1.4.6. The Right Tools Are Like a Melody—Henry Ossawa Tanner

1.4.7. HISTORICAL BACKGROUND

1. Background

1.5. Tools and Skills Categories

1.5.1. Tools

1.5.1.1. YOU NEED THE RIGHT MANAGEMENT TOOL FOR THE RIGHT JOB

A good management tool in the wrong situation will fail. You need to make sure the tools you have fit you and your operation.

If you produce plans that sit on the shelf, maintain data in a milestone tracking or financial management system that doesn't seem to have the right answers, or wonder where expert systems are supposed to help you, you need to organize your tools, identify where each one works, and determine which tools are superfluous and which are missing. The Management System Model (MSM) places your management tools (what is used to manage) into a structured relationship for successfully meeting your goals and objectives in your domain of responsibility. I'll now concentrate on the management tools and how you can make them work for you and with each other. If your tools don't work for you, they'll work against you. If they don't work together synergistically, they'll work at odds with each other.

Many managers, as a hedge on the age of information, develop in-house automation support much like the person in Figure 1.5.1.1. He's one of the guys in the office who bought a home computer and developed expertise in playing computer games. Wanting to extend his capability, he put his home budget and even his bowling scores on his IBM computer using Lotus. After he came to the office and showed off his expertise, management put him in charge of all computer-based automation and/or information systems. The result, of course, is that everything he does uses IBM and Lotus, whether those are the right hardware and software or not.

For identifying, improving, or automating your information needs, you want a specialist who considers a wide range of alternatives and solutions. To help you, an automation specialist, or better yet an information specialist, (or better yet an information generalist), must be an expert in the bottom part of the MSM, including both the measurement/data and the information perception/information portrayal interfaces. One of the guys in the office isn't the kind of specialist you want developing and maintaining the tools that are going to make or break you. He or she should be managing his domain of responsibility and focusing on the decision/action interface in the MSM.

The profundity of the "make or break you" comment is clearer when you consider the relationships, communications, and coordination between domains of responsibility. Your domain is yours and those working for you and your peers have theirs and your boss has his or hers. Being a system means your domain is part of a larger system and has subsystems. All these systems link through the what is used to manage component. Most breakdowns are in communication and coordination within and among management systems. Thus, your information specialist will significantly influence your communication and coordination needs. He or she will influence the situation where most breakdowns occur and will develop and maintain the tools that are going to make or break you.

Typically, specifications for the measurement/data interface (where data is acquired) and the information portrayal/information perception interface (where information is presented) provide the starting point and ending point for management information systems design. Some designers start at the measurement/data interface in the MSM and work clockwise and

other designers start at the information portrayal/information perception interface on the MSM and work in the opposite direction. The point is that these interfaces are where you deal with your management tools—where they're interfaced and either do or do not properly reflect what you manage and your preference in management tools. Put the horse before the cart. You concentrate on who manages and what is managed and manage information specialists who concentrate on what is used to manage.

Figure 1.5.1.1. *"I can do for the plant's production what I did for Ted's and Mary's."*

1.5.1.2. MANAGEMENT TOOLS SHOULD MAKE INFORMATION, NOT HIDE INFORMATION.

Both aggregating and differentiating data make information, but differentiating data usually makes richer information.

The part of the Management System Model the manager knows most about is the most important yet is usually overlooked and neglected. As manager, you should focus on your operation and your interventions to improve your work process. No information specialist will know you, your operation, and your decisions and actions as well as you do. However, you tend to want to focus on the automation specialist's part of the management system because that part is better defined and allows for toys and fads. (Don't we all want to play with toys and fads as we can see in Figure 1.5.1.2.)

When managers want a computer on their desk for status or to play at being an information specialist, they're wasting effort on the wrong things. You want to focus on getting the right information from the information specialist to make the decisions you know most about. Spend your time thinking about what kind of information you need and whether the information is as rich as it can be.

By aggregating, averaging, or summarizing data to deal with the problems of overload, an information system provides bland, sterile inputs to the manager. We lose as much, or more information than we gain through aggregating, averaging, and summarizing. The tendency is to place excessive reliance on the computer, which generally reduces information in simplistic ways (e.g., aggregating it).

In fact, managers need far more sophisticated tools for reducing information; specifically, filtering tools that will systematically and carefully select the relevant facts from the mass of incoming data (e.g., not costs aggregated by quarter, but specific reports showing which costs are above normal and showing the reasons for the increases). The manager also needs help in pattern and trend recognition; he needs tools that will detect changes in streams of incoming data.

The best filters and pattern or trend recognizers are intelligent human beings. Presently, computer programs are not sophisticated enough to filter appropriately the rich array of data currently available to managers.

Before you know what kind of information you need, you must evaluate what you do with or to information. We usually think that we process information directly for decisions, actions, and/or assessments. However, much of what a manager does with information is better characterized as a different process. For example, many of you (especially if you are in a government agency) broker information, in that you receive it from someone else and pass it on to someone else. Especially if your organization is decentralized, you will be apt to be playing a broker role. You can generate information; adjust, update, re-create, or interpret it; manipulate it; or verify it.

I find that for many government offices, 80% of the time is spent on responding to communication brush fires and the budget cycle and 20% is spent on monitoring and managing milestones and program progress and providing overview technical input. Thus, it's more important to automate the 80% than the 20%. Lucky for us, the 80% part is easier. Working on the 80% yields bigger dividends which can

be reinvested in the 20%. We find most people want to work on the 20% because it's more exciting—but because of the 80% you never get to take advantage of the advances made on the 20%.

As information flows come into your domain, there should be a use of the information. Information is of value only if someone does something to or for someone as a result of the information. Who does what to or for whom as a result of information? If you don't define what the information is to be used for, you shouldn't commit the resources it takes to obtain and maintain the data from which the information is to be made—or more likely information is not to be made.

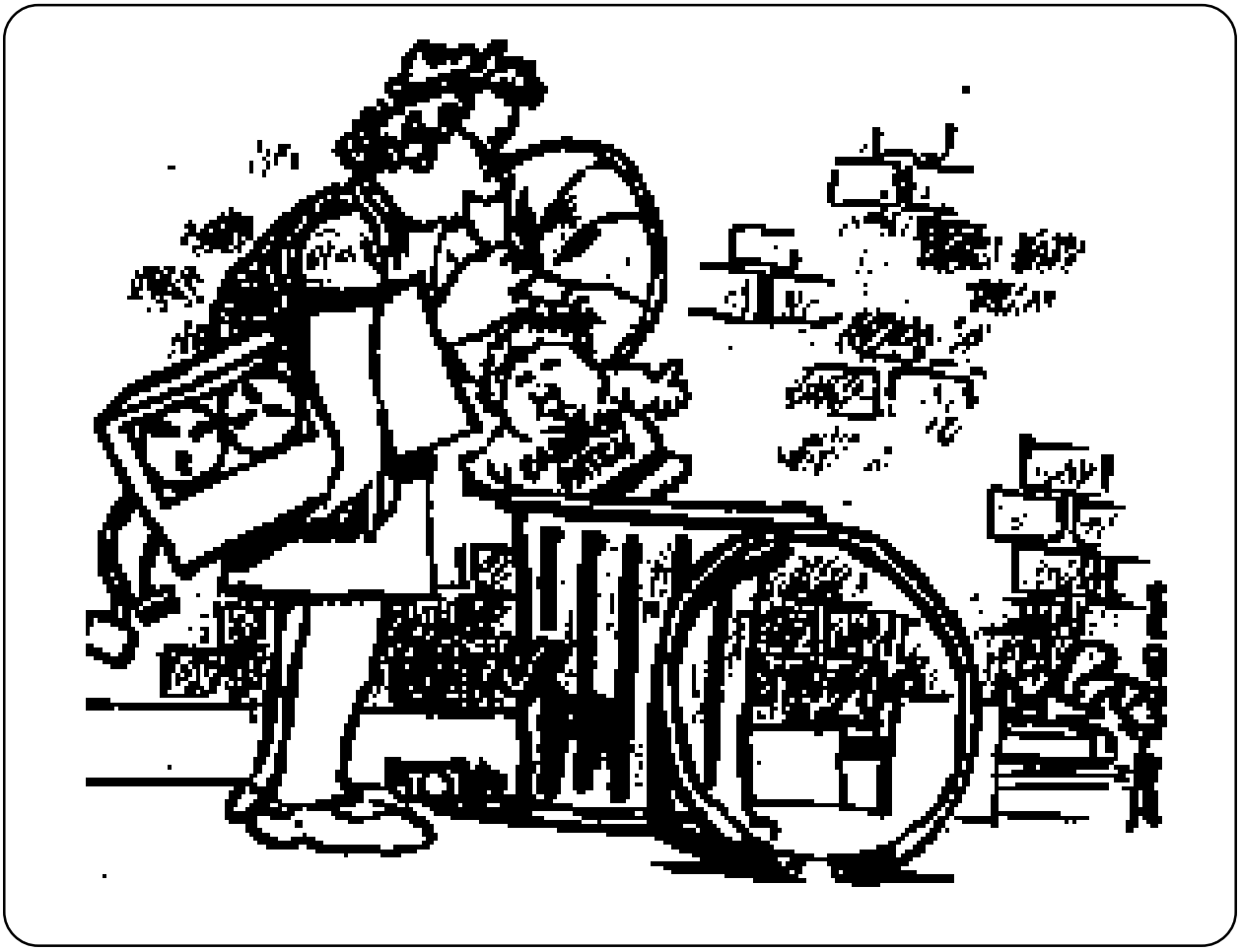

Figure 1.5.1.2. *Toys and fads, even if they're electronic, end up in the trash. That's not what you want to devote your effort to.*

1. Background

1.5. Tools and Skills Categories

1.5.1. Tools

1.5.1.3. The Management Tools

1.5.1.3.1. You Use Five Groups of Management Tools

1.5.1.3.2. Management Tools Convert Data to Information

1.5.1.3.3. Relationships and Structures Help Link the Elements of our Work, Including Other Management Tools.

We use structures to help keep track of our relationships.

Elements of our work, including people, materials, capital, tasks, decisions, customers, products and services, information, and other elements link both with like elements and with different elements. People link with capital through the organization's pay structure. Capital links with other capital through the organization's chart of accounts. People link with other people through the organization structure. People link with tasks through work definition and job descriptions. Tasks link with other tasks through the work breakdown structure. The linkages are the relationships; and the structures are the tools we use to make sure we have the right relationships. We use structures to make sure we don't have counterproductive gaps and overlaps in our relationships. Both the relationships and the structures that help us organize the relationships convert data to information to support decision making.

We can structure tasks or activities through both a work breakdown structure and a work flow chart. The work flow chart looks like a process diagram shown in Figure 1.1.16.5.3. The work flow chart captures precedence and dependence. The chart shows which task(s) must go before and which task(s) must follow any given task in the work flow. The given task depends on the result of the preceding task and the succeeding tasks depend on the result of the given task. When you work on a task, you need to know whom you're depending on to get your job done and who is depending on you to get their job done.

The work breakdown structure (WBS) looks like the diagram in Figure 1.5.1.3.3. This example of structuring the work needed to build an outhouse was taken from *An Introduction to Project Planning* by Jack Gido (Industrial Press, Inc, 1985, p. 9.). The WBS is defined in the *Goddard Space Flight Center Handbook for Preparation and Implementation of Work Breakdown Structures,* "The WBS is a basic management technique which presents systematically subdivided blocks of work (program, project, contract, etc.) down to the point which represents the lowest level of controlled effort (i.e., the lowest level at which the project office plans to maintain routine surveillance). It is a product-oriented family tree composed of hardware, software, services, and other work tasks. It results from systems engineering and management planning processes and completely defines the program/project. A WBS displays and defines the products to be developed and relates the tasks to be accomplished to each other and to the end product. Blocks of related and consistent work effort form a branch of the structure." (Daniel D. Roman, *Managing Projects: A Systems Approach,* Elsevier, 1986, p. 131.)

You can use a WBS for any pursuit. Obviously, the WBS is better defined for those pursuits for which we know the end and therefore can better distinguish all tasks needed to manage the pursuit. For uncertain pursuits, the tasks in the WBS become assumptions to be adjusted as work on the pursuit progresses. Notice that two of the pursuits—programs and projects—are called out in the Goddard definition. A program has only a qualitative fix for the end, whereas, the process has a well defined end. Therefore, expect the WBS to work well for a process too.

Harold Kerzner specifies the hierarchical levels in the WBS. In his definition of WBS, Kerzner stresses the idea that the WBS helps us cover gaps and overlaps in task identification and responsibility by accounting for every task. "The work breakdown structure acts as a vehicle for breaking the work down into smaller elements, thus providing a greater probability that every major and minor activity will be accounted for. Although a variety of work breakdown structures exist, the most common is the six-level indentured structure shown below:

Level	*Description*
1	Total program
2	Project
3	Task
4	Subtask
5	Work package
6	Level of effort

Level 1 is the total program and is composed of a set of projects. The summation of the activities and costs associated with each project must equal the total program. Each project, however, can be broken down into tasks, where the summation of all tasks equals the summation of all projects, which, in turn, comprises the total program. The reason for this subdivision of effort is simply ease of control. Program management therefore becomes synonymous with the integration of activities, and the project manager acts as the integrator, using the work breakdown structure as the common framework." (Harold Kerzner, *Project Management: A Systems Approach to Planning, Scheduling, and Controlling*, Van Nostrand Reinhold, 1984, pp. 553-554.)

Some structures break things down, others add things up. The WBS breaks the work down into smaller elements. The WBS is analytic, like the diagram in Figure 1.1.16.1.1. A chart of accounts—another structure, which shows relationships among the financial accounts in an organization—tends to add things up. The chart of accounts reflects synthesis like the diagram in Figure 1.1.16.1.2. However, in the chart of accounts, we break accounts down so we can add them up. The work flow diagram also looks like it breaks things down so we can add them up also. However, the work flow diagram is more holistic than just a combination of analysis and synthesis. That's why Deming would prefer a work flow chart for an organization chart.

The WBS looks like a typical hierarchical organization chart—a structure we're all more familiar with. The hierarchical organization chart links people through an hierarchy in the organization showing accountability and reporting. We can link people for decision making by using a data flow diagram. For computer specialists, we use the data flow diagram more to link conversion processes in the organization. We can also use the data dictionary to link data and information for decision making.

I do goal-oriented WBS to promote problem solving (making a connected series of related decisions). The goal-oriented WBS links organizational goals and objectives to the organization's aim. The goal-oriented WBS also links activities and tasks to goals and objectives. In this way, the WBS can be used for any pursuit or for any domain of responsibility containing a spectrum of pursuits.

I've mentioned a large number of management tools in the category of relationships and structures. I've only described one in some detail—the WBS. You're familiar with the hierarchical organization chart. I'll describe the other tools in later modules.

To summarize, we need to link many elements in our domain, including people, tasks and activities, decisions, data and information, fi-

nancial accounts, products and services, customers, and many more. These relationships guide us in how a decision about one element affects another element. The structures help us account for everything we need to keep track of. I can think of at least five types of functional linkages: 1) precedence, like a flow chart; 2) hierarchy, like the WBS; 3) partition for showing and relating the parts of a whole; 4) holistic relationships, like similar beliefs and aims; and 5) demographic, like similar gender, job description, material requirements and so on.

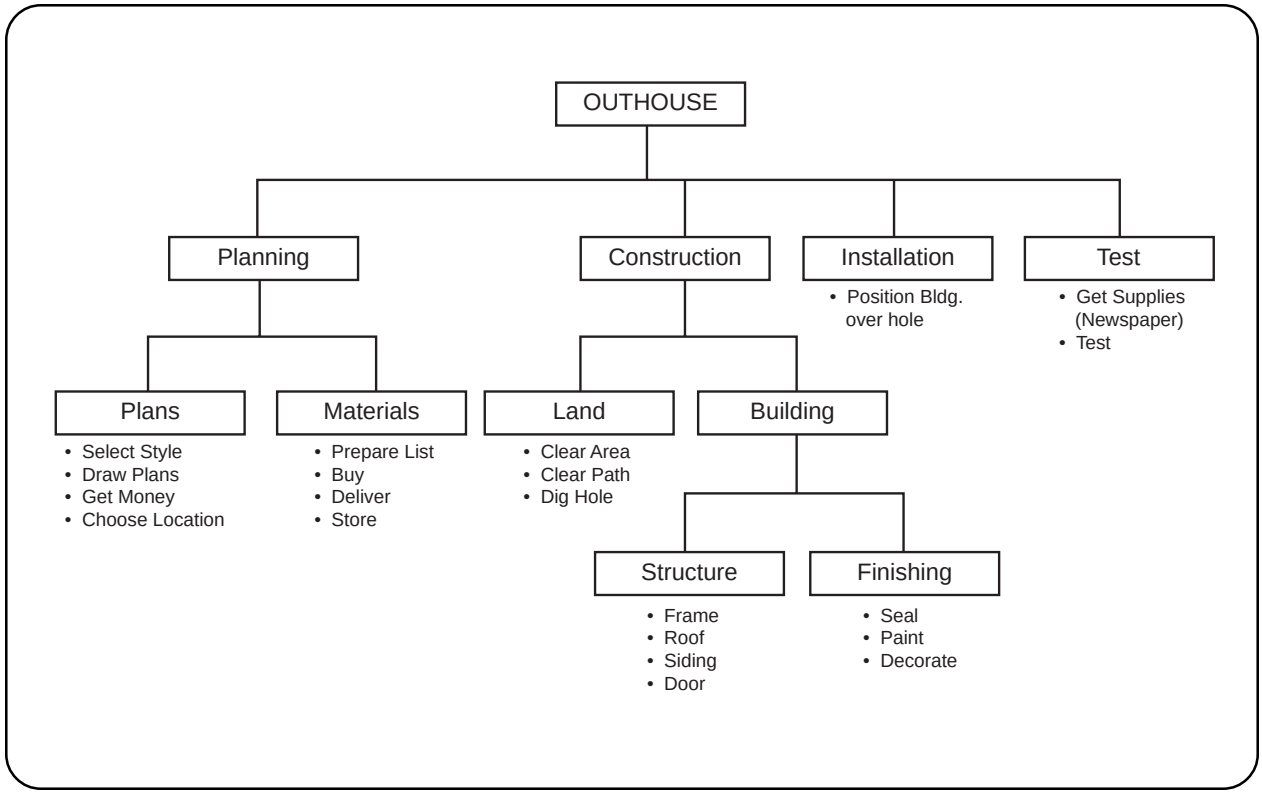

Figure 1.5.1.3.3. *The work breakdown structure is a graphic technique for dividing the project into related tasks. (taken from Jack Gido).*

1.5.1.3.4. METHODS SUGGEST SOLUTIONS FOR THE DECISION MAKER TO CONSIDER.

As a method, even the expert system can only develop a solution for consideration by the decision maker.

Whether the method you use to manage is a quantitative model, paperwork, rule of thumb, or expert system, you look to the method for a suggested solution based on the assumptions and limitations inherent in the method. As a manager, you compare your intuitive solutions (based on your mental model) and judgment to the method and either agree with the method's solution, adjust your intuitive solution, or question the method by adjusting constraints or quizzing alternatives.

Operations Research (OR) models are methods tools. An expert system (ES) is another one of the methods tools. I'll describe the expert system as an example of the methods category of management tools. In the management tools classification, an ES is in the methods category and the management information system (MIS) is in the data-to-information chain category. With other tools and other categories of tools, ES and MIS can work together to provide a decision support system (DSS). The manager selects the best combination of management tools from available alternatives to make up a DSS.

I've taken much of what I say in this module from a paper in an international conference comparing expert systems to operations research tools. Operations research tools are another type of management tool in the methods category (Kurstedt, H.A. Jr., "Responsive Decision Support Systems: A Broad View Illustrates When to Include Expert Systems," *Expert Systems & Artificial Intelligence in Decision Support Systems of the Second Mini Euro Conference*, 1985, pp. 53-77.)

The expert system bridges the gap between heuristics and quantitative models. Once the line of reasoning can be structured and automated, the knowledge engineers feel the system no longer is classed as an expert system. Thus, what is called expert system is continually changing, and describing what constitutes an expert system is difficult.

The standard definition for an ES places the ES within the body of a computer. I don't. An ES replicates an expert's knowledge of facts and rules for generating new facts or hypotheses from what is known. For an ES, the facts and rules are applied to a limited, well-defined domain of responsibility. The ES is structured so it can lead a machine or clerical person toward intelligent advice or an intelligent decision about the operation of the domain. The ES allows the user to repeat and identify the line of reasoning by which the advice or decision was reached.

The domain of responsibility can be considered relatively either a closed or open system wherein the closed system has little or no interaction with its surroundings (environment). Expert systems are not appropriate for open systems and should not be applied where models work. Quantitative models bridge the closed-system/open-system gap, and heuristics are most valuable in open systems. Heuristics are redundant to more precise methods in closed systems.

I frequently use a deterministic logic chart as an ES to capture an emergency manager's line of reasoning and action in responding to an

unusual occurrence. The logic chart details the flow of response actions that the emergency plan elaborates. By documenting the step-by-step progression described by a person who is an expert in responding to a particular type of emergency, I enhance training, employ intelligent automation, and clarify the place each tool occupies within the emergency management system. Each logic chart is designed to identify potential gaps and overlaps in emergency responsibilities and response actions.

The ES is different from the other methods in that it replicates an "expert" and can regurgitate its inferences and line of reasoning. The ES includes and is the natural extension of automation techniques developed since the beginning of the century. A speller and a manufacturing line operator are expert at more operational-level endeavors. A physician and crisis manager are expert at tactical- or strategic-level endeavors. However, all these examples develop their expertise through learning, experience, and habit learned through repetition. The examples also apply that expertise using intuition and judgment. The ES includes both a problem-solving ability and the ability to adapt to the situation. The problem-solving ability achieves high levels of performance on problems that normally require years of special education and training for human beings to solve.

The ES may or may not employ reasoning based on probability. Without probability, the chain of reasoning has the force of logic. With probability, we can't guarantee that the conclusions are repeatable or are necessarily true.

Within the methods category of the "what is used to manage" component of the MSM, I include (in sequence of decreasing definition and repeatability and increasing requirement for the manager's judgment) quantitative models, expert systems, and heuristics. If any algorithmic solution will work, expert systems are inappropriate.

What's the difference between OR, ES, MIS, DSS? OR and ES are methods. MIS is the data-to-information chain. DSS is all categories of tools working together. Which is more inclusive? DSS.

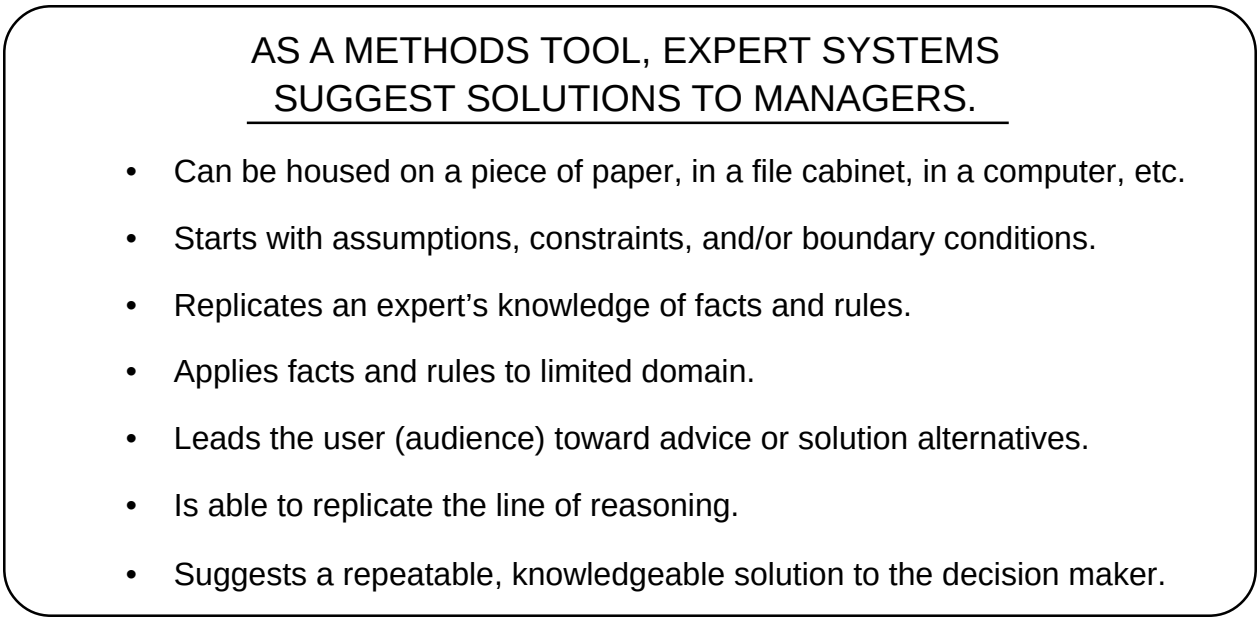

Figure 1.5.1.3.4. *By tracing logic based on facts and rules, we can derive good advice and solutions depending on the appropriateness of the constraints in the facts, rules, and logic, and of the fit to the limited domain.*

1.5.1.3.5. GUIDES AND RULES EVEN SUPPORT OTHER MANAGEMENT TOOLS.

Guides and rules guide or direct you in doing your work and management process.

I'll first separate guides from rules. Webster defines a guide as "one who leads or directs another in his way." A guide tells us what to do, either in general or in specific terms, as we work to accomplish something. A guide implies that somebody has either conceptually (as in planning) or physically been this way before and they have the map in their mind on where to go and what to watch out for. Guides include tools like policies, plans, procedures, and instructions.

We use a guide when we open up the box with our new VCR in it. There's a user's manual in there that tells us what to do. The user's manual may be as important as the VCR. If the manufacturer didn't work so hard to make the VCR fool proof, those people who never read their user's manual before using the VCR would at best break the VCR and at worst kill themselves. One thing we haven't made foolproof is how to set the clock on the VCR. Only those that use a guide like the user's manual or a friend who knows what they're doing can figure out how to set the clock. Unfortunately, not all guides are well made; and some of us can't figure out how to set the clock even with the user's manual.

Keep in mind the importance of the guide for any tool. When we build a management tool, we'll always need to build a guide to go with the tool to lead or direct the user of both the operations tool mechanization for the management tool (if the management tool is mechanized) and for the management tool itself. The success of a management tool is directly tied to the quality of the guide.

Webster defines rule as "a prescribed guide for conduct or action," as "a usually valid generalization ..... a regulating principle," and as "the exercise of authority or control." A rule is like a guide but is more conceptual, more directive, and broader. Rules include laws, orders, directives, and norms. Norms are unwritten rules, like "Don't belch at the dinner table." Norms, by the way, tend to be culture driven.

Rules tell us how to build or use a management tool. One rule I'll stress in my discussion of using management tools is to pay attention to detail. Another rule is don't lose the forest for the trees. Both rules are important. You'd expect to follow each of the statements in a guide carefully. Rules point you in the right direction. Since rules aren't specific and are sometimes conflicting, you have to figure out how to balance the rules.

Figure 1.5.1.3.5.1. shows where each of the guides I listed earlier (policies, plans, procedures, and instructions) apply. Policies give general direction and allow a lot of discretion so the manager can use their experience and intuition to deal with broad endeavors. Figure 1.5.1.3.5.2. highlights the difference between a policy and an instruction. The executive at the desk has a previously-developed corporate communications policy to guide the communications systems throughout all plants, geographic locations, and divisions of the company. The policy is written so the plant manager, area executive, and division head each can meet the communications needs of their domains and also can be consistent with the corporate needs. But, in Figure 1.5.1.3.5.2., the executive is faced with a clerical endeavor.

He has to dial his phone and the new phone system was installed just a few hours ago. The executive doesn't have time for the user's manual for the phone system. He needs a list of detailed steps to carry him through making a phone call. He needs instructions. The corporate policy or the procedure in the user's manual isn't the right tool. From Figure 1.5.1.3.5.2., we can see there's a connection between type of guide and the endeavor we're doing. We want instructions for doing a clerical endeavor. We want policy for doing a strategic endeavor. Notice that the president (often referred to as a strategic-level position) is doing a clerical endeavor. The tool he needs isn't a function of position; it's a function of endeavor.

In Figure 1.5.1.3.5.1., I show instructions as the right guide to help a manager accomplish a specific job (like call home) through direct action (like dial the telephone) in a clerical endeavor. Unlike a policy for general direction, instructions are a guide designed to make sure that no matter who follows the instructions, they'll end up with exactly the same effort leading to exactly the same result.

I've shown my favorite example of a rather ineffective set of instructions in Figure 1.5.1.3.5.3. Those of us who have children know that when you give your child a bicycle for the holidays, you don't buy a bicycle, you buy a box of parts and a set of instructions. In theory, no matter who follows the instructions, he or she will assemble the parts in exactly the same way, use each and every part properly, and end up with the exact same result. The humor in the figure is that instructions in boxes of parts for children's toys never seem to give you any result at all let alone the same result as anyone else, especially if you follow the instructions exactly.

Writing good instructions is harder than you think. Try to write instructions for how to tie your shoe. Then give the instructions to a friend and have him or her follow the instructions to the letter and see what you get. Consider the fact that if you were writing instructions for a robot to tie shoes, each of your steps in the instructions would have to be perfect and the steps would have to work together perfectly. Your friend may not follow your shoe tying instructions exactly because they have intelligence and they probably knew how to tie their shoes before you tried your experiment.

Tying your shoes isn't so critical a job that bad instructions spell disaster. Consider instructions for the guard at the road intersection during an evacuation from the scene of an emergency. As different guards stand their shifts, each must do exactly the same thing and get the same result and the result must be what is needed.

Figure 1.5.1.3.5.4. shows the top manager at a government facility coming to an emergency exercise. An emergency exercise is a methods management tool to simulate a real emergency to see if the emergency organization, plans, communications, and so on work. The top manager has brought with him the guides he's worked so hard and spent so much money to develop. I was the person who helped that manager build the guides he has under his arm. They are the emergency preparedness policies and the emergency response plans for the government site. The problem he and I faced that day was that the guides he brought didn't work. On that day, I figured out Figure 1.5.1.3.5.1.

The emergency exercise is largely an operational endeavor, or better stated, the manager did mostly operational endeavors during the exercise. Or even better stated, the endeavors the manager did for which we could pre-prepare management tools were mostly operational endeavors.

The manager had to figure out what the problem was almost instantly. So much for strate-

gic endeavors. When he figured out the problem, he used his instinct, experience, intuition, and the emergency preparedness policy. Since he was the strategic-level manager, he knew the policy he needed by memory. (The larger value of the policy comes later.)

The resources either were available or they weren't that day. So much for tactical endeavors. The emergency response plan had long ago seen to it that the needed resources either were or were not ready.

What that manager in Figure 1.5.1.3.5.4. needed most and didn't have was a set of procedures. Procedures for notifying people. Procedures for moving people into and out of buildings and areas. Procedures for public information. Procedures for medical assistance. Who would ever have thought that the top manager would need mostly tools for doing operational endeavors? That's why we have exercises—to find out what we thought wrong.

An interesting point in the emergency preparedness story is that you can't develop good procedures until you have a good policy and good plans. That's the value of having a good policy. You need the policy to get good plans and procedures. We had done good first steps in preparing policies and plans. We just hadn't finished the job. We needed good procedures. In Figure 1.5.1.3.5.1., I show policies as the appropriate guide for strategic endeavors, plans as appropriate for tactical endeavors, and procedures as appropriate for operational endeavors.

In the right hand column of Figure 1.5.1.3.5.1, I show how we should evaluate the guides. If you will, the policy is a mechanism that relates the plans. In my emergency management example, we needed plans that carried the emergency preparedness policy toward specific responses. The plans needed to work together within the policy and we needed plans for all aspects of the policy. Likewise, the plan is a framework for procedures. Often in plans that deal with objectives and resources, the procedures are in an appendix.

My second column in Figure 1.5.1.3.5.1. is also important. I show goals as qualitative accomplishments. There should be any number of ways to accomplish a goal, and the goal is a broad result. Objectives are quantitative. We can specify an objective and what's needed to reach the objective. Webster defines mission as "a specific task with which a person or a group is charged; a definite military, naval, or aerospace task." I see a mission as task oriented. We meet a mission successfully when we solve a problem. However, in meeting our mission, we may not have reached either our goal or our objective. We may not have solved the exact problem or used our resources right in solving the problem

I know you can find references showing the words in the second column of Figure 1.5.1.3.5.1. in other sequences. Some people like to have objectives as more general than goals. Other people see the mission as the overarching umbrella above everything. I'm not as concerned about the words as I am the concepts. Call what is met or accomplished a duck, chicken, and turkey. What's important is that at the strategic level, we need qualitative direction; and, at the operational level, we need specific, task-oriented direction.

The third column in Figure 1.5.1.3.5.1. ties the endeavors and guides to the types of effort we work on. We need policies for whatever pursuit we engage in. We need policies for processes just as we do for perplexities. Plans help us with activities.

The word plan is both a noun and a verb. In Figure 1.5.1.3.5.1., the word plan is a noun. We plan (the verb) when we develop policies, procedures, and instructions just like we plan when we develop plans.

THE RIGHT GUIDE LEADS THE RIGHT ENDEAVOR TO THE RIGHT ACCOMPLISHMENTS.

Level of Endeavor	What is Met or Accomplished	Type of Effort	Guide	Evaluation for Guide
Strategic	Goals	Pursuits	Policies	Relationships of Plans
Tactical	Objectives	Activities	Plans	Framework for Procedures
Operational	Missions	Tasks	Procedures	Value of Instructions
Clerical	Jobs	Actions	Instructions	Yes-No on Steps

Figure 1.5.1.3.5.1. *If you build and use the guide best suited to the endeavors you're doing, you get to where you want to go. Otherwise, the management tool will work against your best efforts.*

Figure 1.5.1.3.5.2. *"Don't give me guidance. Tell me how the damned thing works!"*

Figure 1.5.1.3.5.3. *"Why do I have all these parts left over? I hope the wheel doesn't fall off at the wrong time."*

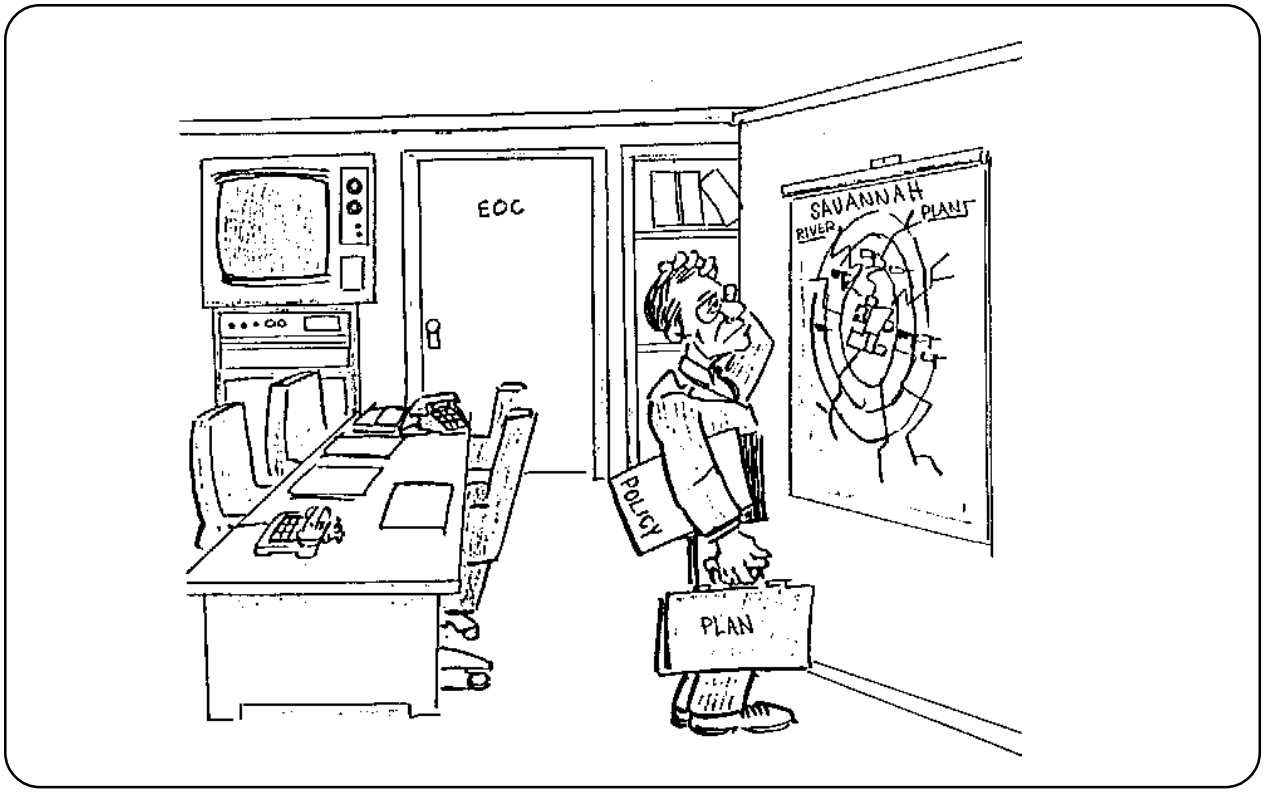

Figure 1.5.1.3.5.4. *"What's wrong with my policy and plan!?" Nothing. It's just that what you need here are procedures.*

1.5.1.3.6. PRECEDENTS AFFECT THE INNER PERSON MORE THAN OTHER TOOLS.

Precedents tools help us set up the stability and consistency we depend on to manage ambiguity.

Webster defines precedent as "an earlier occurrence of something similar; something done or said that may serve as an example or rule to authorize or justify a subsequent act of the same or an analogous kind; the convention established by such a precedent or by long practice." A good manager uses the organization's history and culture to help him or her manage. Much of an organization is below the surface—only partially visible. A manager must manage not only what's on the surface but what's below the surface. Like an iceberg, most of the organization is below the surface.

What sorts of things are below the surface? Where we came from. Who we are. What we believe. Whom we trust. What we need to know. How we do things around here. How to behave. The people who know what's going on. What we stand for. What else counts? Not much. If these things are the important part of the organization, you can't ignore them. You have to make decisions about the precedents and you need tools to help you. Those tools are the precedents tools. These tools include legends and stories, symbols, heroes, values, mission-vision-principles (MVP) statements, rites and rituals, celebrations, and many more. These under-the-surface factors should affect other tools and processes, like the hiring process, the promotion process, and the retirement process.

When you come to a company, you're socialized to the new culture. While frightening to many people who put individualism over group action and competition over cooperation, socialization highlights the precedents management tools. Richard Pascale says socialization is "the systematic means by which firms bring new members into their culture. ..... It encompasses the process of being made a member of a group, learning the ropes, and being taught how one must communicate and interact to get things done." (Richard Pascale, *The Paradox of "Corporate Culture": Reconciling Ourselves to Socialization*, California Management Review, Winter 1985, p. 27.)

I learned about socialization during my four years at the Virginia Military Institute. The idea of socialization was to bring everyone to the same level and to remove any preconceived notions about life and your importance in it. The same level everyone is brought to is the level of a rat. Whether you came from wealth or poverty, city or country, aristocracy or immigrant, you were immediately rendered to a being equal exactly to everyone else. In this way, the Institute could implant its values, beliefs, and traditions into everyone in a consistent fashion. The brotherhood of graduates from the Virginia Military Institute is renowned. My advice is to make sure your personal values coincide with those of a strong-culture organization before you join.

Other organizations practice similar activities of socialization. According to Pascale, companies with strong cultures, like IBM, Proctor and Gamble, and AT&T, generally undertake seven key steps of socialization and, as a result, have sustained themselves over generations. Pascale lists the steps as: 1) "Careful selection of entry-level candidates." 2) "Humility-inducing experiences in the first months on the job precipitate self-questioning of prior

behavior, beliefs, and values. A lowering of individual self-comfort and self-complacency promotes openness toward accepting the organization's norms and values." 3) "In-the-trenches training leads to mastery of one of the core disciplines of the business." 4) "Meticulous attention is given to systems measuring operational results and rewarding individual performance." 5) "Careful adherence to the firm's transcendent values. Identification with common values enables employees to reconcile personal sacrifices necessitated by their membership in the organization." 6) "Reinforcing folklore provides legends and interpretations of watershed events in the organization's history that validate the firm's culture and its aims. Folklore reinforces a code of conduct for 'how we do things around here.'" 7) "Consistent role models and consistent traits are associated with those recognized as on the fast track." (pp. 29-33.)

All organizations will attempt to socialize its new members to some extent. The various tools for socialization are precedents tools. Some scholars feel culture is ingrained in a group and can't be managed. Others (most popularly, Peters and Waterman in *In Search of Excellence*) feel that the excellent companies are the ones with strong cultures; and if you want your organization to be excellent, you need to manage your culture. You don't just use precedents tools for managing new hires, you use them for everyone in the organization.

Pascale argues in favor of effective socialization. "Organizations that socialize effectively manage a lot of internal ambiguity. This tends to free up time and energy; more goes toward getting the job done and focusing on external things like the competition and the customer. ..... When social roles are unclear, no one is speaking the same language; communication and trust break down. Remember, the power to get things done in corporations seldom depends on formal titles and formal authority alone. In great measure, it depends on a person's track record and reputation, knowledge, and a network of relationships. In effect, the power to implement change and execute effectively relies heavily on one's social currency, something a person accumulates over time. Strong culture firms empower employees helping them build this social currency by providing continuity and clarity. ..... The aim of socialization is to establish a base of attitudes, habits, and values that foster cooperation, integrity, and communication. The most frequently advanced objection is that the companies who do so will lose innovativeness over the long haul. The record does not bear this out." (pp. 34-37.) My personal experience from the time of attending high school at the Christian Brothers College in Memphis through the Virginia Military Institute until now supports Pascale's evaluation.

1.5.1.3.7. The Data-to-Information Chain Is a Map to Industrial Engineering Disciplines.

Industrial engineering methods and techniques are applicable to MIS development.

The data-to-information chain is shown in Figure 1.5.1.3.7. as the links that obtain data (through measurement of indicators) about the operation (what is managed), process those data, compare them to setpoints, or reference points, to generate information, and present that information to an intelligent decision maker. The decision maker then acts on the decision based on the information, all of which meets the objective, to affect the operation in such a way as to improve or adjust its condition—ready for measurement to assess the impact of what has gone before.

The illusory link distinguished by the dotted line in Figure 1.5.1.3.7. is really who manages, which is the connection between information and the operation. Obviously, this figure is similar to the Management System Model (MSM), wherein only the data-to-information chain takes the place of the what is used to manage component. All management tools convert data to information and take the place of the what is used to manage component. The data-to-information chain includes the links of the chain for the day-in, day-out acquisition, storage, retrieval, and manipulation of data to make information. The other management tools don't reflect the frequent and regular links of the chain.

Each Link Represents a Technical Specialty.

Each of the links shown in Figure 1.5.1.3.7. represents a technical specialty and is the domain of a highly-trained specialist. As a supervisor, you'll manage these specialists and be responsible for the outcome when the links are connected and working; however your obligation is what you know best—the dotted management intelligence link (who manages) and the operation (what is managed).

Figure 1.5.1.3.7. requires more attention. Consider each link a process, in which data are the raw materials. As industrial engineers, haven't we developed expertise in storing materials (inventory), lining up the materials for processing (queuing), retrieving and manipulating the materials according to procedure (materials handling), converting or assembling the materials into another form (manufacturing processes), interfacing the materials, their conversion, and their processes to the human element (human factors), and overviewing the materials, their conversion, and their processes (economics)?

Conceptual Fundamentals of the Specialty Lead to Transference of Techniques.

Of course there are differences between the specialized techniques of the industrial engineering disciplines and the generic purview of each discipline—much like the difference between minimum slack time (specialized technique) and critical path (generic concept) discussed earlier in module 1.4.5.2.2. An example of this difference involves inventory techniques. With hammers, we have similar objects with a few different prices by purchase sequence, and with data we have similar less-physical objects each one with a different makeup (characters for narrative data and numbers for quantitative data). However, concepts such as the A-B-C theory (80-20) and age of inventory clearly apply. However, I suspect

the concepts never have been applied because the specialists dealing with the links in Figure 1.5.1.3.7. either don't have the industrial engineer's training or are only interested in the computer science aspects of the link in question. Considering all the links together and the industrial engineering disciplines they represent, we have a specialized (data) but universal application (data and information overlay everything we do) of all these disciplines integrated to meet a common objective--if you will, the capstone design (synthesis) effort which brings all our disciplines together.

The data-to-information chain emphasizes the process for converting data to information. Each of the components of the MSM involve a process. The who manages component involves the decision process for converting information into action. (Remember Forrester.) The what is managed component involves the work process. Information systems are about the process in the what is used to manage component. Boland says, "Data becoming information is what information systems are. Data becomes information in the consciousness of a human subject, and that is where we must look if we are to understand information systems." (Richard J. Boland, Jr., *Phenomenology: A Preferred Approach to Research and Information Systems*, Research Methods in Information Systems, Elsevier Science Publishers, 1985, p. 200.)

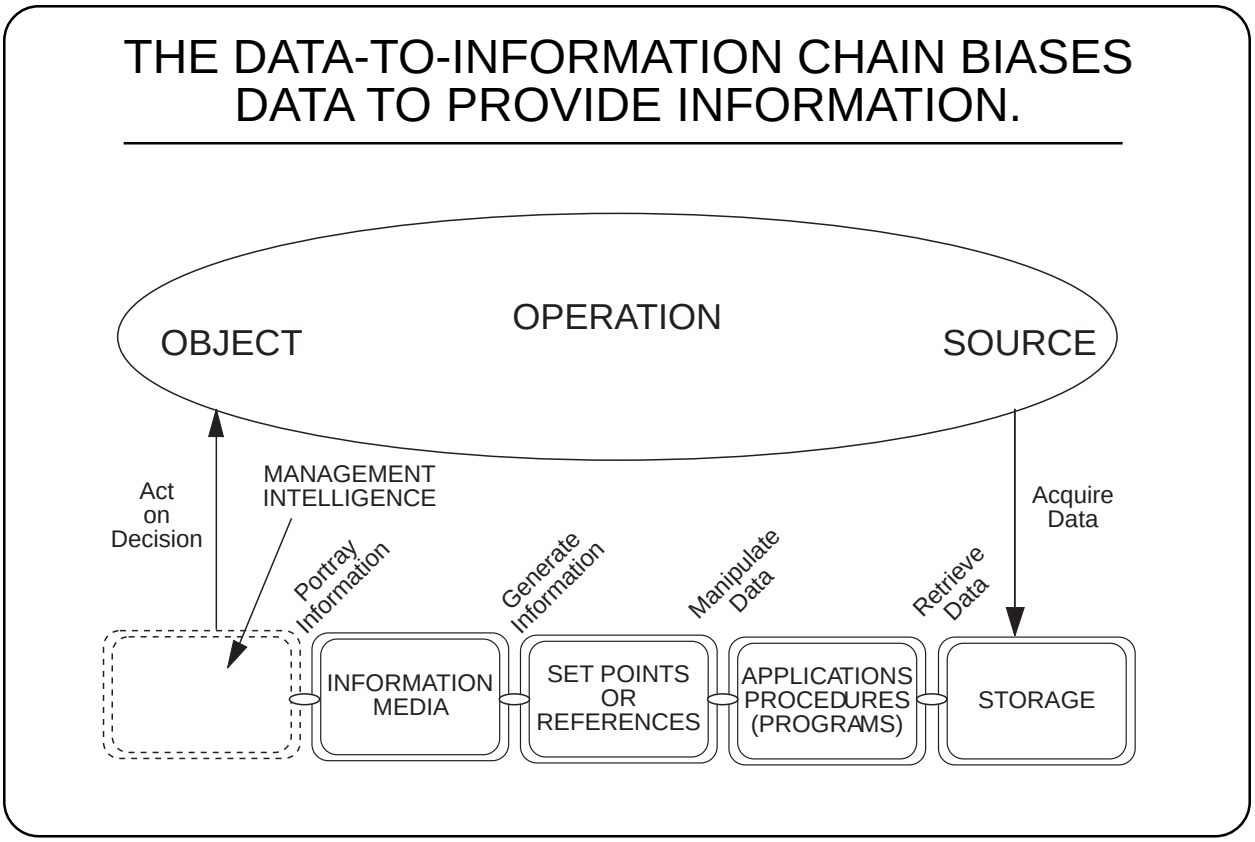

Figure 1.5.1.3.7. *The data-to-information chain includes links to make information from data.*

1.5.1.4. Origin of the Tool Classification