He must learn the concepts and perspectives of many fields. But being a generalist also requires integrating those fields." (p. 5.) The management systems engineering discipline strives to broaden the education of the student and to integrate both quantitative thinking and qualitative thinking to solve complex (or wicked) problems.

Finally, Jane Fraser answers the question of this module: How do generalists and specialists differ? "Generalists and specialists differ in their aesthetics of knowledge. A specialist sees the world as naturally organized into domains, but a generalist sees a whole with domains imposed by humans. They have different intellectual goals. A generalist gets pleasure from statements like 'this idea is similar to that one' while a specialist gets pleasure from working out the details of one idea. It may be that a certain personality trait, that of simply liking to make connections, is necessary for being a generalist. Or it may be that generalists are the people who worry about missing out on something exciting if they narrow their interests.

Because of this difference, generalists and specialists will tend to differ in the methods they use to create knowledge and in the types of knowledge they value. Understanding anything requires taking it apart, analyzing the working of each part separately, reassembling the parts into a whole, and finally understanding how the parts work together. Analyzers emphasize the taking apart and the detailed examination of each part; better understanding is gained by finer and finer decomposition until the smallest essential unit is reached. Synthesizers emphasize the connection of parts and ideas. Both analysis and synthesis are necessary for understanding and both generalists and specialists do both, but generalists tend to emphasize synthesis and specialists analysis.

Generalists and specialists also tend to emphasize different types of knowledge. Knowledge is the organization of ideas and theories that enables us to understand the world. Specialists emphasize the discovery of new facts and the creation of new ideas as the way to increase knowledge while generalists emphasize the creation of new links among existing ideas and the organization of existing facts and theories." (pp. 11-12.)

One of my objectives in this book is to illustrate how a generalist thinks. Not everyone has to think like a generalist. My point, and I believe Jane Fraser's point, is that the generalist will be an important player in solving the significant problems we face today. You will either think like a generalist or work with people who think like generalists. You need to understand where the generalist is coming from.

1.1.27.9. PARETO'S CURVE IS A UNIVERSAL TOOL

As generalists, we should be able to transfer the learning from Pareto's curve to almost anything, never forgetting the origin of the tool.

Pareto's curve is a valuable tool in total quality management. Both the Deming and Juran teachings include the lesson from Vilfredo Pareto. Juran talks about customers and knowing the customer as the first step in planning for quality. "One of the most critical classifications is that of *importance* of the customer. To respond to differences in importance we make use of the **Pareto principle**. Under that principle we classify customers into two basic categories:

1. A relative few ('vital few'), each of whom is of great importance to us.

2. A relatively large number of customers, each of whom is only of modest importance to us (the 'useful many')." (Juran, J. M., Juran on Planning for Quality, The Free Press, 1988, p. 26.)

Deming followers look to Pareto too. "[Pareto charts] are among the most commonly used graphic techniques. People will speak of 'doing a pareto' or say, 'Let's pareto it.' This chart is used to determine priorities. The pareto is sometimes described as a way to sort out the 'vital few' from the 'trivial many.' ..... In this fashion, pareto charts can be used to narrow down problems." (Walton, Mary, *The Deming Management Method*, Putnam Publishing Group, New York, 1986, pp. 105-106.)

Pareto didn't develop his curve for either total quality management or for inventory analysis. Vincent Tarascio describes what Pareto did. "Pareto found that the distribution of income for various countries tended to take the form of a particular curve when plotted as a cumulative frequency function. His income distribution curve, also known as 'Pareto's Law,' can be cast in the following statement: If we call N the number of income receivers having the income X or greater, A and (alpha) being parameters, then the distribution of income is given by the formula:

$$\log N = \log A - (\text{alpha})\log X.$$

The issue of whether this income distribution curve is a 'law' or not centers on the constancy of (alpha). Pareto found (alpha) to be relatively constant using statistical data available to him from such diverse countries as England, Ireland, Germany, Italy, and even Peru. Subsequent empirical studies by others involving different countries indicated (alpha) to have only slight average variations of value, and these were within statistical error. Today, this formulation applies to certain parts of the cumulative frequency function." (Vincent J. Tarascio, *Pareto's Methodological Approach to Economics: A Study in the History of Some Scientific Aspects of Economic Thought*, The University of North Carolina Press, Chapel Hill, 1968, p. 115.)

Figure 1.1.27.9. shows the graph Pareto had in mind. Plot the logarithms of income limits on the y axis. The x axis is the logarithms of income receivers. Alpha is the tangent of the angle OAB made by the line with the log x axis. One question is whether the tangent of the angle is the same for all applications of the "law." For example, does the 80-20 rule apply to everything? Or, is it the 75-25 rule?

Industrial engineers can't talk about Pareto without mentioning inventory analysis. In fact, Pareto never dealt with inventory analysis. But James Riggs uses Pareto in discussing inventories. "It is obviously uneconomical to devote the same amount of time and attention to inconsequential items and to vital supplies. This widely applicable concept has become famous as 'the Pareto principle,' named after the Italian economist Vilfredo Pareto. In simple terms, it says that a few activities in a group of activities, or a few items in a group of items made, purchased, sold, or stored, account for the larger part of the resources used or gained. Its application to inventory policy recognizes that a small number of production supplies accounts for the bulk of the total value used.

The division of inventory into three classes according to dollar usage is known as **ABC analysis**. The usage rating for each item is the product of its annual usage and its unit purchase or production cost.

The Pareto principle translated into general management functions concentrates on a few important tasks that should receive the most skillful treatment because those functions produce the most good in the organization." (Riggs, James L., *Production Systems: Planning, Analysis, and Control*, John Wiley & Sons, New York, 1987, p. 479.)

Consider the last sentence of Riggs' comments in light of the idea of bottlenecks. I'll discuss bottlenecks as a crucial management concern later. We deal with bottlenecks in critical path analysis for project management and in just-in-time for manufacturing.

We can consider Pareto analysis as a method for control in inventory management. "In the problem definition phase of inventory management, a technique is needed that will isolate those items requiring extremely precise control as opposed to those items that can be controlled with less precision.

In defining the inventory management problem, the recommended starting point is the application of Pareto's *Principle of Maldistribution*, which has been expressed as follows: 'Very often a small number of important items dominate the results while at the other end of the line are a large number of items whose volume is so small that they have little effect on the results.' ..... Many managers believe that an ABC analysis is the most rewarding study technique they have ever used. It can be applied, not only to inventory, but also to value engineering, sales planning, quality control, and cost estimating among other operations. (Killeen, Louis M., *Techniques of Inventory Management*, American Management Association, 1969, pp. 19-20.)

"It is rather apparent that extremely precise control of the A items will certainly yield great leverage on the inventory investment required to run the business. Conversely, precision control of the C items probably will not be worth the expense." (p. 26.) (Don't confuse the ABC analysis for inventory policy with the ABC Model in Section 1.3. for understanding how you spend your time.)

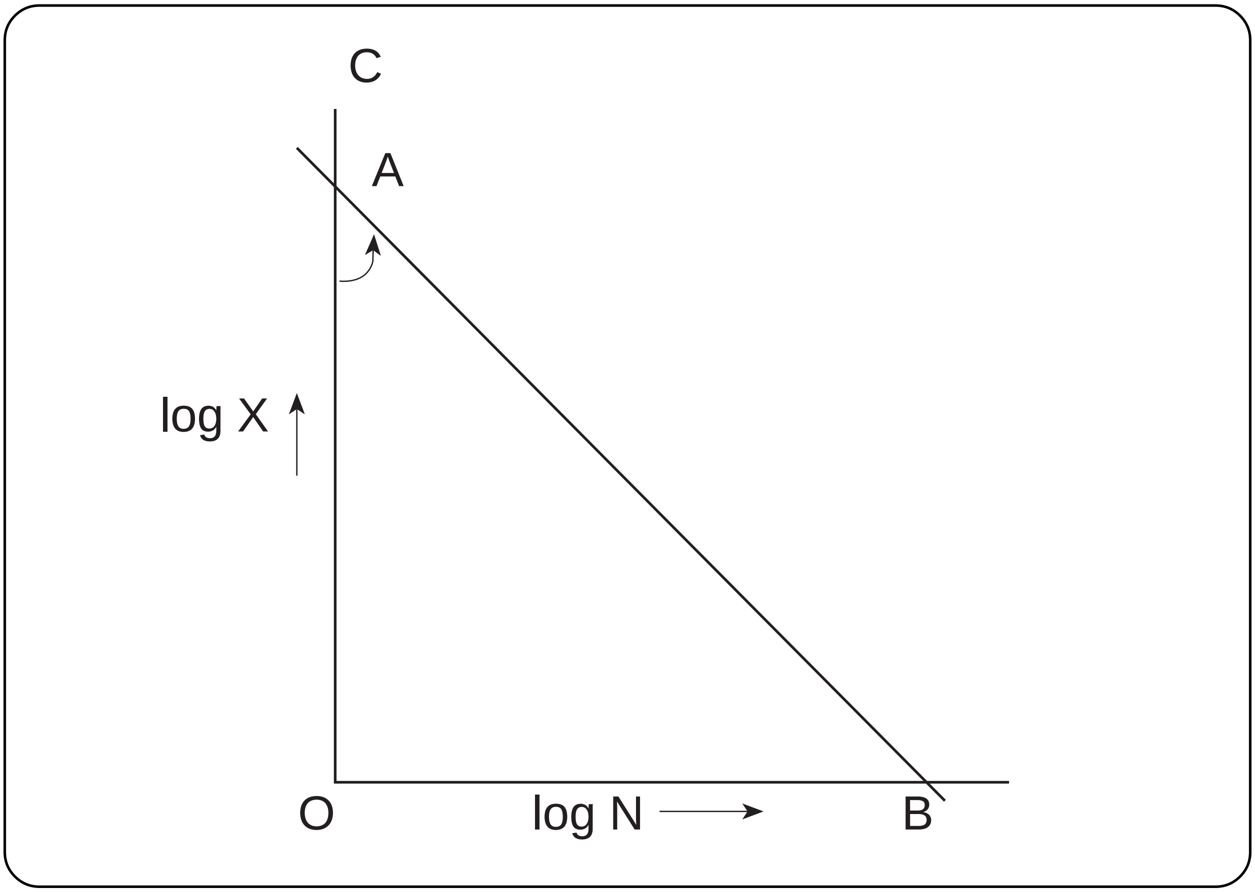

Figure 1.1.27.9. *Pareto's Law is really a straight line on log-log graph paper. We transfer what Pareto learned in income distribution to just about everything.*

1.1.27.10. BALANCE ART AND SCIENCE

1.1.28. Mother Nature is Consistent—Michelangelo, the Painter

1. Background

1.1. Introduction

1.1.29. Illustrative/ Conceptual Model

1.1.29.1. DESCRIPTION

The model for the management process framework is illustrative in that the model shows the ideas of the book and is conceptual in that the model embodies the concept of the management process.

I can argue that the model for the management process framework shown in Figure 1.1.29.1. isn't a conceptual model. The concept of the management process isn't fully cooked yet. We don't understand the management process like we know the process for the internal combustion engine or the process for converting mechanical energy into thermal energy. For those processes, we have conceptual models and we can write equations to represent all or parts of the conceptual models.

We'll understand the management process framework and have a conceptual model when we demonstrate that the model consistently and repeatedly can meet the purposes contained in the framework I'll discuss in the next module. Strictly speaking, in the meantime we have an illustrative model.

The model in Figure 1.1.29.1. does gather together the ideas for the management process framework I've described in earlier modules together and puts them into context with one another. This model is the closest thing we have to a conceptual model.

Figure 1.1.29.1. brings together the various models we've discussed for the organization and its performance and places them with the interventions to improve the organization and its performance together within the general framework of Figure 1.1.11.4. As an intervention-organization-performance path, the model has been called holistic construal. Figure 1.1.29.1. shows the combination of management system analysis and management system synthesis as the organizational model. Any of the alternate organizational models can fit in the center box in the figure. You use the organizational model(s) that's best for showing the relationship between the interventions you want to make and the performance criteria you're trying to affect. In previous modules, I've discussed a number of candidates for the organizational model. I haven't provided you with a complete set of organizational models. There are more. The problem with Figure 1.1.29.1. is that I can't stuff everything into the figure that rightfully fits into the picture.

Not only can we have more or different models in the organization box in the center of Figure 1.1.29.1., we can have a number of models in the performance box to the right. In previous modules, I've discussed a number of candidates for sets of performance criteria. I haven't shown you all there are. Figure 1.1.29.1. shows three of the candidates for performance criteria in the right-hand box. In building or using management tools as an intervention, you may want more than one model in the performance box.

In the left-hand box of Figure 1.1.29.1., you can see theory, tools and their guides, skills, and technique. The theory behind the tools and their use dictates what the intervention is and what it does. I've listed a couple of tools. The Gantt chart is a technical sort of tool, while the meeting is a human sort of tool. Also, I've listed a few skills. Two are skills in thinking I've discussed earlier. Communication is a multiple skill for behavior that includes reading, writing, listening, and speaking. I'll discuss communication later. Technique is defined by Webster as "the manner in which technical details are treated (as by a writer) or basic physical movements are used (as by a dancer); *also*: ability to treat such details or use such movements (good piano technique)." (*Webster's Ninth New Collegiate Dictionary*) Technique then involves both tools with their guides and skills and is something you develop through understanding and practice.

Figure 1.1.29.1. shows an example set of paths through the model. We can build and then use the Gantt chart tool. In building the tool we need all building management tool functions, but I've identified two key ones. First, we must know what information we need from the Gantt chart to support time-based decisions on project tasks. Second, we must know what data to collect and use in the Gantt chart to provide the best information for those decisions. I show the use of the Gantt chart in all three groups of using management tool functions described in Module 1.1.21.4. First, we use the Gantt chart in planning to set expectations about when we intend to perform tasks. We show the planned task duration as an open bar on a Gantt chart. Second, we use the Gantt chart in executing to gather status and progress data and show those data as a filled-in bar on the Gantt chart. Third, we use the Gantt chart in comparing status and progress against plan in verifying our performance.

I've shown the effects of the Gantt chart on the two building management tool functions and the three using management tool functions as dotted vectors in Figure 1.1.29.1. Also, I've shown as another dotted arrow the idea that developing data for building the Gantt chart affects how we convert data to information in using the chart.

When we verify performance using the Gantt chart, we're guided by and wish to affect the amount of time we spend on A, B, and C activities shown in the performance box. We also want to evaluate how the information on performance in the Gantt chart affects the schedule apex of the project management pyramid. I've shown these effects in Figure 1.1.29.1. as dotted arrows. I could show many more effects of the Gantt chart on other functions in the organization model or, either directly or indirectly, on the performance criteria in the performance box. I didn't show these additional effects because I didn't want more lines on the diagram.

To begin to link the path of the analytic thinking skill through the figure, I've shown a dotted arrow linking the skill to the exercising personal effectiveness function of the using management tools set of functions. By affecting personal effectiveness, analytic thinking will affect the reviews (or meetings) we conduct to verify performance. I haven't carried the effects of analytic thinking throughout the model because I didn't want more lines on the diagram.

In the grand strategy system research conducted by the Virginia Productivity Center and the Management Systems Laboratories, we put Sink's seven (or eight) fronts in the organization model box and the project management pyramid and Sink's performance factors in the right hand box. By using these models we focus on the project characteristics of that study. Interventions include things like affinity group meetings, personnel process flow charts, and framed credo statements.

In the managing through cooperation research conducted by the Management Systems Laboratories, we put the management process functions (as shown in the figure) in the organization model box and the ABC Model in the right-hand box. We use these models to focus on the process characteristics within a headquarters group and between field sites and the headquarters group in a government agency. Interventions include things like materials management information systems.

To improve a manufacturing situation at the shop floor level, I would put the management process functions in the organization box and Goldratt's criteria in the right-hand box.

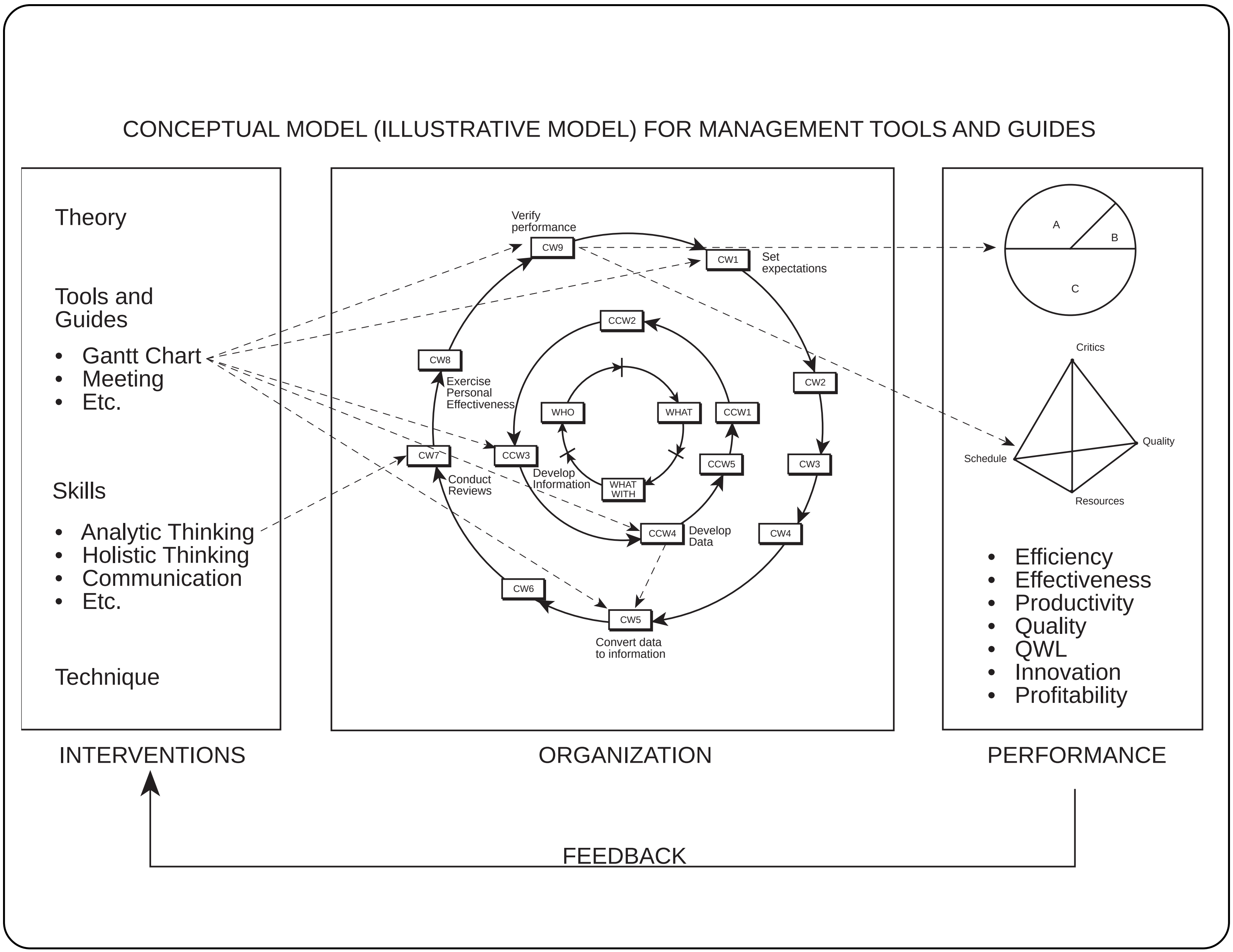

Figure 1.1.29.1. *The framework for the management process helps us determine the linkages between the interventions we make and parts of the organizational models and between these models and the changes in performance resulting from the interventions.*

1.1.29.2. Purposes of Models

To most effectively choose models for improving the organization and its performance, you must know what purpose you want the models to serve.

I'll describe five potential purposes for a model, each progressing to a higher level of contribution. Be careful not to combine too many purposes into a single model. Doing so complicates, and often reduces the effectiveness of, the model, especially for models you intend to serve higher levels of contribution. The management process framework model in the previous module has the problem of being very complex, or at least very cumbersome. That's why I've shown the submodels in the management process framework independently. I want to get the most power out of each model.

The first-level, and lowest-level, model is a descriptive model. The descriptive model describes what the system looks like. The Management System Model is such a model. When I use the illustrative model in Module 1.1.29.1. to show the context for modules in this book relative to the management process, the illustrative model acts as a descriptive model.

The purpose of a descriptive model is to describe something as clearly and completely as possible. A descriptive model usually identifies components and linkages in a system. In that we can't always be complete in complex descriptions, we often choose to highlight certain parameters in our description. As with all models, each of us needs to know the constraints or bias of the designer of the model before we know the applicability of the model. A descriptive model focuses on what the components and linkages are.

The second-level model is an explanatory model. The explanatory model describes how the parts of a system work together to get the output shown. When I use the illustrative model to show how the Gantt chart affects the management process functions which in turn affect performance criteria, the illustrative model acts as an explanatory model.

The purpose of an explanatory model is to show relationships in a system. Beyond showing that one component is linked, or connected, to another, the explanatory model shows how the component is linked but not the effect of that linkage or the input or output of the entire system being modeled. An explanatory model focuses on how the components and linkages work together in a narrative rather than an analytic way.

The third-level model is a prescriptive model. The prescriptive model shows you what to do to a system to get a given result. When you know what you want or must get, the prescriptive model prescribes what you must do to get it. When I use the illustrative model to indicate what tools or skills to use in certain functions to get a desired change in improvement in performance of the organization, the illustrative model acts as a prescriptive model.

The purpose of a prescriptive model is to prescribe certain cause to get a given effect. A prescriptive model focuses on inputs rather than outputs. The output is considered as fixed and the inputs are variable. Alternatively, we can consider how the components and linkages of a system can be adjusted to get the effects we want from certain causes.

The fourth-level, and very powerful model is a predictive model. The predictive model tells you what will happen if you do something to a system. The control loop is a predictive model. Of course, the control loop, which is more complex than the Management System Model, can be used as a descriptive model too. When I use the illustrative model to show what changes in performance will result from using a tool or skill in a certain way, the illustrative model acts as a predictive model.

The purpose of a predictive model is the inverse of that for a prescriptive model. The predictive model focuses on outputs rather than inputs. We're most used to predictive models. The predictive model predicts the outcome for fixed causes.

The fifth-level model is a normative model. The normative model tells you what the system should look like in the future. When I apply the illustrative model to a certain case, like the grand strategy system or the management through cooperation study described in the previous module, the illustrative model acts as a normative model.

The purpose of a normative model is more like a prescriptive than a predictive model. The prescriptive model focuses on achieving an output or result—something tangible or quantitative at the end of a process or the back of a system. The normative model focuses on achieving an outcome or future goal—something general or qualitative beyond the end of a process or the back of a system.

The disadvantage of the illustrative model is that the model is complex and takes many different forms and shows different faces. The advantage of the illustrative model is that I can use the model for so many different purposes. The purpose I serve depends on how I use the model.

1.1.29.3. THE ILLUSTRATIVE MODEL IN CONTEXT

The illustrative model is the structural part of the management process and, for anyone using the model, portends a continuous learning curve for the rest of their lives.

The control loop and the illustrative model for the framework of the management process show you the value of a descriptive model like the Management System Model (MSM). The simple MSM laid the groundwork for the more complex, more flexible, more powerful models. Now we have prescriptive and predictive models. Without the MSM, I at least would not have developed the other models.

I can use the illustrative model to follow the linkages of a tool, like the Gantt chart, through the intervention to organization to performance construal. The Gantt chart affects many functions in the organization, some of which I highlighted in Module 1.1.29.1. Knowing the effects of the Gantt chart on the organization, I can relate the needed skills to the building and use of that tool. Later, I can build an instrument to evaluate the organization to determine the relative need and the best use for that particular tool. I'll need the illustrative model and a series of frameworks I'll describe soon to diagnose the need in the organization and select the right tool to meet the need.

The illustrative model illlustrates the framework for the management process. To do the management process, you need more. You must live and breathe the systems approach. You must understand the fundamentals of management and of the laws of nature. You must fully understand the domain of responsibility representing the application. You must understand the rules governing the functions. (I'll describe the rules when I discuss using management tools.) You must know about a large number of possible tools and the associated skills so you can match tools with the need.

The illustrative model is probably the easiest part of the management process to understand. The systems approach is probably the hardest part to understand. The hardest part to do is scoping the domain of responsibility. If the domain is yours, scoping the domain is much easier than if the domain is someone else's.

Using the illustrative model and the management process it represents is a continuous learning process. The feedback loop applies not only to making better interventions based on changes in organizational performance, the loop applies to the increased knowledge of the user of the model. As you use the model in one application or for a series of applications, you'll develop an insight for what is most effective. As others develop better organizational models and better sets of performance criteria, you can improve the illustrative model. You must not only learn from your experience, but you must learn from the experience of others. To do management systems engineering well, you must continue learning about management and engineering for the rest of your life.

1.1.29.4. Example Use of the Illustrative Model

An example shows the illustrative model as an aid in understanding how interventions affect organizations and their performance.

To show how to use the illustrative model, I'll choose two different interventions to make in an organization. The more you know about the organization, the better off you are in choosing which models to use in the center and right-hand boxes in the illustrative model and in interpreting the results. Since I don't want to spend a lot of space describing an hypothetical organization, I'll work with my two examples for interventions as they might be applied to any organization. I won't describe the organization in detail and a summary won't help much.

I choose to look at the effects of 1) changing the organization's management information system and 2) rethinking the organization's mission/vision/principles statements. These two interventions are quite different. Changing the management information system is more physical in the extensive review, modification or building, and implementation of software and hardware as well as the change in procedures for using a different management information system. Changing the mission/vision/principles is more conceptual in the dealing with what the organization is, wants to be, believes in, and stands for.

I'll start with the management information system. The organizational model needs to emphasize the workings of the organization in terms of data and information. The performance model needs to reflect the reaction of the organization due to a change in the information available, either in terms of timeliness, accuracy, or relevance. Just having more information is counter-productive. We want all the relevant information, not just more information. When reviewing the organizational models in the earlier modules, I believe the nine functions of the management system synthesis cycle will emphasize the use of the management tool, which frequently and routinely converts data to information. I assume we have chosen the management system we want to change to. If we haven't, I'll need to include the five functions of the management system analysis cycle. When I do that, I can show interactions between the two cycles as I work on both building and using the management information system. The information-oriented performance models or frameworks are Sink's seven performance criteria and the project management pyramid. I'll use them both to see if either or both help me understand the effects of the management information system.

In Figure 1.1.29.4., I show the nine functions of management system synthesis at the top of the center box. I want to leave room for other models in the organization box to help me see the effects of rethinking the organization's mission/vision/principles statements. I probably also will find that the two interventions will affect one another; they will do so through the model(s) in the center box. My arrow from the management information system intervention should go directly to the converting-data-to-information function, since that's what the information system does. However, that function is linked to other functions as shown in the management system synthesis cycle arrows. I show both Sink's seven performance criteria and the project management pyramid at the top of the right-hand box. I may want another model for performance criteria when I look at the other intervention. I show several arrows from the organizing and presenting information function of the management system synthesis cycle to several of the factors in Sink's criteria. (I don't show arrows to all the criteria, because I don't want to clutter Figure 1.1.29.4.; however, I think about all the possible effects.) I show several arrows from the verifying performance function to the project management pyramid. I also show arrows from the project management pyramid to Sink's criteria. The advantage of the models and arrows at this point is to cause me to think through what the management information system will do to the organization and what I might look for to measure and see if the management information system really helps.

My second intervention is rethinking the mission/vision/principles statements. The organizational model needs to emphasize the workings of the organization in terms of what the organization is, wants to be, believes in, and stands for. The performance model needs to reflect the reaction of the organization to a new direction and new values. I believe the organizational effectiveness pyramid will emphasize the strategic and value-laden characteristics of this intervention. However, Kilmann's five tracks and Sink's seven fronts have culture-oriented components that would highlight these characteristics. I'll use the pyramid to represent those three models so I can keep the clutter down and because all pyramid apexes rotate around these characteristics. However, I'll include the planning process model because I believe that model will highlight linkages between the effects on the two different interventions on the organization. I'll use the critical success criteria in the performance box because of the strategic nature of those criteria and because of the linkage of the mission/vision/principles statements to the company's success.

In Figure 1.1.29.4., I show the organizational effectiveness pyramid and the planning process in the center box. I show arrows from the intervention to several of the apexes. I also show an arrow from the comprehensive planning apex to the setting expectations function of the management system synthesis cycle. How about other arrows between the two models in the middle box? I know most of the elements in the models are related. I want to think through the various options and show the more-significant ones. I show the critical success criteria in the right hand box. I show arrows from several of the apexes of the organizational effectiveness pyramid to those criteria and a few arrows between those criteria and the other performance models. I also show arrows from the planning process model to critical success criteria in the performance box.

Now look at the overall view of Figure 1.1.29.4. Do you see the interventions acting on the organization through its components as shown by the elements in the three models in the center box? If not, we may need more appropriate models or to think through the arrows (relationships) more. Do you get an idea of what to look for to see if the interventions are doing the organization any good? Do you get a feeling for how the interventions affect each other as they work on the organization? If so, you can make some decisions on how to sequence interventions.

There is no school solution to this example. The objective isn't to check the answer at the back of the book. The objective is to get some understanding of whether the interventions you plan are good ones and then to see if you can verify whether or not they are good ones and to get some understanding of how to sequence the interventions. The illustrative model is an aid. It isn't the school solution.

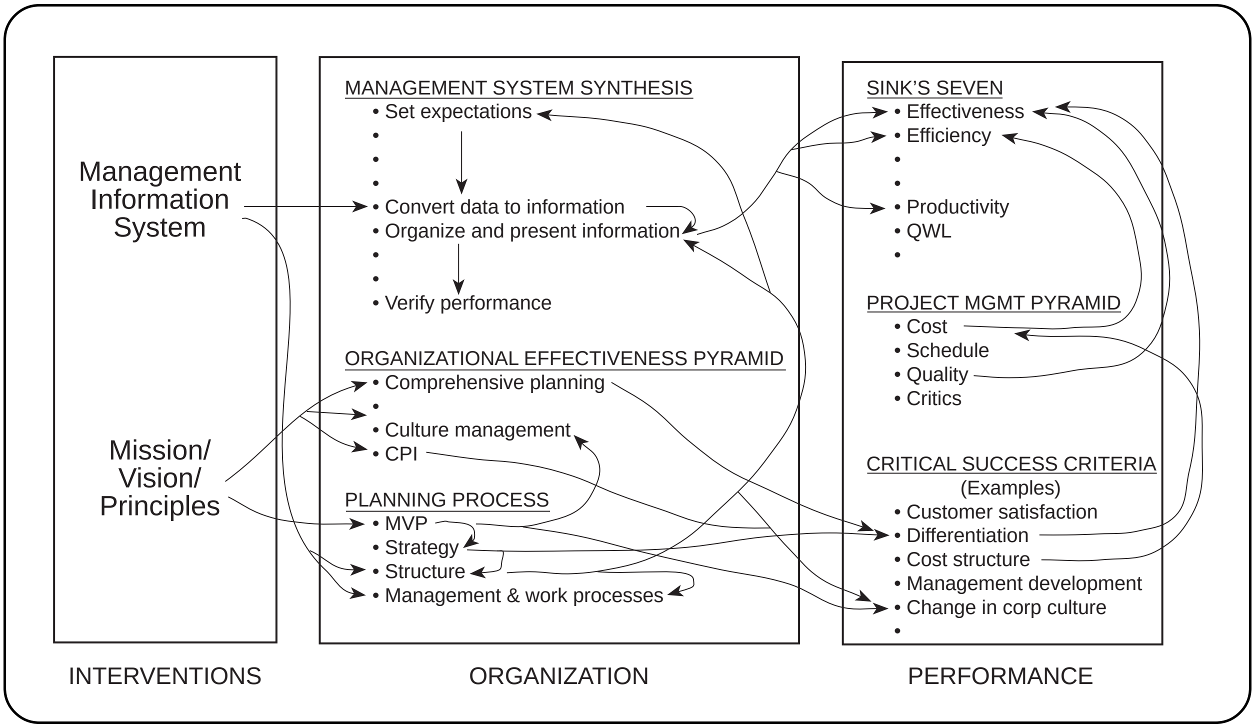

Figure 1.1.29.4. *The models and relationships shown for the example represent the kind of thinking you do as you use the illustrative model.*

1.1.29.5. Cyclic, Recursive, Reversible Characteristics of the Illustrative Model

1.1.29.6. THE DIRECTION

1.1.29.7. SUBPROBLEMS

1.1.29.8. Exercise on the Illustrative Model

You can trace relationships from interventions to components of organizational models to performance criteria for any domain of responsibility.

Explanation
The meeting is one of the most valuable management tools we can use for an intervention to improve performance in an organization. However, the meeting usually is one of the greatest timewasters in an organization. Therefore the meeting is a tool we need to apply carefully. I'll discuss different types of meetings and their use later. I'll also discuss how to improve meetings to make them more effective.

Situation Description
Sally and Bob graduated from Virginia Tech together five years ago. Sally, an engineering graduate, has been successful in technical sales for a major chemical company. Bob, a business graduate, has been an administrative officer for a small company.

Based on their success in working for others, they both wanted to go into business for themselves. They brought a small shoe store in Blacksburg, Virginia, close to their alma mater.

Bob and Sally agreed that Bob would invest 10% more than Sally and thus be the controlling partner in the business.

Sally does the inventory and customer end of the business and Bob does the purchasing and financial end of the business. Sally hired John to carry much of the day-in-day-out customer service. John has a flair for decorating and advertising.

Sally and Bob want to get their management started right. You've been hired as a management consultant to advise them.

Exercise
Start with the people involved in the shoe store. To communicate well and without ambiguity, they need to meet from time to time and discuss what's going on in the shoe store. Consider one or more of the sets of organizational criteria in Modules 1.1.23. and one or more of the sets of performance criteria in Modules 1.1.25. Describe or show the linkages from the meeting (a tool in the interventions box of the illustrative model) to the organizational model (in the center box) and from the organizational model to the performance criteria (in the right-hand box). Don't try to distinguish among the many different types of meetings the people in the shoe store could implement. Also, don't try to improve any meetings they may be having. Describe or show the linkages and then summarize your work by writing 50 words or less to Bob on what you might advise for meetings in his shoe store.