Organizational Behavior Management

Organizational Behavior Management (OBM) began as the application of behavior analysis to organizational settings and retains the philosophical and methodological principles of behavior analysis (Bucklin, Alvero, Dickinson, Austin, & Jackson, 2000). This discipline's main focus is on the behavior of individuals and groups in organizations. Organizational behavior follows the same principles as individual behavior in other settings.

In other words, practitioners should view behavior as naturally–occurring, scientific subject matter, and understand that orderly relations between behavior and the environment allow for the prediction and control of behavior. In addition to a theoretical understanding, knowledge of the experimental principles of behavior (e. g., reinforcement, punishment, stimulus control, discrimination and generalization) is necessary for successful application of behavior analysis to organizational problems. Analyses of work behavior in terms of the principles of behavior analysis are provided in many sources (e.g., Brown, 1982; Daniels, 1989; O'Brien & Dickinson, 1982; Mawhinney, 1984). For particularly detailed analyses, including the role of rules and establishing operations, readers are referred to Johnson, Redmon, and Mawhinney (in press), Mawhinney and Mawhinney (1982), Mawhinney and Fellows-Kuber (1999), and Poling and Braatz (in press).

The goal of this section of the Cambridge Center for Behavioral Studies' website is to more fully explore the contributions of OBM to the field of performance improvement. Through articles in press and original works from the field of behavior analysts, book reviews, consultant case studies, questions, comments, other website references, we hope to bring the importance of OBM to a larger audience. Please contribute your work to be published on this website.

Historical Background of Organizational Behavior

(prepared by Professor Edward G. Wertheim, College of Business Administration, Northeastern University, Boston, MA 02115)

Certainly large numbers of people have been doing work for a long time. Pyramids and many other huge monuments and structures were built, armies and governments were organized, Civilizations spread over vast territories. This took organization and management. There are some writings from antiquity that suggest that systematic approaches to management and organization did evolve and were transmitted to others.

But the primary influences in organizations and management today stem from more recent events.

Some would claim that to begin to understand our organizations today we need to look at the Protestant Reformational and the Protestant Ethic. A new ethic began to evolve, an ethic that shifted the orientation of one's life from the "next world" to this world. This ethic is best embodied in quotes from Luther ("All men possess a calling in the world and the fulfillment of its obligation is a divinely imposed duty") and Calvin ("Disciplined work raises a person above the calling into which he was born and is the only sign of his election by God to salvation"... "The soul is naked before God without Church or communion-religion is a personal matter; worldly success and prosperity are construed as signs of God's approval").

Over time, the Protestant Reformation provided an ideological foundation for the modern industrial society by suggesting that work is now a profound moral obligation, a path to eternal salvation. The focus is in this world and materialism, not next world. The individual's obligation is self-discipline, and systematic work. It should be clear that the factory system which began to evolve late in the 18th Century could never have flourished without the ideological underpinnings of this profound shift in philosophy as exemplified by the Protestant Ethic.

Scientific Management

The Industrial Revolution that started with the development of steam power and the creation of large factories in the late Eighteenth Century lead to great changes in the production of textiles and other products. The factories that evolved, created tremendous challenges to organization and management that had not been confronted before. Managing these new factories and later new entities like railroads with the requirement of managing large flows of material, people, and information over large distances created the need for some methods for dealing with the new management issues.

The most important of those who began to create a science of management was **Frederic Winslow Taylor,** (1856-1915). Taylor was one of the first to attempt to systematically analyze human behavior at work. His model was the machine with its cheap, interchangeable parts, each of which does one specific function. Taylor attempted to do to complex organizations what engineers had done to machines and this involved making individuals into the equivalent of machine parts. Just as machine parts were easily interchangeable, cheap, and passive, so too should the human parts be the same in the Machine model of organizations.

This involved breaking down each task to its smallest unit and to figure out the one best way to do each job. Then the engineer, after analyzing the job should teach it to the worker and make sure the worker does only those motions essential to the task. Taylor attempted to make a science for each element of work and restrict behavioral alternatives facing worker. Taylor looked at interaction of human characteristics, social environment, task, and physical environment, capacity, speed, durability, and cost. The overall goal was to remove human variability.

The results were profound. Productivity under Taylorism went up dramatically. New departments arose such as industrial engineering, personnel, and quality control. There was also growth in middle management as there evolved a separation of planning from operations. Rational rules replaced trial and error; management became formalized and efficiency increased. Of course, this did not come about without resistance. First the old line managers resisted the notion that management was a science to be studied not something one was born with (or inherited). Then of course, many workers resisted what some considered the "dehumanization of work." To be fair, Taylor also studied issues such as fatigue and safety and urged management to study the relationship between work breaks, and the length of the work day and productivity and convinced many companies that the careful introduction of breaks and a shorter day could increase productivity. Nevertheless, the industrial engineer with his stop watch and clip-board, standing over you measuring each little part of the job and one's movements became a hated figure and lead to much sabotage and group resistance.

The core elements of scientific management remain popular today. While a picture of a factory around 1900 might look like something out of Dickens, one should not think the core concepts of scientific management have been abandoned. They haven't. They have merely been modified and updated.

While many people think of bureaucracy in negative terms, this model in its pure form was a dramatic improvement over the previous model of organization which was a feudal model based on fixed status and position by birth, not merit and unquestioned authority.

The Human Relations Movement

Despite the economic progress brought about in part by Scientific Management, critics were calling attention to the "seamy side of progress," which included severe labor/management conflict, apathy, boredom, and wasted human resources. These concerns lead a number of researchers to examine the discrepancy between how an organization was supposed to work versus how the workers actually behaved. In addition, factors like World War I, developments in psychology (eg. Freud) and later the depression, all brought into question some of the basic assumptions of the Scientific Management School. One of the primary critics of the time, Elton Mayo, claimed that this "alienation" stemmed from the breakdown of the social structures caused by industrialization, the factory system, and its related outcomes like growing urbanization.

The Western Electric (Hawthorne Works) Studies (1923-1933) Cicero, , ILL.

The most famous of these studies was the Hawthorne Studies which showed how work groups provide mutual support and effective resistance to management schemes to increase output. This study found that workers didn't respond to classical motivational approaches as suggested in the Scientific Management and Taylor approaches, but rather workers were also interested in the rewards and punishments of their own work group. These studies, conducted in the 1920's started as a straightforward attempt to determine the relationship between work environment and productivity. The results of the research led researchers to feel that they were dealing with socio-psychological factors that were not explained by classic theory which stressed the formal organization and formal leadership. The Hawthorne Studies helped us to see that an organization is more than a formal arrangement of functions but is also a social system. In the following chart, we can see a comparison of traditional assumptions vs. a newer "human relations" view.

Traditional Assumptions	Human relations Assumptions
people try to satisfy one class of need at work: economic need	organizations are social systems, not just technical economic systems
no conflict exists between individual and organizational objectives	we are motivated by many needs
people act rationally to maximize	we are not always logical

rewards we act individually to satisfy individual needs	we are interdependent; our behavior is often shaped by the social context informal work group is a major factor in determining attitudes and performance of individual workers management is only one factor affecting behavior; the informal group often has a stronger impact job roles are more complex than job descriptions would suggest; people act in many ways not covered by job descriptions there is no automatic correlation between individual and organizational needs communication channels cover both logical/economic aspects of an organization and feelings of people teamwork is essential for cooperation and sound technical decisions leadership should be modified to include concepts of human relations job satisfaction will lead to higher job productivity management requires effective social skills, not just technical skills

Results of the Hawthorne Studies and the related research

These studies added much to our knowledge of human behavior in organizations and created pressure for management to change the traditional ways of managing human resources. The Human Relations Movement pushed managers toward gaining participative support of lower levels of the organization in solving organization problems. The Movement also fostered a more open and trusting environment and a greater emphasis on groups rather than just individuals

Douglas McGregor's Theory X and Theory Y

Douglas McGregor was one of the great popularizers of Human Relations approach with his Theory X and Theory Y. In his research he found that although many managers spouted the right ideas, their actual managers indicated a series of assumptions that McGregor called Theory X. However, research seemed to clearly suggest that these assumptions were not valid but rather a different series of notions about human behavior seemed more valid. He called these Theory Y and urged managers to managed based on these more valid Theory Y notions.

Work is inherently distasteful to most people Most people are not ambitious, have little desire	Work is as natural as play if the conditions are favorable

for responsibility, and prefer to be directed	Self-control is often indispensable in achieving organizational goals
Most people have little capacity for creativity in solving organizational problems	The capacity for creativity is spread throughout organizations
Motivation occurs only at the physiological and security levels	Motivation occurs at affiliation, esteem, and self-actualization levels, not just security, physiological levels
Most people must be closely controlled and often coerced to achieve organizational objectives	People can be self-directed and creative at work if properly motivated

SCHOOLS OF HISTORICAL THOUGHT AND THEIR COMPONENTS BY DECADE

Org. theory prior to 1900: Emphasized the division of labor and the importance of machinery to facilitate labor

Scientific management (1910s-)- Described management as a science with employers having specific but different responsibilities; encouraged the scientific selection, training, and development of workers and the equal division of work between workers and management

Classical school (1910s-) Listed the duties of a manager as planning, organizing, commanding employees, coordinating activities, and controlling performance; basic principles called for specialization of work, unity of command, scalar chain of command, and coordination of activities

Human relations (1920s-) Focused on the importance of the attitudes and feelings of workers; informal roles and norms influenced performance

Classical school revisited (1930s): Re-emphasized the classical principles

Group dynamics (1940s) Encouraged individual participation in decision-making; noted the impact of work group on performance

Bureaucracy--(1940s) Emphasized order, system, rationality, uniformity, and consistency in management; lead to equitable treatment for all employees by management

Leadership(1950s) Stressed the importance of groups having both social task leaders; differentiated between Theory X and Y management

Decision theory(1960s) Suggested that individuals "satisfies" when they make decisions

Sociotechnical school (1960s) Called for considering technology and work groups when understanding a work system

Envir. and tech. system (1960s) Described the existence of mechanistic and organic structures and stated their effectiveness with specific types of environmental conditions and technological types

Systems theory- (1970s): Represented organizations as open systems with inputs, transformations, outputs, and feedback; systems strive for equilibrium and experience equifinality

Contingency theory (1980s): Emphasized the fit between organization processes and characteristics of the situation; called for fitting the organization's structure to various contingencies

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Landmarks in Management Thought

1835: Babbage, "On the Economy of Machinery and Manufacturers

1835: Ure: The Philosophy of Manufacturers

1886: Towne "The Engineer as Economist"

1895: Taylor: "A Piece Rate Systems"

1900-1915: Scientific Management Writings of Taylor, Gantt, Emerson, Cooke, Gilbreths

1920's: Industrial Psychology Movement, start of Hawthorne studies

1930: Mayo, "Human Problems of an Industrial Civilization"

1930's Roethlisberger and Dickson, "Management and the Worker"

1930's Mooney and Reiley, "Onward Industry

1940's Barnard, "Functions of an Executive"

Appendix: The Protestant Reformation and the Protestant Ethic

Luther: *"All men possess a calling in the world and the fulfillment of its obligation is a divinely imposed duty"*

Calvin: *"Disciplined work raises a person above the calling into which he was born and is the only sign of his election by God to salvation"... "The soul is naked before God without Church or communion-religion is a personal matter; worldly success and prosperity are construed as signs of God's approval*

Impact of the Protestant Reformation on work
work is now a profound moral obligation, a path to eternal salvation
the focus is this world, materialism, not next world
obligation is self-discipline, systematic work

Social Darwinism-anti-social to help the weak; we must be free to compete and profit from fitness for survival; poverty is a sink

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Appendix 1: Taylorism (Frederic Winslow Taylor, 1856-1915)-Scientific Management

first attempt to systematically analyze human behavior at work
attempt to make organizations adjunct to machines-
look at interaction of human characteristics, social environment, task, and physical environment, capacity, speed, durability, cost
reduce human variability
Principles of Scientific Management
describe and bread down the task to its smallest unit; science for each element of work
restrict behavioral alternatives facing worker-remove worker discretion in planning, organizing, controlling
use time and motion studies to find one best way to do work
provide incentives to perform job one best way-tie pay to performance
use experts (industrial engineers) to establish various conditions of work

---

Some Results of the Scientific Management Movement

new departments-industrial engineering, personnel, quality control
growth in middle management; separation of planning from operations
rational rules and procedures; increase in efficiency
formalized management, mass production
human problems-dehumanization of work; sabotage, group resistance, hated
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Weber's Model of Bureaucracy

At about the same time German sociologist Max Weber, observing the organizational innovations of the German leader Bismark, identified the core elements of the new kind of organization. He called it bureaucracy.

The Basic Elements of the Bureaucratic Structure

(Note: many of these aspects have existed for thousands of years)
formal rules and behavior bounded by rules
uniformity of operations continuity despite changes in personnel
functional division of labor based on functional specialization
rational allocation of tasks
impersonal orientation
membership constitutes a career
promotion based on technical competence
employment based on merit-no ascribed status
qualifications tested
proscribed authority-legally defined
limited discretion of officers
specific sphere of competence
legally based tenure
These factors were supposed to ideally result in the ideal bureaucratic organization:
authority is rational and legal; authority should be based on position, not on the person in the position
authority stems from the office and this authority has limits as defined by the office
positions are organized in a hierarchy of authority
organizations are governed by rules and regulations

Appendix: The following lists some specific experiments that were part of the Hawthorne Studies

Relay Assembly Test Room Experiments
examined relation of light intensity and worker efficiency
failed to find simple relationship
behavior is not merely physiological-also psychological
decided to learn more about workers-eg. worker attitudes,
called in Elton Mayo
Relay Assembly Test II, 1927
selected 6 workers from large shop floor-average worker completed 5 relays in 6 minutes
kept record of output for five years-quality, weather conditions, worker health, sleep
had no supervision as such; workers told of experiment, could suggest changes
work conditions varied-eg. rest periods, length of work day
looked at effect of changes on out
results-output rose slowly and steadily even with shorter workday
workers said experiment was "fun"; liked absence of supervision; group developed socially, informal leadership, common purpose
Interviewing stage, 1928
examined how 21,000 employees felt about work and company
learned how to improve supervisory training
found supervision improved as supervisors began to look at employees differently
found managers knew little about good supervision

concluded that employees couldn't be viewed as individuals, but rather as part of organized social groups, families, neighborhoods, working groups
workers band together for protection; purposely restrict output to norm; resent group piecework; punish rate busters; enjoyed fooling management
informal leaders keep group together
Bank Wiring Observation Room (1931-1932)
choose 9 workers, three soldermen, two inspectors to assemble terminal banks
group piecework used-guaranteed base rate; pay reflects both group and individual effort
group placed in separate room to observe impact of group dynamics on prod.
what happened-employees had notion of proper day's work; most work done in morning; when they felt they had done what they considered enough, they slacked off so output constant
wage incentive really didn't work; informal social organization evolved; controlled rate busters
workers often traded jobs and helped each other; formal supervisor often looked other way
why did workers restrict output-didn't want management to know they could do more
complex social system evolved-common sentiments, relationships

-what is critical is not what is but what is perceived
-since worker couldn't affect management, group gave meaning and significance to work
-workers resist formal changes in management to break up loyalties, routines industrial engineer

Behavioral Systems Analysis:

Fundamental concepts and cutting edge applications[1]

Part I — Definition and Fundamental Concept

Dale Brethower, Ph.D. Professor Emeritus
Western Michigan University

Introduction

What is behavioral systems analysis?

Behavioral systems analysis is a set of concepts and techniques that help establish healthy school, workplace, and clinical environments. The concepts originated in two disciplines: behavior analysis and general systems theory. The techniques borrow freely from many areas but are selected, focused, and guided by behavior analysis and general systems theory. This series of papers describes a few of the most fundamental concepts and most useful techniques[2].

Why must behavioral systems analysis include both behavior analysis and generals systems theory?

Behavior analysis concepts help us understand how people function within the realities of the world they live in. General systems concepts help us understand how that world works. If we put the two areas of knowledge together we can do a better job of developing people's potential and enabling schools and workplaces to function more effectively.

Where has behavioral analysis been used?

Behavioral analysis has been applied to individuals within a wide variety of families, schools, workplaces, communities, and cultures. It has been applied to help people develop academic knowledge and skills (reading, writing, arithmetic, and content area knowledge, infancy through graduate school)

a great variety of work and professional skills such as time management, self-management, teamwork, project management, and establishing constructive relationships at home or at work.

It has helped people bearing a great variety of labels and clinical diagnoses including:

workers, students, executives, professionals, dyslexics, developmentally delayed, gifted, Attention Deficit Hyperactivity Disordered, neurologically impaired, and many others. If it is related to behavior, behavior analysis applies.

Where has general systems theory been used?

General systems theory has been applied in the study of forests, families, weather patterns, business and governmental organizations, and many other topics. It was developed originally in response to the explosion in scientific knowledge; it was an attempt to identify concepts that were fundamentally similar across disciplines and specialty areas. General systems theory contributed greatly to the development of areas such as operations research, organizational theory, and environmental ecology. This work started people talking about the systems approach, meaning a careful attempt to find all the variables influencing an outcome: economic variables, psychological variables, cultural variables, ecological variables, and so on.

How are behavioral analysis and systems analysis integrated in practice?

The first integration was conceptual: how can behavior analysis concepts and systems analysis concepts help figure out how to deal with a difficult practical issue such as improving the effectiveness of a classroom or school or business. As that work progressed, general systems people began developing special tools and tactics. Two professional societies were formed to support the work: the International Association for Behavior Analysis (which includes the Organizational Behavior Management Network) and the International Society for Performance Improvement. The work has been incorporated into a dozen or so graduate training programs around the nation and around the world. Many of the people contributing to the work are members of the Cambridge Center for Behavioral Studies.

This series of papers describes some of the tools and techniques that are often used, cutting edge applications, and work going on now that will lead to useful tools to deal with problems that are still very difficult to solve.

So what?

I believe that if intelligent people understood the basics of behavioral systems analysis it could save them a great deal of frustration. After reading this series of papers and thinking through some of the issues you face, I hope you will agree that people of good will are now wasting much of their energy. They are spending huge amounts of time and money trying to use piecemeal tactics on matters that only respond to total system approaches. Intelligent consumers say no to piecemeal approaches. Intelligent consumers seek comprehensive approaches that are consistent with well-supported theory. Intelligent consumers ask to see the data about effectiveness and ask about the specific methods used.

I believe, as do many of my colleagues, that the time has come to do two things:

describe what we do in ways that intelligent people can readily understand share the concepts and tools in ways that support those who wish to become expert.

This series of articles is a step in that effort. The papers describe and illustrate seven fundamental concepts, share fifteen "lessons learned" about how to improve performance in real settings, and discuss examples of cutting edge applications.

The First of Seven Fundamental Concepts

Fundamental Concept One B = f (O, E,)

A Fundamental Principle of Psychology

There is one fundamental principle that most, possibly all, psychologists agree upon. We write the principle as B = f (O,E) and read it "Behavior is a function of interactions between a person (O) and that person's environment (E)."

Studying B to learn about O

One reason the B = f (O,E) principle is important is that it calls attention to the study of behavior (B). Most psychologists study behavior, not because they are interested in the behavior, per se, but for what it reveals about the person (O). Behavior is the window to the person. Psychologists want to know about person variables. Labels such as "attitudes," "motives," "values," "perceptions," "personality characteristics," "intelligence," "ADHD," and "developmentally delayed" describe person variables.

The principle, B = f (O,E), captures the essence of a major issue in the field. The issue can cause great concern to any family with a "special" family member. "Is my child dyslexic because of something I've done? Maybe I should have read to him more when he was really little. Or is it a genetic defect? Uncle John had trouble with reading. If it is genetic, is there anything that can be done to help? If I've done something wrong, how can I avoid messing up his younger brother?" Parents get conflicting answers from different experts. About dyslexia, ADHD, autism, childhood schizophrenia, and an array of other topics.

The confusion and conflicting answers grow out of a very old controversy, the nature vs. nurture debate. The controversy should have been put to rest years ago, but it is debated to this day. The B = f (O, E) principle implies, correctly, that both O variables, nature, and E variables, nurture, are important. What a person does, B, is a function of both sets of variables. It is not either nature or nurture, it is both. How much of each is involved in a child's reading ability or other characteristic? There is no way to know for certain and knowing how much of each is not necessary to move forward to help the child develop her full capabilities, whatever they might be. For example, we know that a couple might have one child who was very active in the womb and another who was much quieter. We know that those differences continue for some time, perhaps the children's entire lives. That much is fact. It looks like a "nature" difference. But if we think about it, we can see that it might be a "nurture" difference. The mother might have been ill during the first few weeks after one child was conceived and healthy during that period for the other child. Or the couple might have had different prenatal care for the two children or they might have fought a lot during that time for one child and been calm, caring and affectionate during that time for the other. The womb is a nurturing environment, subject to many environmental influences. We can not accurately assign the difference, at birth, to nature or to nurture. It just has to be a function of both sets of variables. But the difference is important: a child who tends to be very active gets very different reactions from the world that one that tends to be very quiet. One might become a bully, the other a victim; one might become a leader, the other a follower. Both are genetically capable of either leading or following and, in fact, both will probably be leaders in one setting and followers in another setting. They are capable of both sets of behaviors and the environment determines which set is functional at any given moment.

As it happens, there is a tendency among many mainstream psychologists to argue the nature side and for behavioral psychologists to argue the nurture side, but that is just a bad habit. I avoid the argument: "You are what you are genetically. I don't know how to give you a gene transplant; neither does anyone else--yet. But I can help you use everything you have to attain your goals." I do not for one minute say that the nature side is unimportant. I believe couples who like to plan things should get genetic counseling as part of family planning. But once genetic O variables are set, I focus on E variables.

Behavioral psychologists usually emphasize E variables. It is practical to do so. Work settings allow free manipulation of environmental variables; however, direct manipulation of person variables is usually impractical, illegal, or unethical. The tactic is to design the least restrictive workplace possible:

Design workplaces to accommodate differences in O variables.

Discriminate against "bad workplaces" not "unfit people."

An environmental approach does not ignore O variables; it manipulates E variables to support O variables. (Human factors engineering, ergonomic workplace design, etc. take this approach.)

Studying B to learn about B

While most psychologists study B to learn about O, behavior analysts take a different path. We believe that a science of behavior is both desirable and possible. Our reasoning goes something like this. Look a crime statistics-they show us how often certain behaviors occur. Look at economic statistics-they tell us how much and how

often how many people buy or sell how much. When I go shopping, the salespeople want me to support the economy by behaving like a consumer. When I go to a restaurant, I choose the right amounts of healthy foods or I behave differently and load up on unhealthy calories. I drink and drive or keep the two behaviors separate. As a good citizen and parent I give time or money or votes to good causes and attend my children's performances; as a poor citizen I do none of that. The President declares war; the General orders an attack; the private kills or gets killed-all are behaviors. Significant ones. The ones that drive societies and cultures and economies. Human behavior is important. Worth studying.

Behavior analysts study behavior, per se. Behavior is the subject matter. We focus, not on the mysteries inside O, but on the mysteries of O's behavior in interacting with E. How O's behavior interacts with E defines whether the behavior is functional or dysfunctional. E defines whether my behavior is "friendly" or "harassment." E defines whether my killing behavior is "hunting," "poaching," "negligent homicide," "first degree murder," or "heroism." Of course, people try to figure out what was going on in my head at the time, but they figure it out based external circumstances, E, and on my behavior, B. If they ask me about my intentions and I tell them what was going on in my head, they look at E to figure out whether I am "telling the truth" or "lying."

The choice to focus on B and its interactions with E as our subject matter sets us on a different path than the one taken by most psychologists. We like our path. They like theirs. That is OK. But it is a difference that makes a difference.

The first fundamental concept, B = f (O,E) shows our focus on behavior B. It also defines the point of agreement (we all study behavior) and the point of departure from mainstream psychology. Mainstream psychology analyzes O, behavior analysts analyze B. The departure does not mean that behavior analysts ignore the findings of mainstream psychology but it does mean that we view the findings in terms of the light they shed on how we can design or manipulate environmental variables to support functional rather than dysfunctional behavior.

A Fundamental Principle of General Systems Theory B = f (O, E) is not only a fundamental principle of psychology, it is also a fundamental principle of all the social, natural, and biological sciences and, hence, of General Systems Theory. (I must take credit or blame for that assertion-I have found it in print anywhere.) An obvious and familiar example is the behavior of a river. How and where it flows is a function of environmental variables, the terrain through which it flows. How and where it flows is also a function of other more remote environmental variables such as how much snow there was in the mountains last winter, how much water was taken out for irrigation in the spring and so on. The behavior of the river is a function of interactions among properties of O (the water) and many events occurring in E. We could not possibly understand the behavior of the river by studying O, the water. Nor could we understand the behavior of the river without studying water. O and E, not one.

The behavior of a tree is also a function of environmental variables. Consider how the limbs grow. Walk through a forest and notice that some limbs grow up and over and around other limbs of other trees. Some limbs do not find a path to the sun and die in the shade of more robust limbs. How rapidly the tree grows is a function of E variables such as the amount of moisture, the combination of minerals in the soil, the action of insects, etc. Whether it has large leaves or small needles is a function of O variables.

Consider the behavior of chemicals, as studied in a high school chemistry class. Students study chemical behavior by manipulating E variables. Manipulations include heating substances, putting them in a near vacuum, and combining them with other chemicals. And on it goes.

I lack the data and the expertise to know for sure that my assertion is true but I believe that B = f (O,E) is a general principle of all sciences. I mention the principle in part to show that behavior analysts are not alone in the belief that studying behavior is both practically important and scientifically respectable.

Three Lessons Learned From B.F. Skinner Three of the first and most important things I learned as a graduate student in Harvard's psychological laboratories follow:

Learn all about the pigeon! (O)

Learn all about the apparatus! (E)

Manipulate E, Measure B!

I had to learn all about the pigeon because my first research was to be in studying the behavior of the pigeon. Skinner, while a graduate student at Harvard, had studied in Walter Crozier's physiology laboratory. He taught, by example and by standards, that knowing as much as we can about O is essential to good research. I studied from a very large book that summarized and illustrated most of what was known about the physiology and the neuroanatomy of the pigeon.

I also had to learn all about the apparatus. Frankly, I was dismayed at first. The apparatus used in the lab was quite complex. We used telephone switching relays, programmed by attaching hundreds of wires (students use computers now.) I wanted to learn psychology, not the operation of electro-mechanical circuits. I wished we could rely on technicians to program the apparatus for us. But lab culture and folklore contained too many stories of errors that came about as a result of failures to understand the apparatus. Each graduate student had to decide how expert to become but it was very clear that excellence demanded full knowledge. I am ashamed to say that we demonstrated youthful arrogance by laughing at researchers who decided that expertise in how the apparatus worked was not necessary.

Manipulate E and measure B was an easy and obvious lesson-except that measuring the right B often required building special apparatus. Manipulating specific E variables also frequently required building new apparatus. The research culture contains many stories of scientific breakthroughs coming about as a result of the ability to build new apparatus to measure new phenomena. The history of the natural and biological sciences is full of such examples.

The three lessons I learned in the first semester of graduate school are ones that I have had to learn again and again over the years as I worked outside the walls of the lab. These three lessons, in fact, describe the road to success in practical endeavors. The lessons provide tactical guidelines we can and should use in projects intended to improve performance in education and commerce.

"Learn all about O" signifies that we should always learn as much as we possibly can about the person or persons or departments or businesses we intend to work with.

"Learn all about E" signifies that we should always learn as much as we possibly can about the workplace or marketplace or economic and social environment within which clients function.

"Manipulate E, measure B" signifies that we must find ways to identify, manage, or manipulate the relevant environmental variables and we must find ways to monitor or measure the behavior that we are trying to improve.

Everything I have to say below about cutting edge applications will come back to these three lessons. B = f (O, E). But before going there, allow me to share Part I of this series of articles:

describes behavioral systems analysis as an approach that draws from two disciplines, behavior analysis and generals systems theory asserts that knowledge from both disciplines is important for practical work because behavioral knowledge about how each person will act within a specific environment and general systems knowledge about how organizations and other living systems function is essential in today's complex world describes B = f (O, E) as the fundamental concept of the biological, social, and physical sciences, psychology, and general systems theory.

Conclusion-an invitation to think

You are invited to think about what you have just read. One way to do that is to think about answers to one or more of the following questions.

If you were talking to a psychologist, what are two or three questions you could ask to determine whether the person has chosen to study mainstream psychology or behavioral approaches?

Do you agree that mainstream psychology's decision to emphasize O variables is OK?

Do you agree that behavioral psychology's decision to emphasize the how B interacts with E variables is OK?

Do you believe that people following each path could and should learn from one another?

What are some of the human issues, problems, or topics that you are most interested in?

Do you have any clues yet about how behavioral systems analysis concepts might help you understand any of the issues? (Suggestion: think a little about the E variables involved.)

The next article in this series deals with the most fundamental concept in behavior analysis. The concept is the one that defines all the principles of behavior.

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(1)This series of articles is based upon a tutorial presented at the International Association for Behavior Analysis annual conference, 2002. The tutorials are intended to capture, preserve, and transmit the experience of senior members of the Association. The tutorial was invited by the Organizational Behavior Management Network and the Executive Director of ABA.

(2)The term "behavioral systems analysis" was first used by Richard Malott and Dwight Harshbarger in 1974. The area is also known by two other labels. Members of the Organizational Behavior Management Network use organizational behavior management as the preferred label. Members of the International Society for Performance Improvement (www.ispi.org) use human performance technology as the preferred label.

Part II The 3 Term Contingency

Dale Brethower, Ph.D. Professor Emeritus

Western Michigan University

Part I of this series of articles:

describes behavioral systems analysis as an approach that draws from two disciplines, behavior analysis and generals systems theory asserts that knowledge from both disciplines is important for practical work because behavioral knowledge about how each person will act within a specific environment and general systems knowledge about how organizations and other living systems functionis essential in today's complex world describes B = f (O, E) as the fundamental concept of the biological, social, and physical sciences, psychology, and general systems theory.

Part II revisits B = f (O, E) briefly to show how the concept relates to a fundamental concept of behavioral systems analysis, the concept of the 3 Term Contingency.

Introduction

What each of us does at any moment is influenced by our past experience and the current situation. Obvious? Perhaps. Important? Very. Why? Because the ability to bring our past experience to bear on a new situation enables us to learn and develop. The ability to learn from experience is closely related to a fundamental concept of psychology and general systems theory: B = f (O, E). Human behavior (B) is influenced by variables related who the person is (O) and where the person is (E).

A child's moment to moment behavior (B) is influenced by current environmental variables (E) such as where the child is, who she is with, and what others are doing right then. Her behavior is also influences by O variables that describe "who she is." Some O variables are genetic: Is she large or small for her age? Is she unusually active or passive? Is her skin light or dark? Some O variables are related to her learning history: What language has she learned to speak? Has she learned how to "play nicely?" Has she learned that her parents are attentive and loving or distracted and angry? Some O variables relate to the current state of her body: Is she well or ill? Is she hungry or not? Is she too warm or too cold? Behavior analysis is the study of how those all those variables influence her behavior.

The same set of variables continues to influence her behavior as she grows, learns, and joins the workforce or becomes a parent. The parental influences become a bit weaker and the influences of boss and co-workers become stronger but she responds to the same sorts of variables. The variables in the immediate environment have the strongest momentary influences on her behavior, even though how those influences play out is conditioned by all she has learned before. There is no mystery about why the momentary influences are strongest. She is a member of a species that has survived by being very tuned in to what is happening. Being tuned in is

necessary whether she is in a jungle, on a busy street, driving her car, or helping her son practice his cello lessons.

The fundamental concept B = f (O, E) helps us identify and understand the importance of both O variables and E variables. The O variables can be thought of as everything she brings with her: the genetic code she received from her parents and will pass on to her children, everything she has learned up to the present moment, and her hopes and dreams and goals and aspirations and fears. The E variables can be thought of as everything else in the entire world that has an influence on what she does. Oil production in the Middle East influences the cost of gasoline which, in turn influences how costly it is for her to drive her car, which, in turn might influence the sort of car she buys or how much she drives.

Psychology-and her life-would be hopelessly complex and impossible to understand were it not for a simple fact:

Not all variables are equally important at any given moment.

Her parents did their best, time and again, to sort out some of those variables:

(Is she sick? Is she hungry? Is she too hot or too cold? Did Jeffry just take her favorite toy?)

Behavior analysis sorts out those variables, too. Not with the urgency of a parent but with the care of a scientist. B = f (O, E) is a fundamental concept that helps. It shows us that we must ALWAYS look toward both O variables and E variables to understand human behavior. But the concept does not tell us exactly which of the O and E variables are at work and influencing behavior.

The next concept, the 3 term contingency, helps behavior analysts (and parents and teachers and managers and friends) figure out how the variables work.

Fundamental Concept Two of Seven

Fundamental Concept Two The 3 Term Contingency

The unit of analysis for behavior analysis is the 3 Term Contingency, A-B-C. All of a child's behavior, B, is influenced by conditions present when the behavior occurs and what happens just after the behavior occurs. We call the conditions present when the behavior occurs Antecedents (A); they there just before the child acts. We call what happens after the consequences, C.

We abbreviate the 3 term contingency with the letters A-B-C and cheerfully tell students, parents, or managers that they must learn their ABCs if they are to understand human behavior.

The ABCs of the English alphabet are little units that we use to construct all the English words in the dictionary. The 26 letters (and one space) combine to yield thousands of words; we combine the words in countless ways to form all the sentences in all the books and articles ever written. The ABCs are building blocks of our written language. The ABCs Antecedents, Behavior, Consequences are the building blocks of complex human performance. These ABCs form a unit of behavior, the smallest unit that is meaningful in building more complex behavior.

The 3 Term Contingency is a unit of analysis in the sense that it is the smallest "whole" unit that works in studying behavior. A-the telephone rings. B-I pick up the receiver, speak, and listen. C-I discover whether there is someone there, whether it is a wrong number, whether it is a pesky salesperson making a cold call, etc. Which one it is will influence my behavior when the phone rings again.

The operation of the 3 Term Contingency defines the basic principles of behavior. I will mention a few of the principles just to show that they relate to the 3 term contingency. The principles that follow are usually included in undergraduate textbooks. If you do not already know them just think of them as several different ways the 3 term contingency operates. Please do not try to memorize them as if there will be a test: Undergraduates or parents or managers or teachers or behavior analysts-in-training or undiscovered geniuses fully understand the principles only after considerable guided practice applying them.

Textbooks typically start with the Law of Effect which says, loosely, that behavior is governed by its consequences:

Behavior followed by positive consequences increases (reinforcement)

Behavior followed by negative consequences decreases (punishment)

Behavior followed by no effective consequences decreases (extinction)

The Law of Effect mentions only two of the three terms, the B and the C. Mentioning only two terms would be fine if 3 conditions were met only one behavior occurs, ever that one behavior has only one consequence and occurs in a totally unchanging world

Those 3 conditions are never met, of course. To make the Law of Effect useful and applicable, we must also consider the third term, the A, which represents all relevant variables in effect at just the moment the B occurs.

The principle of reinforcement states that, if good things happen when behavior occurs, the behavior is more likely to occur under similar conditions in the future. Behavior always occurs under some condition and always has some consequence so we must use the 3 term contingency to analyze real situations. For example, a school psychologist might ask questions like these to as part of a functional analysis:

Questions to pinpoint A "When is Edgar most likely to disrupt the class? What is happening in class? What time of day is it? What are other people doing right then?"

Questions to pinpoint B "When you say Edgar disrupts the class, just exactly what does he do? Does he always do it in the same way? How many different things does he do to disrupt the class? Does he do different things under slightly different conditions?"

Questions to pinpoint C "When Edgar does that, what happens? What do you do? What do others do? Does it happen immediately? Does it happen consistently?"

After getting a lot of information by asking the functional analysis questions, the school psychologist can begin manipulating environmental variables, attempting to

change things that set up the behavior or change the immediate consequences. The same sort of functional analysis can be done for any other important behavior.

"When is Eloise most likely to be rude to customers? What is happening right then? What has happened just before?"

"What does Eloise do or say when she is rude? Does she always do the same things?"

"What happens right then and there? Does the customer go away? Do you say anything to her? What does she do next?"

I could continue at length about the principles and the thousands of examples that it takes to truly define and understand them. I could continue at even greater length about the thousands of examples that show the power, generality, and practical importance of the principles. However, other people have written many volumes that do that task superbly so I need not repeat it here. Besides, only experts have to know all that.

If you are an expert, you already know it; if you are not an expert, it is not important to you right now. All that is important now is to recognize that when analyzing behavior, B, we must look at what happens just before (A) and what happens just after (C).

The practical implication is clear and important:

If we are to manage behavior, B, we must assure that, under appropriate conditions (A), B will be followed by an appropriate C.

Easy to say but often very difficult to do. For example, the important contingencies relevant to knowledge work are often private and occur within the work itself. It is difficult to assure that "B will be followed by an appropriate C."

Much of the difficulty relates to the time domain of the contingency. The time between B and C must be very very short. Measured in milliseconds in the lab and less that a second anywhere. When I "manage" knowledge workers, I cannot possibly hover over them to provide "appropriate C's" when they do their work.

Here is a simple reason the 3 term contingency is so important to behavioral systems analysis: You and I and every other person alive lives within a rolling window of time, the present moment. It is always with us and always changing. The 3 term contingency operates within this ever-present time domain. This is a very important point that is, sadly, neglected by mainstream psychology and pop psychology.

The 3 term contingency operates in the here and now. A psychologically healthy person lives in that moving window in time, acting so as to use lessons from the past and position well for the future. A psychologically unhealthy person typically spends many precious moments "stuck" in worrying about the future or "stuck" in worrying about the past. Clinical psychologists urge patients to "get in touch with the here and now!"

Connecting the moving window in time to the past and future is a practical task for each human being. It is also a critical issue for behavior analysis. Behavior analysts

talk about the past in terms of a unique reinforcement history and talk about "rule governed behavior" as a bridge to the future. Understanding the mechanisms involved in connecting the moving window in time to the past and future is important to the science of behavior. On the other hand, knowing exactly what those mechanisms are is not necessary when it comes to devising practical procedures for acting intelligently. For the purpose of guiding intelligent action, now, it is enough to know that the mechanisms are built in to us. If they were not, intelligent action would be impossible and our species would not have survived.

Applications of the 3 Term Contingency

The 3 term contingency has been with us for centuries but the applications started occurring in a planned and replicable ways only forty to fifty years ago. The first applications were case studies involving one person at a time. The number and variety of applications sky-rocketed in the 1970s and 1980s. Here in the 21st Century they are occurring all around us and being written about regularly. The Cambridge Center for Behavioral Studies has many publications detailing the work and many website links to organizations and people doing the work.

Allow me to describe how some of the current work is done and then show links to three commercial firms that earn their livelihood by knowing the 3 term contingency. The point I wish to support by mentioning these firms is that knowledge of the intricate workings of the 3 term contingencies can be quite valuable. Let me confess that I am quite biased in selecting the firms: the firms employ (or were founded by) people who have studied behavioral systems analysis at Western Michigan University.

Aubrey Daniels and his colleagues at Aubrey Daniels International have proven the value many times in the last 40 years. ADI professionals have taught the principles of behavior to thousands of supervisors and managers. Teaching managers about and helping them use behavioral principles has been the core of the successful consulting firm for many years. More information can be found on the ADI web site: www.adi.com

Terry McSween has different service. His consulting firm also adds significant value using behavior analysis. But Terry has done it by focusing on a very specific area that is important in all businesses, the area of safety. Government regulations, insurance costs, the costs of accidents, and humane considerations all conspire to make safety of the workforce extremely important. Terry and his colleagues collaborate with organizations to implement safety programs that work. (see www.qualitysafetyedge.com) The Quality Safety Edge and others apply the principles of behavior to increase safe behaviors and measurably reduce accidents and the cost of accidents.

Leslie Braksik and her colleagues have a third service model for applying behavior analysis in organizations. Leslie collaborates with her clients. Leslie and her colleagues supply the behavior analysis knowledge and her clients supply the business knowledge relevant to their specific business. The service is applying behavioral knowledge to implementing specific business initiatives. The service model is described very simply and well on the company web site: www.clg-online.com

One of the reasons these three firms are successful is, as I have said, the consultants' knowledge of behavior analysis. In addition, Braksik and McSween have

two things going for them that neither Aubrey Daniels nor I had years ago when we began. In addition to their knowledge of behavior analysis, Leslie and Terry have good business sense and a working knowledge of behavioral systems analysis.

One of the subtle but powerful points Braksik and McSween get from behavioral systems analysis appears in the way they select behaviors to reinforce. Along with Aubrey Daniels, they talk about pinpointing behavior and are careful to pinpoint important behavior. How can we reliably identify classes of behavior that are important?

In behavioral research labs, classes of behavior are identified and shaped by consequences. It is, or should be, the same outside the lab.

Important practical behaviors are identified by their consequences!

Important safety behaviors are those that increase or decrease the frequency of accidents: proper and improper lifting, proper and improper use of safety equipment, and so on.

Important sales behaviors are those that increase or decrease the frequency of sales.

Important machine operator behaviors are those that increase or decrease the output of good products.

Important reading behaviors are those that increase or decrease reading comprehension.

Important social behaviors are those that help or hinder developing good relationships with others.

It makes a lot of sense when you think about it. Unfortunately, there is another way to identify "important" behaviors: ask people what they are! Or do it more efficiently with a questionnaire! These are very common ways to do it as can be seen by reading a book on competencies such as the one by David Dubois, (1998) The Competency Casebook, published by ISPI/HRD Press.

It would be nice if asking people or using a general questionnaire were all it takes. Unfortunately, people are often wrong, identifying traditional practices that worked in another time, benchmarking practices thought to work in another setting, and sharing superstitions. I learned that the hard way. Years ago, when I began teaching methods of reading instruction at the University of Michigan, I would ask expert teachers (teachers whose students consistently learned to read) to come into my class and tell teachers-in-training just how they do it. The experts came in and told teachers-in-training all sorts of wondrous things. What they said did not describe what I had seen them do at all. I soon stopped asking them to tell and started asking them to show. It worked. They could show, just not tell.

I thought at the time that the difference in what they say and what they do might be unique to expert reading teachers. Research on expertise done years later has clearly shown that it is a characteristic of experts in general. Doing it and saying it are very different skills. Very few who are good at doing it have also developed the skills necessary to be good at saying it.

Competent behavioral systems analysts always look at both behavior and consequences. Tom Gilbert, in his book Human Competence (1996) emphasized this point by arguing that we should always select behaviors by looking at both behavior and what the behavior accomplishes, never just at the behavior. Here is one simple example. Way back in the dark ages when I was playing high school basketball coaches knew the best behavior to use in shooting free throws: Hold the ball in both hands, bring it down between your legs, bend your knees and bow your legs slightly, then bring the ball up from there and propel it toward the basket. Never mind that "the right way" to shoot free throws could not be used (and practiced) anywhere else; never mind that everyone on our team could make more free throws with a different shot. Coaches knew the right way. (Our coach was progressive; he finally caved in to our complaints and allowed us to shoot in a way that scored points.) Gilbert has many business examples in the book, including several in which a worker thought to be the worst because he or she did things differently than others was actually the best in terms of accomplishment. Standard practices are often lead to mediocre results.

Gilbert argued that we should focus, not on behavior, but on performance. He defined performance "behavior plus accomplishment." He argued that the job of management is to manage performance, not behavior. Behavior, he said, contributes to the cost of doing business: the value is added by what the behavior accomplishes. People who belong to the International Society for Performance Improvement typically use Gilbert's definition of performance. Braksik and McSween are aware of the definition and make sure that they and their clients pinpoint behavior that accomplishes something of value. That might seem a small thing but, in my experience people in business pinpoint value-adding behavior only about 80% of the time, unless tasked with identifying "the skills or competencies required to do a job," when it drops to about 20%. People in human services seem to me to pinpoint pointless behaviors about 80% of the time.

It might be helpful to know whether or not perception is close to reality. If it is, huge amounts of human energy are being wasted. Be that as it may, Braksik and McSween help their clients focus on behaviors that are, by Gilbert's definition, components of valuable performance. It is one of the ways they assure that clients get their money's worth.

Conclusion-an invitation to think

Ask the pinpointing questions about a behavior that occurs regularly at work (perhaps you wish that it would not). Compare what that suggests to you about the behavior with what you think about it now. Talk with others about the behavior and note whether or not they tell you about anything you learned by pinpointing.

Think about behavior you have observed until you have a couple of examples of behaviors that have delayed consequences that are bad and immediate consequences that are pleasant. Talk with others about those behaviors. Do the same with examples of behaviors that have delayed positive consequences and immediate negative consequences.

Talk with someone who has studied behavior analysis carefully for several years. What has changed in the way they look at what people do?

Just as Part II was devoted to the unit of analysis for behavior when O is a person, Part III is devoted to the unit of analysis for behavior when O is a total organization.

Part III begins to show how Gilbert's definition of performance is useful and how to identify which behavior and which performance to improve.

Part III The Total Performance System

Dale Brethower, Ph.D. Professor Emeritus

Western Michigan University

Part I of this series of articles:

describes behavioral systems analysis as an approach that draws from two disciplines, behavior analysis and generals systems theory asserts that knowledge from both disciplines is important for practical work because behavioral knowledge about how each person will act within a specific environment and general systems knowledge about how organizations and other living systems function is essential in today's complex world describes B = f (O, E) as the fundamental concept of the biological, social, and physical sciences, psychology, and general systems theory.

Part II provides a way to analyze any activity into 3 essential components, using the 3 term contingency. The 3 term contingency is the smallest meaningful unit for analyzing individual performance. Part II then describes three different service models used by successful consulting firms. Each firm, in a different way, helps managers apply the 3 term contingency and associated principles within business environments.

Part III will describe the unit of analysis for behavioral systems analysis, the adaptive system. It will also show that proper use of the adaptive system concept helps identify what performance (behavior plus what the behavior accomplishes) to improve.

Introduction

Early in my career I was responsible for operating the Reading Improvement Service at the University of Michigan. When I accepted the task, I asked Donald E. P. Smith, who had the job before me, what I was responsible for in the new role. Don's answer was very simple, totally accurate, and very frightening: "Everything!" What if, I wondered, one of the practicum students did a bad job of working with one of the children? "You are responsible for that," said Don. What if the Freshman Engineering Advisors stop referring their students and enrollment drops in the college service? What if the University administration cuts the budget in half? What if … Don responded to every question in the same way: "You are responsible for that!"

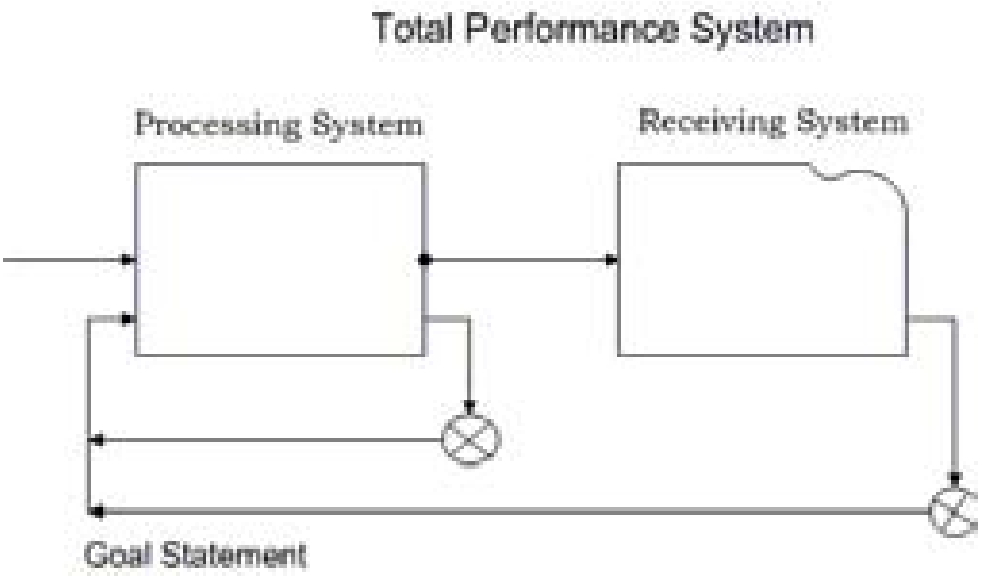
I am grateful to Don to this day. His clarity and insight enabled me to see that I had better learn really fast. Otherwise, I would not fulfill my responsibilities. Knowledge of the 3 term contingency had enabled me to do the things I did to qualify for the job of Chief of the Reading Improvement Service. But I had to learn a lot more to do the job. I had to learn more ways to use the concept. I was afraid, correctly, that I would have to get out of my comfort zone. It was time to really master some of the general systems theory concepts I had read about.

The always-present practical problem for any O (me or the Reading Improvement Service or business leaders) is "What should I do now?" Acting appropriately in the here and now occurs occasionally by good luck but knowledge of E, the environment that supports and threatens and challenges us can help enormously. Knowledge of E helps predict which actions will be effective. Knowledge of E helps avoid mistakes and do the right things.

Helping ourselves and others behave intelligently is much easier if we know the fundamental concepts of behavior analysis and of general systems theory. Dwight Harshbarger and Richard Mallott created the term "behavioral systems analysis" almost 30 years ago to label this combined knowledge.

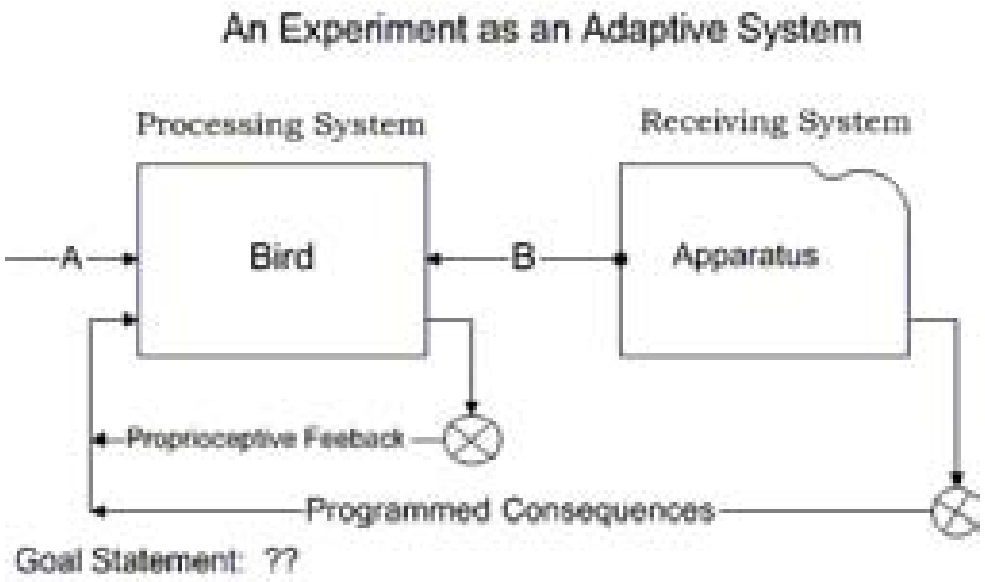
Fundamental Concept Three The Adaptive System

The unit of analysis for behavioral systems analysis is the adaptive system. The concept of the adaptive system does for behavioral systems analysis what the concept of the 3 term contingency does for behavior analysis: it gives us the "atom" or smallest unit we can use to understand what we must. Like the atom and the 3 term contingency, the adaptive system has parts and is a unitary whole. The diagram below shows the 7 parts, each necessary for intelligent performance. Several examples follow to illustrate how the parts fit together to function as a whole (called the Total Performance System), we can use the concept to manage an enterprise intelligently, and the adaptive system concept and the 3 term contingency relate to one another.



The Processing System box represents the (O), the Receiving System box represents the (E). The arrow from Processing to Receiving System represents (B). The arrows coming out of the boxes and going down to the circles represent data; the circles signify interpretation of the data, thereby converting it to feedback. (The examples that follow illustrate the importance/necessity of having both feedback loops to support intelligent or adaptive behavior.) The arrow into the Processing System, the input arrow, represents the inputs of material, information, and energy that enable the Processing System to function. The Goal Statement represents the purpose, mission, or reason-for-being of the system.

The diagram below uses the same diagram to describe an experiment set up to study behavior. It is the set-up I first encountered when I was a graduate student doing research with pigeons. Imagine a pigeon (Bird) inside the Processing System box. The input arrow represents the A or antecedents (all the conditions and stimuli we had arranged); the output arrow represents the behavior (B) of the pigeon. The Processing System feedback loop represents proprioceptive feedback, that is, feedback the bird receives directly from the bird's behavior. (It is like the proprioceptive feedback you and I receive as we walk or talk or type.) The control Apparatus is inside the Receiving System box. The apparatus records the pigeon's responses and provides the consequences (C), such as a new stimulus or a reward/reinforcer. The presentation of consequences and stimulus changes is represented by the feedback loop from the apparatus to the pigeon. The Goal Statement is about the bird's goal. Since bird's do not ordinarily write their goal statements, we infer the goals from the bird's behavior. I count the 7 parts of the adaptive system, beginning with 1) the Goal Statement, 2) the Receiving System, 3) the Receiving System Feedback, 4) the output arrow, 5) the Processing System, 6) the Processing System Feedback, and 7) the input arrow. They can be counted in any order but I do it that way to emphasize the importance of the goal, receiving system, and receiving system feedback in an adaptive system.



The diagram below uses the adaptive system/total performance system diagram to depict a learner as an adaptive system. The learner is in a speed reading class at a major university. The learner's goal is simply to read faster. The learner's Receiving System includes the class instructor, other students in the class, and students and instructors in other classes the student takes at the university. (The Receiving System also includes much more: e.g., the student's workplace, friends, family, academic advisor, the Dean of the college the student attends, and much more; we don't show everything in the diagram-which is both a strength and a weakness of the diagram.)

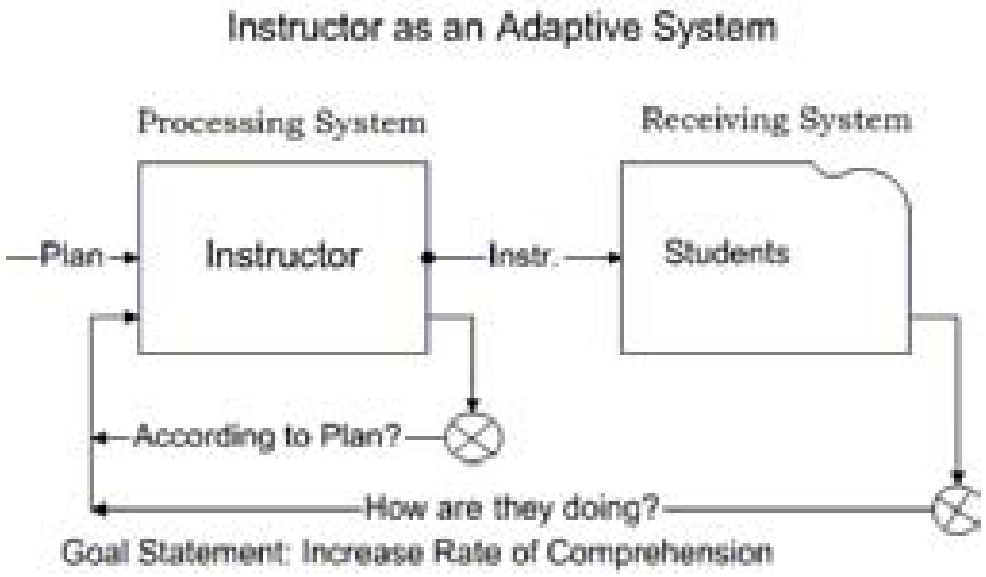
Relevant Receiving System feedback includes immediate feedback from the instructor, feedback from reading tests taken in the class, and feedback from tests taken in other classes. The student's outputs are her notes, completed reading assignments, and the like. Processing System Feedback is labeled "Self-talk" in the diagram because students talk to themselves ("This is a stupid assignment!" "I like this!" "I hate this!" "I'll never be able to do this!" "I've almost got it!") and represents

not only what they think but what they feel. Inputs are the assignments given by instructors.

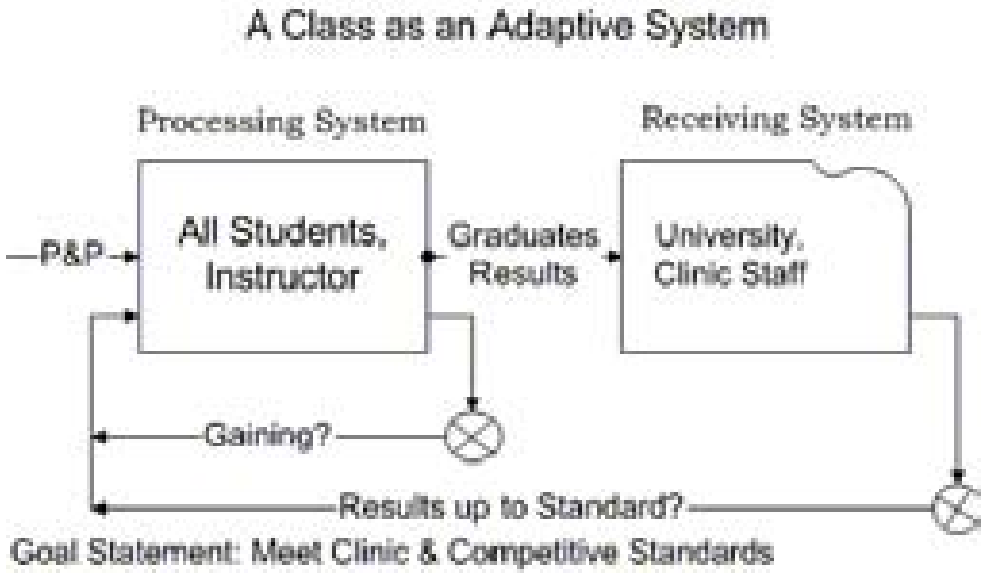
The next diagram depicts the instructor of the reading class. The instructor's immediate goal is to enable the learners to comprehend material faster-faster reading with equal or better understanding. Students are the Receiving System and feedback about their performance is Receiving System Feedback. The instructor's outputs are simply labeled instructions and include assignments as well as confirming and corrective feedback. (The confirming and corrective feedback are part of the feedback loop to the learner on the diagram above.) The instructor for this class has a plan to follow and monitors his own performance regarding how well he follows the plan. If Receiving System Feedback shows that the plan isn't working, he might modify it as he goes and will certainly modify if before teaching the class again.

Like the experimenter, the instructor considers the O, the "stuff" the student brings. The student's stated goal is to read faster. Not just for the fun of it but to learn more in less time, i.e., increase learning rate. If the instructor helps the student increase reading rate and not learning rate, the student will thank the instructor but not be truly satisfied: the instructor has not "served" the student. That is why instructors of these reading classes have students do "homework" with real material and do so out in the receiving system. Doing so enables the student to get receiving system feedback from an important source, instructors in other courses. The instructor gets that feedback, too, by talking with the students and coaching them in their efforts to apply what was learned in the clinic.

The receiving system feedback is delayed feedback and not very precise but it is necessary to necessary to sustain the value of the more immediate feedback. This form of feedback, from real attempts to use the skills, is the single most important difference between these classes and other speed reading classes: we consider both loops, (a well-known psychologist has even named it "dual loop learning".) It is a difference that makes a difference: it answers the relevance question for student and instructor. When several of my colleagues and I pioneered this method of instruction in the 1960s it was quite rare. It has become increasingly common in the years since then. Karolyn Smalley and I were able to write an entire book recently about applications of this form of instruction in business and industry. We call it "Performance-Based Instruction" because it focuses on real performance outside the classroom in which it is taught.



The next diagram shows the whole classroom as an adaptive system. The Goal is to meet Clinic and competitive standards. The Clinic offered subsidized services to students at the university but they could purchase the services elsewhere. The Goal was to compete on quality and price, i.e., beat commercial competitors on both quality and price. The Receiving System is shown as the University as a whole and the entire Clinic Staff. If key persons in the clinic and in the university were not satisfied with the results, students would be referred to the competition or staff assigned to other clinic programs or the budget cut. Two outputs are shown, both Graduates (the students themselves) and Results (statistical summaries of reading gains.) The Standards for end-of-class results were set at higher gains, faster and cheaper than the competition. Internal feedback monitored whether or not the class was moving at a pace necessary to achieve that goal. The P&P on the input arrow stands for Practices and Policies at the clinic. The practices and policies, goals and standards, and receiving system demands all contributed to each instructor as he or she planned lessons from semester to semester and from one class to the next.

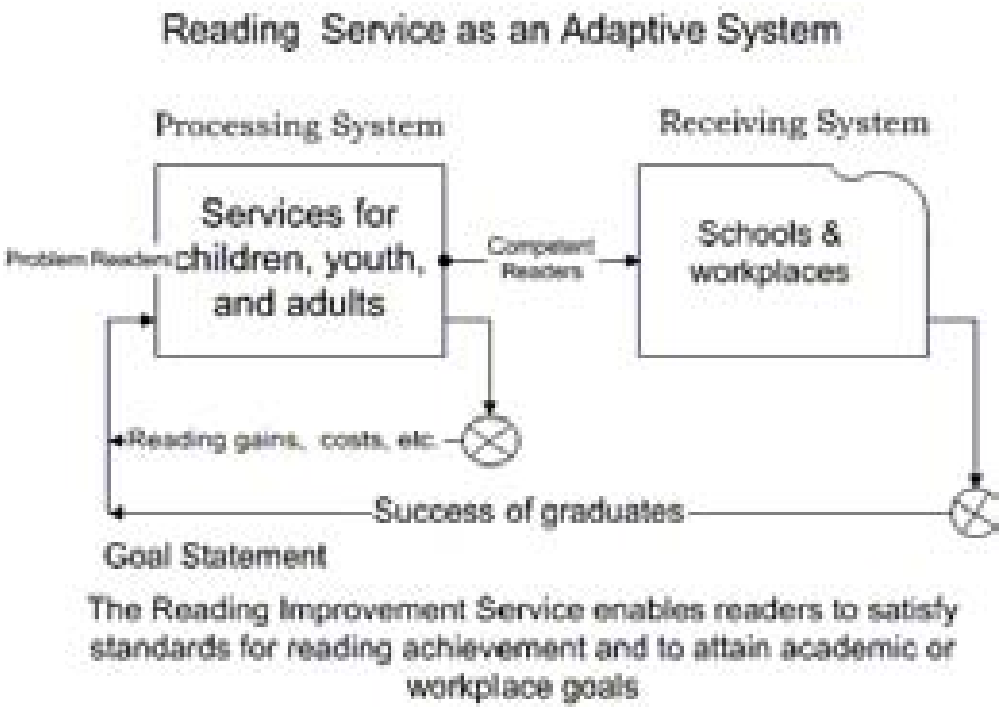


The views above of the learner, the instructor, and the classroom are based upon work I did for my doctoral dissertation many years ago. The dissertation was a

validation of the adaptive system concept and the total performance system diagram I invented to represent an adaptive system in a practical and useful way. The title of the dissertation was *The Classroom as a Self-Modifying System. Classrooms* contributing data to the dissertation were located in the Clinic and in two elementary schools in the area.

The diagram below shows a larger system, viewing the entire clinic as an adaptive system. This is the perspective I used when I was Chief of the service. (My boss was ex-Navy and established his title as Chief of the Bureau of Psychological Services. Each service within the Bureau was headed by a Chief.)

The internal loop feedback was the basis of weekly staff meetings in which instructors in every program show/discuss the current data: how many students are gaining? How much? Are the students applying it and making real world progress? Notice that much of these data are anecdotal. We used the data and trusted it only because we had other sources of more objective data that we could use to confirm or disconfirm our interpretations of the anecdotal data. If I had presented those data to my boss, he would not have been impressed. But data on such things as grade point averages before and after the clinic services were more meaningful to him. The data answered these questions: Are students using what they have learned? Does using it do any good?



The Goal Statement is significant. We were committed to doing two things. First, we would do the job we were expected to do and "enable readers to satisfy standards for reading achievement." But when we asked ourselves if we would be satisfied as professionals if that is the only thing we accomplished, the answer was no. We would be satisfied only if graduates attained "academic or workplace goals." We would be satisfied with our:

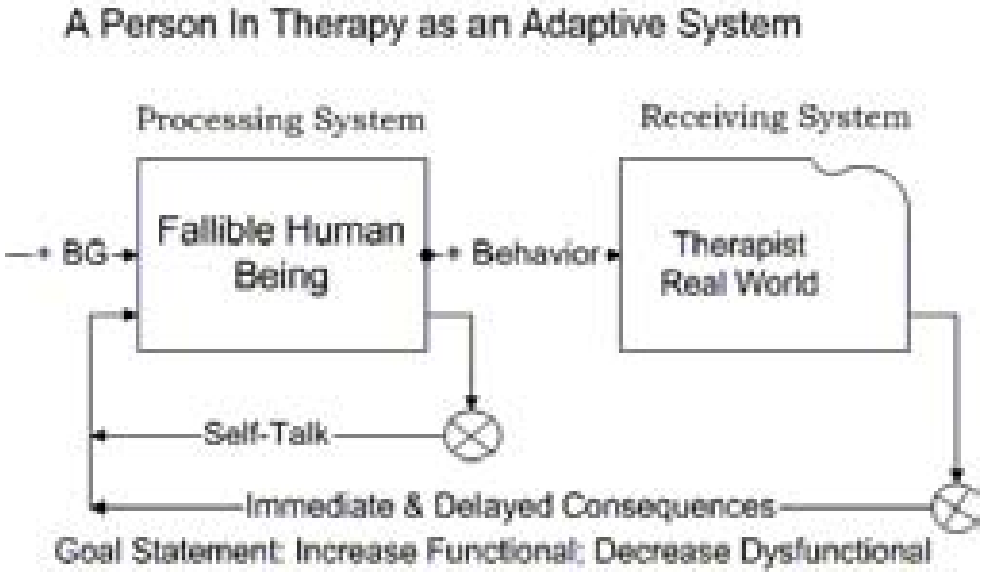
adult literacy program only if graduates could read well enough to do their work competently

children's service only if graduates could perform competently in mainstream school classrooms

college service only if graduates performed well academically, i.e., if they graduated with higher than expected grades.

The decision to include academic and workplace goals in our goals is unusual for reading clinics but not unusual for behavior analysts. There is good evidence that far too little that is learned in a clinic setting will be applied outside the clinic unless we do specific things to assure transfer. We "teach for transfer" and provide follow-up support. It was unusual, 35 years ago, to have students practice with everyday material but it later became a "best practice" in adult literacy.

These 5 examples show that the adaptive system concept can be applied to laboratory experiments, individual learners, instructors, classrooms, and total not-for-profit agencies. The cutting edge applications that I will describe a bit later apply the concept to for-profit businesses. The next example applies it to a client in (psychological) therapy.



The goal statement shown is a generic one, to increase functional and decrease dysfunctional behavior. The client and therapist might agree, for example, to work on increasing the number of healthy interpersonal relationships through learning new skills and decreasing specific bad habits, such as belittling others, avoiding social interaction, making unreasonable requests, and rarely listening to what another person says.

The client is listed as a Fallible Human Being, the only kind there are. The output arrow specifies desired behavior, i.e., the behavior necessary to achieve the therapeutic goals. The Receiving System includes the therapist and the client's world outside therapy. The Receiving System Feedback is about immediate consequences and delayed consequences of the client's behavior. The input arrow shows positive behavior guidelines that are provided by the therapist. During the session, the client might practice some of the new interpersonal behaviors and receive immediate coaching from the therapist. The client will typically have a homework assignment to use the new skills in the real world and to track the frequency of specific instances of the bad habits. The real world sometimes provides immediate consequences. The

client might belittle others, who immediately get up and walk away; the client might practice active listening skills and learn more about the other person. The real world also provides delayed consequences such as terminating employment if the client persists in the bad habits or ending a probationary period if the client performs well.

Not all clinical psychologists do therapy in this way but it is common among behavior analysts. The clinical research literature shows that it is common among therapists who get good results, independently of the therapist's theoretical orientation.

Behavioral Systems Analysis Lessons Learned: Please allow me to point out 5 things these examples illustrate about using the adaptive system diagram and concept.

In all applied behavior analysis specialties the client's goals are attained by decreasing dysfunctional behavior and increasing functional behavior in the client's real world environment. B = f (O,E) That is the meaning of "behavioral" in behavioral systems analysis.

In all our professional work, we engage in activities in which the pay-off is elsewhere. The pay-off comes in the Receiving System, not the Processing system. Success is determined by the Receiving System and is a resultant of interactions between the Receiving System and the Processing System.

The 3-term contingency operates within the adaptive system. The person or persons in the Processing System each functions within his or her moving window in time. Immediate consequences of each person's behavior, though often unnoticed, are extremely important in supporting functional and/or not supporting dysfunctional behavior.

It is important for the manager or teacher or researcher or therapist to understand the apparatus (the receiving system.)

If any of the 7 parts of the adaptive system are missing or defective, the system cannot function effectively.

The two feedback loops are necessary to support adaptive behavior. The processing system feedback helps people keep track of what they are doing; the receiving system feedback helps people know whether or not what they are doing is "working" properly.

The goals determine what outputs/behaviors are necessary and what feedback is necessary.

Feedback is often missing, delayed, inaccurate, conflicting or misinterpreted and misused.

I've given special attention to the units of analysis (the 3 term contingency and the adaptive system). The units of analysis leverage and organize many basic principles. Each of the remaining 4 fundamental concepts is important but requires less explanation.

As an introduction to Part III, I shared a personal experience, assuming the role of Chief of the Reading Improvement Service at the University of Michigan. I knew the 3 term contingency and faced my responsibilities with full confidence that I could do the

job a sadly lacking in knowledge about exactly how. The lack of knowledge propelled me toward general systems theory. It also propelled me toward people who knew something about organizations, business, and management including professors in the College of Business. Among the many that I learned from, I learned the most from George Odiorne, an economist, entrepreneur, professor, and Director of the Bureau of Industrial Relations and Geary Rummler. George told me once, in speaking about business, "You know how to solve a very large number of business problems. The only obstacle is, you don't have the foggiest notion of what the problems are!"

The collaboration with Geary was essential because George was right. I knew behavior analysis but I did not know three things:

the B, what behaviors were valuable in business,

the O, the way organizations worked, and

the E, the nature of the business environment.

The adaptive system concept and the total performance system diagram enabled me to figure out what I had to do to fulfill all my responsibilities. It helped me pinpoint the behaviors that would enable everyone to accomplish more, the behaviors that were part of valuable performances. But there was much more to learn.

Geary Rummler had already earned his Masters in Business Administration. His knowledge of business, coupled with good sense and practical experience from summers working with automotive engineers, complemented my knowledge perfectly. Between the two of us, we knew enough to be very effective in doing behavioral systems analysis! We worked together for several years and then worked separately to develop systematic procedures to enable us to be more effective and efficient in the work.

Conclusion-an invitation to think

You are invited to think about what you have just read. Doing so will help you understand where and how the material relates to topics or issues you are concerned about.

Think about your experiences as a student or as an employee. What Receiving System feedback did you get regularly, if any?

Think about what happens to an employee's performance if any of the parts of the total performance system/adaptive system are missing or weak. (I do that as a group exercise, assigning each of the 7 parts to different people. When they report back and discuss, they always conclude that if any part is weak, it makes it harder for an employee to perform well. The also conclude that, if Receiving System feedback is very weak or absent it would be impossible for the person to perform intelligently.)

Part IV introduces a concept from general systems theory that helps keep business concepts simple and in perspective. It then introduces 3 additional general systems concepts that are especially relevant understanding why long term success for an organization requires managing it as a whole, not as a collection of separate parts.

Part IV Four Concepts

Dale Brethower, Ph.D. Professor Emeritus

Western Michigan University

Part I of this series of articles:

describes behavioral systems analysis as an approach that draws from two disciplines, behavior analysis and generals systems theory

asserts that knowledge from both disciplines is important for practical work because

behavioral knowledge about how each person will act within a specific environment and

general systems knowledge about how organizations and other living systems function

is essential in today's complex world

describes B = f (O, E) as the fundamental concept of the biological, social, and physical sciences, psychology, and general systems theory.

Part II provides a way to analyze any activity into 3 essential components, using the 3 term contingency. The 3 term contingency is the smallest meaningful unit for analyzing individual performance. Part II then describes three different service models used by successful consulting firms. Each firm, in a different way, helps managers apply the 3 term contingency and associated principles within business environments.

Part III describes the smallest meaningful unit for managing organizational performance, the adaptive system. The adaptive system concept is the basis of the total performance system diagram that shows the 7 essential components of an adaptive system. If any one of the 7 components is weak or missing, intelligent performance is very difficult or impossible.

Part IV begins with a concept from general systems theory that helps keep business concepts in perspective. It then introduces 3 additional general systems concepts that can help executives (and behavior analysts) understand why long term success for any organization in a changing world requires managing it as a whole, not as a collection of separate parts.

Introduction

The wife of a business owner told me recently, "My husband can manage any part of the business very well. He can manage anything about the business. But what he can't do is manage everything all at once!" She understood the problem, having run a business herself. But neither she nor her husband knew what to do about it.

The problem is common. When I first met the owner of Ronningen Research and Development almost 20 years ago, he could do every job in the company. He could run every machine, do the computer assisted design and computer aided manufacturing, repair the furnace, and sweep the place. He could walk through the plant and sense whether it was functioning well or whether something had gone wrong or was about to. And he could manage it effectively. The only problem was that he could manage it only by means of his personal expertise. He had to be there and put in long hours every day, week by week, month by month, year by year. He and everyone in the plant knew that Jon could do anything; the difficulty was that he could not do everything. His wife and his banker worried that if he kept going as he was he would kill himself; the business would die with him.

The next set of concepts from general systems theory help understand why it is necessary to manage everything at once and how to do it without superhuman effort.

Fundamental Concept Four-Value Set

Any living system survives by maintaining a small set of variables, each within a narrow range. For example, a person becomes ill or dies if blood pressure is too high or too low, blood sugar level is too high or too low for too long, temperature is too high or too low, etc. There are a few more such as pH levels, but the point is that there are only a few major vital signs. A business also has a small number of value set variables that must be maintained within a narrow range. The variables include cash flow, income-expenditure balance, indicators of customer relations, and the like.

These essential variables are called value set variables, for obvious reasons. The value set concept is quite important because maintaining the variables is, literally, a matter of life or death for a person or an organization.

The value set concept is important for another reason. It enables us to focus our efforts to understand or manage the system. Deal with value set variables first! When I first began studying organizations, I was struck by the complexity, by the number of variables I could look at, by the number of different views about what is important in any specific organization. I was absolutely amazed by the amount of information a business owner or senior executive might have and by the gaps in their knowledge. Fortunately for me, a very wise manager in Fortune 100 corporation explained to me that business was really quite simple. "We make things," Art Main said, "and we sell things. Everything else supports those two processes." Art's wisdom helped me learn that there may be a lot of confusion within an organization but there are only a few value set variables that must be managed carefully.

The value set concept provides a rationale for a concept that is hot topic in the business press right now, the balanced scorecard. I hope it continues to be a hot topic. Business scholars have long pointed out that, while the financial measures such as profit margin and return on investment are very important, they are not the only important measures. Kaplan and Norton (1966) describe a tool, the Balanced Scorecard, that can help enormously in keeping the most important Value set variables in balance and in focus.

Fundamental Concept Five-Homeostasis

The concept of homeostasis is very closely related to the concept of value set. The value set concept is that there are a small number of variables that must be kept

within narrow ranges in order for an O (plant, animal, person, organization) to survive. The concept of homeostasis is based on the observation that all biological systems have mechanisms to regulate value set variables, i.e., keep them from changing very much. The term comes from two Greek words, homeo (similar) and stasis. My Random House College Dictionary defines stasis as: "a state of equilibrium or inactivity caused by opposing equal forces." Living systems survive by balancing opposing forces. Living systems are dynamic systems, not static. Living systems work at all times to balance multiple opposing forces to maintain value set variables.

Homeostasis was one of the most talked about concepts in general systems theory in the 1960s as scientists began noticing that all biological systems have homeostatic mechanisms. Yet those of us who seek to bring about change in people or organizations find it vexing that people and organisms resist our efforts. It is tempting to think that something is wrong with "them" when "they" resist benevolently intended efforts; however, balancing opposing forces is a necessary and natural phenomenon. I've come to believe that if I do not encounter "resistance" it is because I am working on something quite unimportant or performing so incompetently that my efforts do not have to be resisted.

Homeostatic mechanisms are so valuable that engineers build them into every complex piece of equipment they build. There are thermostats in my house and car to regulate temperature. The checks and balances built into the federal government can be thought of as homeostatic mechanisms; we see them in action every day in the news.

The existence of homeostatic mechanisms is not a "hot news." Homeostatic mechanisms are so well known that it is easy to forget how important they are. One of the most important things I learned from one of my graduate school professors, S.S. Stevens, is "Never ignore the obvious!" It takes a Harvard professor to point out something that basic. Without his authority I might not have had the courage to write about fundamental concepts rather that a current hot topic.

Fundamental Concept Six-Interconnectedness

The sixth concept is also obvious, up to a point. It is the concept of interconnectedness which is, simply, that within a system everything is connected to everything else. Every value set variable is connected in some way to every other value set variable. Everything done in a system has ripple effects.

Interconnectedness also means that the system is connected to many other systems. The reading clinic was connected to other parts of the Bureau of Psychological Services (through the budgeting process), to all the colleges within the university and all the public schools in the area (through referral networks), to the larger community (competing with commercial speed reading courses), to several professions (through allegiance of staff members), and to several academic departments (in which staff members earned advanced degrees.) One of the things that amazed me when I became Chief was how everything I did rippled throughout the clinic and throughout the community. Homeostatic mechanisms within the clinic, within the university, and within the community constrained my ability to lead. It took me quite a while to figure out that was a good thing.

The fact that everything is connected to everything else in a system has many implications. I will mention only a few of them:

Any person or organization operates in a multiple consequence environment. Each thing I do has multiple consequences; if I devote more energy to project A (a personal/family project), I have less energy to devote to project B (a work project.) Each thing an organization does has multiple consequences; energy devoted to project A (launching a new product or service) is not available for project B (continuous improvement of an existing product or service.) For both persons and organizations, multiple 3 term contingencies are always in effect, both internally and externally.

Some contingencies are rapid-acting; some are slow-acting. Both rapid-acting and slow-acting are extremely important in business and in life. This point is best illustrated in terms of proximate and ultimate causes or effects. A proximate cause is an immediate, closely connected event. For example, the proximate cause of most people's death is heart failure. The heart stops and they die-but what causes the heart to stop? In my father's case, it was loss of blood due to injuries suffered during a fall. What caused the fall? He was weakened by cancer and his most recent treatment. What caused the cancer? Many things, including life-style variables, age, genetics, and an injury that lowered my father's natural resistance, giving the cancer opportunity to grow. What caused my father's death? The death certificate listed the proximate causes, the hemorrhaging from caused by the fall and the weakened state due to cancer. consequence.

Attempts to find THE cause of anything are doomed: the cause of a disease, the cause of a drop off in sales, the cause of low morale, the cause of high sales, the cause of high morale, the cause of an accident, the cause of a crime, the cause of anything. For example, if sales at the local hardware store fall off dramatically, what is the cause? The proximate cause might be unusually cold weather but there are multiple variables involved, the ultimate causes. Attempts to track down the "ultimate" causes demonstrate that a) some of the slow-acting variables are very difficult to pin down, b) no event has a single cause, and c) no action has a single effect.

Managers (of anything-health, businesses, teams, mutual funds) must attend to both rapid-acting and slow-acting consequences. That can be done only by attending to trends in many different variables, including value set variables.

Simple solutions do not work.

Fundamental Concept Seven-Living System

The concept of the living system is fundamental to behavioral systems analysis or any practical work in organizations. The concept is simplicity itself: we work with living systems. Every person and every organization, every client and every supplier, every governmental and every stakeholder organization is a living system. This point is made clearly and in great detail in James G. Miller's superb book, *Living Systems*.

Giving the ultimate definition of "living system" is exactly as difficult as giving the ultimate definition of life. Rather than attempt the ultimate definition, I offer a practical definition. A living system is anything with these specific characteristics:

It has a reasonably definable value set.

Value set variables are homeostatic.

It is dependent upon an external environment for its survival.

All its actions are interconnected and multiply caused.

If we are to understand what we are doing when we seek to help a person or organization, we must treat the O as a living system, interacting within a life-sustaining and life-threatening E. Because that is the nature of the O. Even if we do not know it and take it into consideration, O is a living system. Making O "better" requires making O function better as a living system. Attempting to manage O as if it were an entity that bends to one's will does not work well; it is a root cause of much human suffering. Effective management requires something that we are only now beginning to understand and do effectively: manage an organization as a system.

Seven Lessons Learned

Please allow me to summarize the broad implications of the fundamental concepts.

O cannot survive without E

O has functional and dysfunctional behaviors; my job is to support increases in functional and decreases in dysfunctional

I must fully understand E if I am to know what is functional and dysfunctional

E typically does not have switches and knobs designed for convenient adjustment of E variables to improve O's performance; the switches and knobs must be constructed

O is complex; E is complex; interactions between them are complex; the complexity must be captured by a simple and powerful theory and managed by a powerful technology

Behavioral systems analysis had to be invented to provide

A theory related to both fast-acting and slow-acting contingencies

A technology that supports intelligent application of the theory

The technology had to be intelligent rather than prescriptive (living systems must adapt or die in a changing world)

The seven lessons learned summarize much of what we learned in identifying and applying the fundamental concepts.

Conclusion-an invitation to think

What does the concept of interconnectedness suggest to you about efforts to find the cause of cancer? About finding a "magic bullet" for any real and important problem?

What important-to-you topic or issue would the value set concept help you understand?

What does the concept of homeostasis suggest to you about the resistance to change? When is resistance to change good? When is resistance to change harmful? How can you or anyone else tell the difference between when it would be helpful and when it would be harmful?

What is the practical importance of knowing that both fast-acting and slow-acting variables are important?

Part V describes cutting edge applications that apply the fundamental concepts, the theory, and use the technology of behavioral systems analysis.

Part V Illustrative Applications

Dale Brethower, Ph.D. Professor Emeritus

Western Michigan University

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Part IV describes the Value Set, a concept from general systems theory that helps keep the most important organizational variables in focus. It then introduces 3 additional general systems concepts, the concepts of homeostasis, interconnectedness,

and living system. These 4 concepts plus 3 described in Parts I, II, and III, support the notion that long term success for any organization in a changing world requires managing it as a whole, not as a collection of separate parts.

Part IV ended with a description of seven lessons learned in doing behavioral systems analysis. But the concepts are not enough.

"Intellect in itself has no power to move; it must be intellect directed to a certain end; in other words, it must be practical." Aristotle, Nicomachean Ethics, VI, 2

Three Cutting Edge Applications of Behavioral Systems Analysis

One of these two cutting edge applications is old and the other two are both new and ongoing. The applications are cutting edge because they do something all too rare: they explicitly, persistently, and effectively apply the theory and technology of behavioral systems analysis. They explicitly seek to manage the total organization as an adaptive system rather than taking a piecemeal approach use the adaptive system model and the 3 term contingency emphasize aligning processing systems with the demands of receiving systems.

Experience has taught each of us, at one time or another, that piecemeal tactics do not work. Now would be a good time to stop redoubling efforts to make piecemeal tactics work and move on to assure that cutting edge practices become standard practices.

Application #1-An Application in Education

The first application I will describe uses diagrams of the learner as an adaptive system, the instructor as an adaptive system, and the classroom as an adaptive system very similar to those in Part III. It involves learning how to perform competently in my responsibility-for-everything job as Chief of the Reading Improvement Service, University of Michigan. The work is both cutting edge and over 30 years old.

The research study validated the adaptive system diagram. The research was conducted in the Reading Improvement Service and in several classrooms in two different elementary schools. It was action research, carried out over significant periods of time with real students in real settings. The agreement with the principals, teachers, and staff was that the first priority was that anything we did should benefit students. The second priority was that it should be perceived as a benefit to the teachers and administrators involved. The third priority was that it would generate data for the research. The priorities reflected the values and responsibilities of the people involved. An important side benefit of the priorities is that they assure what researchers call external validity, meaning that the results can be generalized to other settings. This benefit was important to me because it was done as my doctoral dissertation, *The Classroom as a Self-modifying System.*

The research demonstrated that a) the diagram could be used to provide a meaningful description of a classroom, a learner, and an instructor and b) providing the learners and the instructor with improved feedback enabled them to "self-modify" and improve performance. The data showed that, given a bit of coaching and encouragement from

teachers, learners could use receiving system feedback to manage their own performance. Performances included accurate completion of school assignments in several different school subjects, adhering to a behavior code generated and self-managed by fifth grade students, effective use of a resource center, as well as reading and learning more effectively within the university.

Performance of individuals and classrooms improved, as measured by both processing system and receiving system feedback. The most visible technology used was feedback supported by graphs showing individual performance. The other technology used can be found at http://kanga.cc.wmich.edu/~brethower which is my web page at Western Michigan University. (Click to the Reading Clinic case in PSY 651 Behavioral Systems Analysis.)

An important feature of the way the research was done and in the way I continue to do behavioral systems analysis work is that the analysis moves from the outside in, from results to outputs, and from outputs to processes.

Look outside: Begin with an analysis of the Receiving System. The work at the Reading Improvement System began by looking at the world our students were in when not attending our classes. What tasks were they required to do? (Tons of different school assignments.) How well should they do the tasks? (A lot better than they could now!) What kind of feedback did they get? (Not much, and mostly not at the right time.) What kinds of recognition, rewards, or reinforcement did they get? (Not much, mostly not at the right time.) The analysis produced more detailed answers, of course, but even at this level of detail, the analysis points toward two important conclusions. First, helping the students make small gains would not be good enough; we had to set high standards if we were to serve them well. Second, the "learning support" they received in school could not be relied upon; we had to help students learns self-management skills in addition to reading skills.

Look at outputs: Identify specific valued tasks they perform in the Receiving System. These are the tasks they must learn to perform. This analysis was what brought us to the conclusion that our instruction should involve practice with tasks similar to and, if possible, identical to those they had to do in school.

Look at the process: Identify effective ways to perform the tasks. This was not easy. We investigated how the very best students perform the tasks. Then we designed instruction to enable our students to do the tasks the way the best students did. It made no sense to us to ask them to practice doing what average or poor students do. Nor did it seem like a good idea to frustrate our students by asking them to do the impossible.

The behavioral systems approach specifically does not ask "What goals do most clinics set? What are their results? How do they do the instruction?" That could be done — and, truthfully, we knew all that-but looking at what the Receiving System demanded convinced us that imitating even very good reading clinics would not get the job done. Moving away from common practices or even best practices in reading was not for the faint of heart but I have since learned that it is a great way to identify a competitive edge.

Application #2-An Application in Graduate Training

Richard Malott, Professor of Psychology at Western Michigan University, has operated the Behavioral Analysis Training System (BATS) for several years. Malott believes that a good graduate program should attract good students who do superior work while in the program, graduate in a timely manner, and perform in an exemplary fashion afterwards. While many professors agree with those criteria, few set out to design a system that will meet the criteria, consistently producing measured results. Malott applied behavioral systems analysis to the initial design of BATS and continues to apply behavioral systems analysis to the operation and continuous improvement of the system. The graduate program enables students to learn behavioral systems analysis, practicing the concepts and techniques while in the program. Malott refers to it as a goal-driven system and involves the students in continuous improvement of the training system.

BATS students all do projects in which they analyze a subsystem of BATS, take data on how well it is functioning, do specific things to improve it, and take data on the results. Thus each subsystem functions as an adaptive system-students use the diagram-and improves.

Some of the subsystems were designed based upon receiving system feedback. For example, employers and former students both agreed that acquiring fluency with basic computer software packages (word processing, desktop publishing, spreadsheets, etc.) would be valuable. However, getting training in the packages was difficult, costly, and out of synchrony with the BATS curriculum. A BATS student developed a rudimentary self-study curriculum which later students developed into a self-paced and peer coached system that enables all BATS students to do all their regular school work using the software packages. Each cohort of students now has a student in charge of running the subsystem.

Students go through the program in cohorts, starting at the same time and graduating on the same schedule. The program is so effective at "on-time delivery" of graduations-on-schedule that this benefit to students is an important recruiting tool.

Graduating the incompetent is contrary to the mission, making quality assurance especially important. Quality assurance takes two forms, the normal quality assurance provided by other instructors who teach BATS students, and faculty reviews of student products. Lest people believe that students graduate on time because Malott allows academic standards to slip, all student projects are reviewed by at least two faculty members from within the Psychology Department who are not part of the BATS system.

The BATS subsystems, all run by students, generate the data and feedback necessary for effective performance. Running the systems provides practice in doing what the students will do once they graduate. Getting receiving system feedback on student performance after they graduate is done informally-Malott keeps in email contact with many of the graduates and meets with them at the Association for Behavior Analysis annual conference. Visible evidence of success of the graduates occurs in books they write, professional presentations they make, and behavioral systems analysis consulting firms they operate. For example, in a recent internet search for materials on the Balanced Scorecard I encountered a very practical how-to-do-it book written by Mark Graham Brown who graduated several years ago. Similarly, one of the

significant books in the area of behavioral safety was written by Terry McSween who earned his Ph.D. in an earlier version of the BATS system. I predict that collecting quantitative and objective measures of success of graduates will become the topic for a BATS student project soon and that maintaining the data will become a routine part of the system.

The third cutting edge application is in the private sector.

Application #3-An Application in a High-Technology Company

The second cutting edge application I'll describe occurred almost 30 years later, in the early 1990s. It was Susan Eickhoff's doctoral dissertation conducted over a span of about 2 years. (The actual work began before the study and continues today.) The research dealt with integrating behavioral systems analysis concepts, total quality management concepts, and strategy implementation concepts. The first part of the research was to integrate concepts from the three different literatures into one set of concepts that could be applied in the company. The second part applied the concepts to manage the company in a manner that accomplished the day to day work while implementing strategic initiatives.

The company is the one I mentioned in Part IV, the one that Jon Eickhoff was managing quite effectively and heroically but, unfortunately, self-destructively because the effort required was too great to sustain. The company is plastics proto-typing company with about 150 employees and Fortune 100 clients. The company has two major service lines:

enabling clients to move quickly from concept to prototype by designing the molds for plastic injection production of the housing for new products, primarily in the computer and communications industries.

doing the first production runs, making the first few thousand products.

The first productions runs used aluminum injection molds which the company must make quickly, enabling the clients to have products on the market by the time steel molds can be made for later and longer production runs. Nearly all the company's clients are large companies that have the resources to do the work that they outsource. The clients outsource only because the company can do the work faster. Quality standards must be high and the price tag is premium but, because of the speed, actually cheaper for the client in terms of opportunity costs and perhaps actual costs.

The company had evolved from a company that sent engineers to their clients to deal with special problems. They helped their clients bring products to market better and faster. As time went on, it became clear that the consulting engineers could stay home and do some of the work themselves cheaper than by flying and helping clients do it. Thus the company modified itself in response to a marketplace opportunity, in this instance very detailed knowledge of the Receiving System. The company could be successful only if it could do a project better and faster than their clients. Their clients were their major competitors. Thus, the company's competitive edge was being able to outperform "competitors" who had access to more people, more money, and, often, more advanced technology. The competitive edge requires outstanding performance.

The behavioral systems analysis work was directed at maintaining the competitive edge by learning to manage effectively but not heroically. The work involved several different projects, tracking the results of each project, providing additional feedback (to workers, work groups and functions), and managing by tailored scorecards that cascaded downward from the managers in charge of the two major service lines.

The key to success was in making the scorecards work. The numbers demanded by the tailored scorecards were based on business strategy and current business goals. The internal measures were set based upon the marketplace results to be achieved.

Measures and goals were not based on what sales or marketing or accounting or human resources or data processing or any other function believed was reasonable but upon the unreasonable demands of the marketplace. For example, profit margins had to be maintained (in order to meet the requirements of a leveraged buy-out) while prices were maintained (in order to meet competitive pressures) and materials costs doubled (which was an external economic factor well out of the company's control.) In addition, labor costs were reduced while headcount was maintained and individual's compensation increased (in order to implement specific strategic initiatives.)

A summary of the results is simple: customer relations, on-time delivery, profit margin, and strategic goals were met. The internal measures showed improvements. Sales, profitability, and customer relationship measures met or exceeded minimum goals but did not always meet "challenge" goals. The business owners believed that, although the company had always been innovative, the innovative projects had not always fit together well. The behavioral systems approach enabled them to achieve synergistic effects rather than having one initiative compete with another.

Over 10 years have gone by so I can report on the sustainability of this cutting edge work on using a balanced scorecard to manage an organization as a system. In the world at large, more companies are edging toward being managed as systems. Kaplan and Norton (1996) articulated a similar notion and introduced the term balanced scorecard into the management lexicon. Within the company, much has changed. There are new faces, new machines, new responsibilities, and new challenges. Jon had a heart attack but it did not kill him and it did not kill the company. His wife, Sue, had been taking on more and more of the operational responsibilities and, after the heart attack, did so officially as the new CEO. Jon meddles little, supports a lot, and pursues his hobbies avidly.

The scorecards are in place and continuously refined. Jon and Sue can leave town for extended period-they are building a new home 2000 miles from the plant. But even while they are on the road, Sue is the CEO. She uses a cell phone to call in and connect her laptop to the company's information systems. She looks at her scorecard and can drill down to those of every member of her management team and everyone else, if she wants to. But usually she does not look at the scorecards because the leadership team members give her daily email updates. She can ask questions, praise good work, and initiate corrective action. Her team likes to demonstrate that they can handle everything well when she is gone.

Not everything goes according to plan and projection. As one team member put it in an email recently "I was tempted to try to fix this without telling you but it would soon show up on the scorecard. Here's how I'm trying to get it back on track: ... ... Any suggestions?" Sue leaves the premises, she does not neglect her responsibilities. Jon observes, coaches, and smiles.

Conclusion-an invitation to think

Two of the applications above are in the public sector, a human service agency and a graduate training program. The third is in the private sector in an industry in which time is of the essence. I argue that applicability to such different settings demonstrates the power of the concepts. One could argue that the only reason the concepts are applicable is that they are vague generalizations that would fit anything. What do you think? Is it the concepts are fundamental, as I allege, or are they just applicable as vague generalizations?

Why is Receiving System feedback more urgent at Ronningen Research and Development than it is in BATS or the Reading Service?

In Part VI, I will describe more cutting edge applications and show the current status of some of the cutting edge tools being used to do cutting edge work.

Part VI Illustrative Applications

Dale Brethower, Ph.D. Professor Emeritus

Western Michigan University

Part I of this series of articles:

describes behavioral systems analysis as an approach that draws from two disciplines, behavior analysis and generals systems theory asserts that knowledge from both disciplines is important for practical work because behavioral knowledge about how each person will act within a specific environment and general systems knowledge about how organizations and other living systems function is essential in today's complex world describes B = f (O, E) as the fundamental concept of the biological, social, and physical sciences, psychology, and general systems theory.

Part II provides a way to analyze any activity into 3 essential components, using the 3 term contingency. The 3 term contingency is the smallest meaningful unit for analyzing individual performance. Part II then describes three different service models used by successful consulting firms. Each firm, in a different way, helps managers apply the 3 term contingency and associated principles within business environments.

Part III describes the smallest meaningful unit for managing organizational performance, the adaptive system. The adaptive system concept is the basis of the total performance system diagram that shows the 7 essential components of an

adaptive system. If any one of the 7 components is weak or missing, intelligent performance is very difficult or impossible.

Part IV describes the Value Set, a concept from general systems theory that helps keep the most important organizational variables in focus. It then introduces 3 additional general systems concepts, the concepts of homeostasis, interconnectedness, and living system. These 4 concepts plus 3 described in Parts I, II, and III, support the notion that long term success for any organization in a changing world requires managing it as a whole, not as a collection of separate parts.

Part V describes three cutting edge applications, two in the public sector (a reading clinic and a graduate program) and one in the private sector (a high tech company). The applications are cutting edge in that they explicitly apply behavioral systems analysis to manage a total organization.

Part VI describes two additional cutting edge applications, one in county government and one in a small business.

Introduction

The next applications are in local (county) government, a small (4 employee) business. The local government application is included to illustrate some of the real constraints involved in doing behavioral systems work; local governments are pushed this way and that by special interests, believe they are under-funded, and live the bureaucratic reasons behind the saying: "You can't fight city hall!"

The very small business is the story of a transformation from a failing to a successful business. I should also confess that the people leading the work all studied behavioral systems analysis with me at Western Michigan University.

Application #4-An Application in County Government

The prosecuting attorney in Kalamazoo County faced a problem that many businesses would like to have: he had too many customers. Several local police departments were doing a good job of arresting people suspected of having broken the law. The Office of the Prosecuting Attorney was charged with presenting the case so that the courts could determine whether or not the suspicions were correct. The caseload had been increasing steadily for several years; however, the budget of the Office was not keeping pace. It was not possible to hire enough additional attorneys to handle the load; opinion polls and news editorials indicated that the public did not wish to have the police to apprehend a smaller portion of the lawbreakers, nor did they approve of a trend toward resolving cases by plea bargaining, nor did they approve of the County Commissioners putting more tax dollars into the Office's budget.

The prosecuting attorney wanted to maintain or improve the quality of the Office's work while improving the number of cases handled, and without requiring the attorneys to work even longer hours. He and the attorneys believed that most attorneys could easily get higher paying jobs and would if they had to work harder for the lower pay they received. The prosecuting attorney familiarized himself with the quality management literature and talked to several vendors who were willing to help

him with the problem. None of the vendors were able to convince him that they could solve the problem.

The prosecuting attorney, therefore, funded an internship that enabled a doctoral student, well versed in behavioral systems analysis, to work on the problem for two years. The general approach was to document and improve some of the internal processes, help people measure effectiveness, and have people work in teams to solve specific problems as well as to get more work done through processes revised to support teamwork. Prosecutors tend to bring their adversarial skills to the office which makes it a bit difficult to establish teamwork. In addition, the prosecuting attorney, who unabashedly used a command and control management style, had to change to a participative management style. Not because he wanted to or even because management experts advocate doing so but because it was the only way to implement some of the changes that he agreed were necessary. It was especially difficult to learn to reward bringing problems and issues to the surface rather than inadvertently rewarding hiding problems and blaming others.

The intern, Tim Nolan, used process mapping and project management technology and used his knowledge of behavioral systems concepts to facilitate efforts to specify and measure quality of work performed within specialized service areas. His major role, it turned out, was as a behavioral coach, providing social reinforcement and suggestions to individuals and teams.

Tim learned to work within the constraints of the heavy workloads, limiting his initiatives to bare essentials, setting priorities among necessaries, and celebrating small successes. A team of volunteers was formed to celebrate successes, partly to provide greater recognition of successes and partly to build positive recognition into the culture. Another significant small success occurred when two of the teams began seeking and obtaining "customer feedback" through use of simple forms filled out by clients. Both internal (processing system) and external (receiving system) data were adequate to support hard work but inadequate to support improvement. (That is the situation in a great many workplaces.)

The overall success of the project was both extraordinary and limited. Anecdotal evidence was very positive but objective data were limited. For example, representatives of a consulting firm who had done a study before the internship and another during the second year of the internship reported that they had never seen as much positive change in a prosecutor office in such a short period of time. The prosecuting attorney's new participative style is obvious, not only to him but also to everyone in the office. People report significantly improved working relationships among attorneys, among support staff, and between support staff and attorneys.

The anecdotal evidence is strong enough to support the notion that the project was highly successful. I heard some of the anecdotal reports first hand in conversations with attorneys and staff. I consider them encouraging but not convincing without better data. Even if the rumors of success are accurate, the success probably cannot be sustained for more than another couple of years unless better processing system feedback and better receiving system feedback mechanisms are established. If the voters elect a different prosecuting attorney who puts his or her own preferred

management style-or management superstitions-to work, the successful practices and procedures developed by the current staff will be eroded.

On the other hand, two actions by the prosecuting attorney make the success more visible and more likely to be sustained. He sent an unsolicited and extremely positive letter of recommendation about Tim Nolan's work. He recommended to a new county administrator that the administrator recruit another intern "like Tim" to support a total quality initiative in the county. There was no one just like Tim (who is now a consultant with CLG, one of the firms mentioned in Part II). Peter Dams, though "not Tim," served ably as that intern, once again taking a total system/behavioral systems analysis approach to the task.

Peter completed his dissertation at the county during the internship. The topic of the dissertation was the validation of a new internship model. The typical internship has the intern working under the close supervision of a mentor at the internship site. Dams' model is for an internship, like the ones Tim and Peter had, in which the intern serves as a technical expert who receives technical mentoring only from the university and not from the site. The literature on internships mentions that one of the benefits to the site is that interns often bring in new ideas (or cutting edge technology.) That benefit is likely to increase in value as the pace of innovation increases, which is one of the reasons faculty members approved the dissertation topic.

The dissertation reports projects Peter supported, all of which have satisfaction data from the internal clients and a few of which have reasonably good objective data. The dissertation also includes a listing and examples of specific behavioral systems technology that he used during the internship. These include my Total Performance System/Adaptive System diagram and a one-page job aid (see http://kanga.cc.wmich.edu/~brethower) for generating measurable mission statements, Geary Rummler's Super-System diagram and Cross-Functional Process Map (Rummler, G. & Brache, A. 1995), and Tom Gilbert's Behavior Engineering Model (Gilbert, T. 1996). Specific tools were introduced into the organizations and used by persons other than the interns. For example, the county's new organization chart closely resembles Rummler's Super-System diagram.

I describe the work in the prosecutor office and the county as cutting edge application, not because the data about success are convincing but to present the work in a realistic perspective. Systemic change is typically messier than it might appear from glowing case study reports in the popular press. The great strength of behavioral systems analysis is that we have the tools to deal with the very human and messy beginnings and a theory and technology that is powerful enough to guide us through a sustained effort. The next case involves clear results that have been sustained for several years in a small business.

Application #6--An Application in a Small Business

Solid Flue sells and supports chimney relining materials and services. Solid Flue's relining process involves inserting an inflatable tube into a chimney, pouring a special cement-like relining material into the chimney, and deflating and removing the tube once the material has hardened. Solid Flue earns most of its money by selling the special relining material. Solid Flue's customers are, typically, contractors who

remodel homes or repair fire-damaged homes. The relining business is a profit center within the contractor's business.

A critical business issue brought the owner of Solid Flue, Doug LaFleur, to behavioral systems analysis. The business, originally owned by Doug's father, had been losing money for some time. Doug, his brother, and 3 others were the employees. For a variety of reasons, detailed in his book *The Transformation*, Doug had decided to purchase the company from his father. His business problem was clear. He had to find a way to make the business profitable again, profitable enough to pay his father enough money to sustain his father in retirement, feed Doug's growing family, and meet the payroll. Doug was well-prepared for challenges: he had been the starting quarterback of his college football team, had several years of experience in outside sales work for a large company, had just earned his Masters in Business Administration, knew the Solid Flue business, and knew most of Solid Flue's customers personally. All that preparation enabled Doug to accept the challenge but it did not tell him how to meet it. It was clear what had to be done. He had to improve customer relations-customers were leaving-improve cash flow, and turn a profit it, and do all that in a hurry. But it was not clear how to do that.

He learned how by taking courses in behavioral systems analysis. As he worked through each course, he took a bit of technology from it and applied it to his business. The turnaround began during the first weeks of his first course when he learned a strategy for returning to profitability. In each course that followed, he acquired additional technology for applying the strategy. The technology, unbeknownst to Doug at that time, had been designed so that each piece fit with each other piece and supported it. The results were related to value set variables and the effects were cumulative.

Doug's strategy was simplicity itself: he had to assure that his clients' profit centers were profitable and successful in increasing their business. The more success they had, the more product they could buy. More of them would continue to be customers and the cost of recruiting new customers would go down. Please notice that his strategy changes the nature of his business: Doug had to become a business consultant rather than "a chimney guy." Rather than merely sell to them and service the account, he had to help them sell to their customers more effectively. After that, he had to help them deliver what they sold more efficiently and effectively.

His clients know much of what Doug had learned while earning the MBA. Like most owners of small businesses that I have known, each fiercely believes that he knows more than Doug does about the nuts and bolts of running his business in his community. Nevertheless, Doug's business became profitable within the first year because more and more of their businesses became more and more profitable. Doug then set about developing and refining the delivery system he used to provide the business consulting services. More details about what he did and how he did it are included in his book. (It is his book, though he acknowledged my role in sharing behavioral systems analysis principles by including me as an author.)

His approach followed closely the lessons I had learned from B.F. Skinner: Know the O, know the E, manipulate E variables to improve O's behavior (B). In this case, the O was Solid Flue and Doug knew it well at the beginning. The E, was his customers and

the business environment they operated in. He then had to learn how they could operate their organizations (O) successfully in their environments (E), viewing each of their businesses as adaptive systems.

He worked with his customers to get agreement on the value set variables they had to manage. He designed his delivery system around those variables and what he knew about the feedback, coaching, and social support they would require to manage those variables. There were two key parts to the delivery system, client group meetings and weekly performance feedback. The weekly feedback operated like this: they faxed him the data, he sent them back two items, one with graphs that showed trends in all the key variables and one that offered congratulations, comments, and suggestions.

The quarterly client group meetings were structured very carefully to provide very specific support and guidance. A client hosted the meeting each quarter. The host shared data, goals, and plans with the group. The group asked questions, made suggestions, etc. and provided significant peer pressure to present data clearly and honestly and to follow through with plans. Doug sometimes presented new ideas or concepts directly related to the host's business issues. Group members looked at the business records and interviewed the host's employees to get their input. Part of the meeting was spent going over each person's business data but the major focus was on the host; the group made very specific and detailed recommendations.

The group meetings plus the weekly feedback graphs provided each business owner with guidance and support for implementing plans and making business decisions. Without telling them directly, Doug was helping them manage their businesses as systems and in accord with principles of behavioral systems analysis.

The title of the book, *The Transformation*, was prophetic. It described the transformation of a dying business into a thriving business. It also marked a transformation from selling and servicing products into a consulting business. What Doug did not expect was that he would also transform his consulting business into one that operates in a very different industry. Doug, the chimney man, is now building a business in the health care industry, specializing in doing for cardiology practices what he has done for his chimney reliners.

There is a strategic reason for the shift. There are a finite and declining number of chimneys requiring repair. On the other hand, there is a much larger and rapidly growing number of hearts that require repairs or other treatments. Could behavioral systems technology be applied to cardiology practices? Putting in a shunt, doing a by-pass, transplanting a heart, or providing less dramatic treatments is much more complex than relining a chimney. The health care industry is very different than the construction industry. Doing your work in a hospital is very different than making a house call to repair a chimney.

But when all is said and done, cardiologists provide services and sell services. Demand for their services is so high that their sales costs are next to nothing. Cardiology patients, like customers everywhere, want services that are better, faster, and cheaper. Better, faster, and cheaper cardiology services would benefit patients, employers, and society at large. That is not over-simplification, it is obvious fact. Cardiologists have a noble mission and it would be nice if behavioral systems

technology were up to the challenge of helping them. Doug LaFleur and his colleague, Karolyn Smalley, have accepted the challenge. It is clearly a cutting edge application because it must deal with a large number of difficult system issues that have proven to be quite intractable in recent years.

Conclusion-an invitation to think

If you would like to gain insight while practicing, make an adaptive systems/total performance system diagram (like those in Part III) for Doug's chimney business and for a cardiology practice. Compare them. You have almost enough information to do so. Doug had almost, but not quite, enough information to do it when he first began a behavioral systems analysis of his business and when he began with his first cardiology practice.

If you wish, make a total performance system diagram for the prosecutor's office and for a county government. You will notice, if you think it through, that the county government has many little adaptive systems in it-or little subsystems locked in a homeostatic balance with what benefited the citizens in days long past.

Imagine some of the difficulties you would encounter if you tried to persuade the owner of a business or the head of a county government department such the department that manages the airport, the parks, or the sanitation services that he or she would really benefit by getting regular and systematic feedback from customers.

Think about how Doug or Peter or Tim would go about deciding which projects to take on-there are a zillion little problems that people can tell you about. How would they go about deciding which ones to put major effort into? (You might want to think about value set variables, time constraints, and what the clients would and would not expect.)

Part VII describes behavioral systems analysis work in the International Association for Behavior Analysis. The work is ongoing and performed by the Executive Director and her staff. The organization has approximately 3000 members and relies on volunteers to do much of its work. Part VII includes examples of a few of the actual tools that are used in these behavioral systems analysis applications. The tools were the subject of a symposium presented in 2001 at ABA's annual conference. Part VII concludes by mentioning the work of a loosely knit collection of individuals working to simplify and clarify the language used in practice by behavioral systems analysts.

Part VII Toward the Future

Dale Brethower, Ph.D. Professor Emeritus

Western Michigan University

Part I of this series of articles:

describes behavioral systems analysis as an approach that draws from two disciplines, behavior analysis and generals systems theory asserts that knowledge from both disciplines is important for practical work because behavioral knowledge

about how each person will act within a specific environment and general systems knowledge about how organizations and other living systems function is essential in today's complex world describes B = f (O, E) as the fundamental concept of the biological, social, and physical sciences, psychology, and general systems theory.

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Part IV describes the Value Set, a concept from general systems theory that helps keep the most important organizational variables in focus. It then introduces 3 additional general systems concepts, the concepts of homeostasis, interconnectedness, and living system. These 4 concepts plus 3 described in Parts I, II, and III, support the notion that long term success for any organization in a changing world requires managing it as a whole, not as a collection of separate parts.

Part V describes three cutting edge applications, two in the public sector (a reading clinic and a graduate program) and one in the private sector (a high tech company). The applications are cutting edge in that they explicitly apply behavioral systems analysis to manage a total organization.

Part VI describes two additional cutting edge applications, one in county government and one in a small business.

Part VII briefly describes cutting edge behavioral systems analysis work in the International Association for Behavior Analysis and two current initiatives to advance the field. Part VII includes examples of a few of the actual tools that are used in behavioral systems analysis applications.

Introduction

Application #7-An Application in a Professional Association

The International Association for Behavior Analysis (ABA) was formed over 30 years ago and has approximately 3000 members (see www.wmich.edu/aba/). The membership includes many professionals, academics, and students who work in the public sector and a significant number of professionals who work in the private sector. The association is managed as a total system. Dr. Maria Malott, the Executive Director, believes that she can mange the association competently only through behavioral systems analysis. She wants to know and show that she performs competently as executive director while keeping her day job as a consultant and an adjunct professor in several universities. Most of the ABA members have a strong

scientific background and understand the importance of data-based management of the association.

Dr. Malott regularly shows comprehensive and objective data on operations to the ABA Board of Directors. She demonstrates how paid staff and volunteers are involved in significant issues. She takes delight in demonstrating that she carries the ABA management system around in her laptop. She can quickly scroll through graphs to show how various subsystems are performing and can scroll through process maps to show in exquisite detail how specific work gets done. For example, she has a complete, detailed, and very long cross-functional process map with a supporting set of job aids that support running the annual conference. (This tailored technology, "the conference in a box," was developed by staff member and graduate student Lori Miller.)

Application #8-An Application to Develop and Deploy Behavioral Systems Technology

The Performance Design Lab is a small consulting firm formed by Geary Rummler two years after selling his former company, The Rummler-Brache Group. Performance Design Lab develops, validates, and transfers performance technology. Rummler is a thought leader in the field; he developed much of the technology used by people who did the work referred to in this series of articles. (Many examples of slightly older but still cutting edge tools are included in the best-selling book by Rummler, G. & Brache, A. 1995.)

The Performance Design Lab operates public workshops and does consulting projects that include new tools that Rummler and his colleagues have developed. The new tools emphasize the development of measurement and management systems to operate total organizations as adaptive systems comprised of adaptive sub-systems. Some of the technology this group has been using was the subject of a symposium at the 2001 International Association for Behavior Analysis conference. (Sasson, Rummler, and Brethower, 2001) The symposium, organized by Joe Sasson, dealt with a very specific problem. How can someone become expert in behavioral systems analysis in a few months?

The ABA Symposium: Research on expertise tells us that experts in any field differ in specific ways from novices. Novices see each new situation as new. Experts see each new situation as similar to ones they have seen before. Novices have to deal with a vast unknown--even if they begin with solid theoretical knowledge.

Another characteristic of experts is that problems that appear very complicated to novices appear rather simple to experts. The novice sees things as a vast array of separate variables, each one potentially important; the expert sees things as a small array of interconnected variables, each one important in a specific way. A novice grounded in theory knows that he or she will discover, on analysis, a few important variables and knows, in theory, what they are but is clueless about how the actual variables can be identified and controlled in a new setting. Experts can say "Oh, that's simple!" and mean it. (They can also spend hour after hour giving intricate, detailed, and confusing-to-novices explanations about the simple thing.)

Another difference between a novice and an expert is that a novice can approach a problem in only one way; if that way doesn't work, the novice is stymied. An expert, on the other hand, can approach the problem from several angles. The novice wants a recipe, a 1, 2, 3 procedure. Experts know that 1, 2, 3 procedures work only occasionally and expertise requires great flexibility in how something is accomplished. The expert can go with the flow whereas the novice tries to control the flow and gets swept under.

Research on expertise is very clear about what it takes for a novice to become expert. First, it takes guided practice. Second, it takes more guided practice. Third, it takes even more guided practice. Students and people newly hired in a consulting firm or an internal unit offering services related to behavioral systems analysis would like to acquire expertise quickly.

Operating a growing consulting firm requires either the ability to bill clients for shoddy work or finding efficient ways to help novices learn quickly. Similarly, operating an effective graduate program in behavioral systems analysis requires efficiency unless we make the program several years in length. That is one reason Geary Rummler and I develop so many job aids. Good job aids help enormously in guiding practice. If we construct a job aid that captures many of the lessons we have learned over the years, someone can use the job aids to become expert in much less time than we required ourselves.

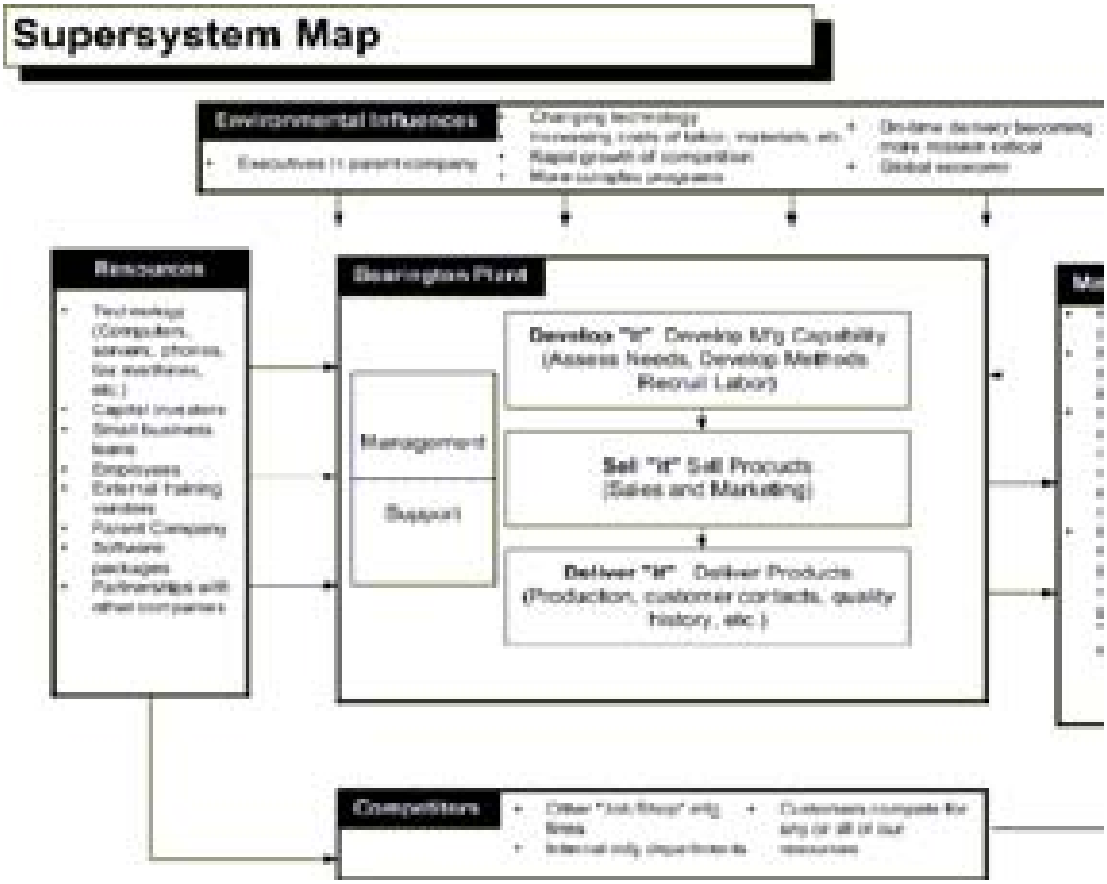
Examples of Job Aids for Behavioral Systems Analysis: The total performance system diagram, shown in Part III is one job aid. Novices practice by using blank diagrams to fill in the details that depict a specific system.

A mission statement job aid helps draft organizational or personal mission statements (see http://kanga.cc.wmich.edu/~brethower in section devoted to Psychology 651 Behavioral Systems Analysis). The job aid asks a series of simple questions that get the relevant ideas captured on paper quickly. I typically facilitate the efforts of people involved in the organization by helping them weave the answers into a relatively simple mission statement that looks, on the surface, a lot like the mission statements that can be found on thousands of organizational web pages.

Not everyone knows that the words, no matter how they are generated, are essentially meaningless except to the people who generate them. The mission is not "real" until it is "wired in" by with managing based on measures of everything specified in the mission statement. For example, if you analyze the mission statement for the Reading Improvement Service in Part III, you will discover that measures and indicators for everything said are built into managing the work of the Service. Another example that shows the measured connections between the words of the mission statement and the actions of the organization can be found in LaFleur and Brethower, *The Transformation*, (1998).

One of the most important tools is Rummler's Super-System diagram template. It helps people get clear about the importance of the external environment. The diagram below (prepared with a template in a previous version of Microsoft Visio) is one I produced for the fictitious Bearington Plant in *The Goal* (Goldratt & Cox, 1984). It shows the key parts of the Market-investors, the parent company, and so on; key

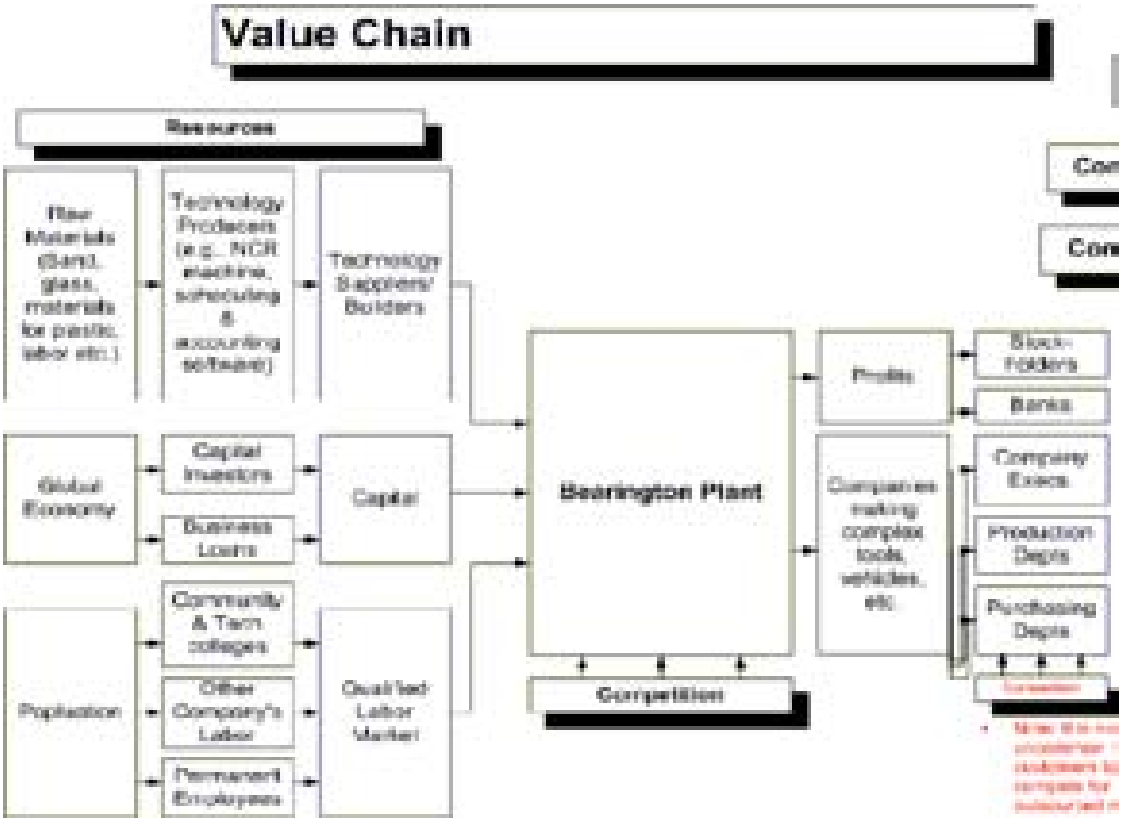
Resources-technology, people, money, and so on; key Environmental Influences-executives in the parent company, changes in the global economy, growing competition, and so on; key Competitors-though on this fictitious diagram the competitors are not listed by name and locus of the competition.



I drafted it to show that the Bearington Plant processing system deals with the classic functions Developing capability, Selling products, and Delivering products (which includes production). I also show two boxes, Management and Support. Support includes accounting, human resources, information technology, scheduling, maintenance, and so on, all the functions necessary to support the three primary processes. Management includes all the planning, budgeting, leadership, and so on necessary to coordinate all the resources and get the work done in accordance with the constraints imposed by the marketplace, suppliers, competitors, and the economic, social, and physical environment.

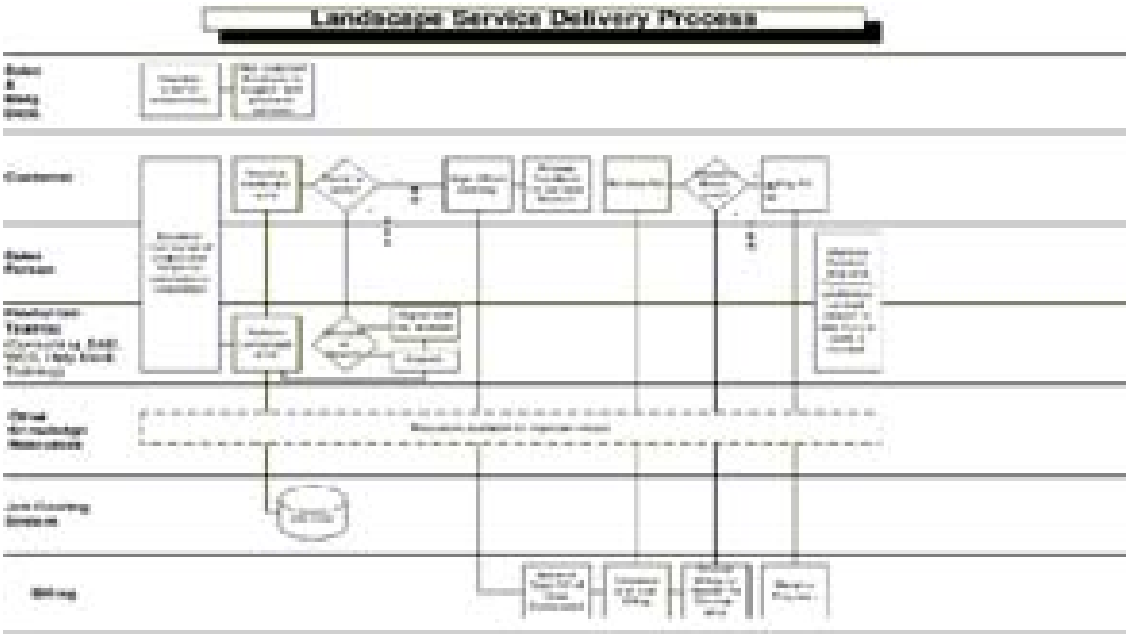
When I draw the Receiving System box in the total performance system diagram, I imagine that it includes the resources, competitors, and environmental influences. The Super-System pulls them out of the little Receiving System box and shows how they literally surround the Processing System. Showing them explicitly is essential for strategic planning and goal setting. Rummler uses another tool, the Super-Duper System Diagram which expands the diagram horizontally to show that the suppliers as well as the receivers are part of a complex value chain. The diagram below is my attempt to show how it would look for the Bearington Plant. The draft shown is weak on the customer/receiving system side. It correctly shows stockholders and banks as customers for financial results and the several departments within the customers'

processing systems-the execs, production, and purchasing. The diagram should move at least one more step to the right and show the customers' customers. If the Bearington Plant is to add value to its customers, it must provide goods or services that benefit the customers' customers. For example, Doug LaFleur had to look that far down the value chain to make his chimney business work profitably (see Part VI of this series).



There some extra Competition boxes sprinkled around on the diagram. It is my whimsical way to emphasize that multiple and sometimes unknown competitors surround an organization. We use these particular tools to help executives and managers "think outside the box."

The next diagram shows a reasonably simple cross-functional process map of the service delivery process for a landscaping service. The diagram was developed by Joe Sasson and is based on the process of a real firm, though it departs from what the firm actually does. One value of this tool is that it shows who has a hand in the process. The horizontal lines enclose a specific part, person, or resource of the landscaping firm that performs specific activities in service delivery. We, as a convention, always include the customer, at or near the top of the chart. A major value of the chart is that it shows where everyone "touches" the process. This tool (and all the others) is typically used by the analyst by interviewing people, looking at documents, and making a rough draft. The draft is reviewed by the people involved who discuss it and make suggestions and corrections. Typical reactions are: "I didn't know what everyone did!" "That can't be the way we do it; there are unnecessary steps in it!" "No wonder we have trouble getting it right!" Drawing up things the way they are has turned out to be a major motivator for improvement efforts.



It takes a few rounds of practice to become competent in using any one of the tools shown here (and several others there is not room for). The benefit is that the tools guide the process and clarify communication among people involved. A new person can get up to speed a lot faster using the tools than would be possible without them.

The set of diagrams begins to "capture expertise" and show why every new situation looks familiar to an expert. Experts see new situations through the lens of extensive experience. The diagrams capture the essence of those experiences-after the diagrams have gone through a couple of dozen drafts and been tailored to many different situations. That is the good news. The bad news is that each of the pioneers in the field were busily developing their own toolkits, based upon their experiences with specific sets of problems. As a result, each pioneer has a toolkit but each pioneer has a slightly different set (see Dean & Ripley, 1997). There is much in common across experts. Unfortunately, from the perspective of the novice, the theme is almost totally obscured by the variations. That is why application #9 is, potentially, very important.

Application #9-An Application to Integrate Multiple Approaches to Performance Improvement.

Both general systems theory and applied behavioral analysis began in the 1950s accelerated in the 1960s. While both developed their own theory languages, the applied work has not developed standard tools and procedures. The theoretical rigor and fundamental consistency among the pioneers of the field has not been at all obvious to students, clients, or other interested parties. Lack of standardization has been both a strength and weakness of the work. It is a strength in that we have been free to try different tactics and it has been a weakness in sharing the results among ourselves, with clients, and the general public. It appears to some of us that the time has come to begin the difficult task of achieving as much standardization as we can without locking ourselves into static approaches to inherently dynamic work.

An informal group is currently working on developing a language-in-common and a methodology-in-common to reduce the communication difficulties and show one

another and the world more clearly just what we do and how we do it. The work is an outgrowth of conversations begun during a think tank sponsored by ISPI, the International Society for Performance Improvement in the fall of 1997. If we use the founding of ISPI in 1961 as the marker for the beginning of the field, the seven members of the group bring a combined total of approximately 280 years experience to the task. The intention is to capture the lessons learned by members of the group, not to capture history, but to create a foundation for moving forward. We will, of course, make use of what has worked in the past but the work product of the group will be cutting edge and systemic, applicable to total organizations both large and small. The group is informal so there is no clear membership roster; we expect to involve more people in the work as soon as we have made enough progress to merit it. (The work is so "cutting edge" that we can not promise results! Yet.) The URLs of web sites of most members of the work group are in the References below. Some of the work of the group is posted on my web site at Western Michigan University.

Comments

I selected applications to describe in this series of articles based upon three considerations.

The work had to be applied to total organizations

The work had to apply the behavioral systems analysis concepts described above.

I had to have direct knowledge of the work.

There is much excellent work in the field that I did not describe.

Behavioral Systems Analysis works from the outside in. By that I mean that each application looks first at the environment. The total performance system diagram, the super-system diagram, and the value chain diagram are all tools that guide discovery of the environmental influences on value set variables. The purpose of schools and businesses and government agencies is to add value to the environment; the environment must be examined closely to determine where and how it might be possible to add value. It is also helpful to look at the state-of-the art in products or services to find out what others, potential competitors and allies, are doing. Then the leadership of the organization can make an intelligent guess about whether or not the organization can deliver the value better, faster, or cheaper than others. If so, there is an opportunity.

The oldest application, the reading clinic, used the adaptive system diagram to define the mission of the clinic, identify the most critical parts of the receiving system, and specify the added value we aspired to provide and have receiving system feedback confirm. From there we could identify standards for our outputs by specifying typical tasks that our graduates would be able to complete and specifying both how and how well they would complete them. After specifying the tasks and identifying what the tasks had in common we were able to define the processes we would have to use to meet the standards. In many instances, best practices in reading were not good enough to meet the standards. We had to make a choice: either bow to the inevitable and

lower our standards to what existing practices could provide or do the research and development work to provide necessary quality and efficiency of service.

Similar choices were made in the other applications. If best practices are not good enough, invent better practices! There is a sense in which that is the essence of behavioral systems analysis. Use these powerful concepts to invent better ways to assure exemplary performance by persons and by total organizations.

Rummler invented his Super-System diagram to unpack the Receiving System box and show what designing from the outside in really means. I have used the Super-System diagram with students to teach what strategic planning must be about and to help a small number of organizations develop strategy. Rummler has used the diagram to help organizations identify the critical (value set) variables they should be tracking, to define the measures that go into the organization's scorecard, to show the external relationships that must be managed, and to identify standards that must be set for internal processes.

Culture change was mentioned specifically in the Office of the Prosecutor application but it was an enabling part of all eight. Each application changed what people talked about at work, the way people interacted with one another, and the way people worked together to improve the organization. Three members of the group working to integrate language and methodology specialize in systemic approaches to establishing healthy organizational cultures.

Concluding Comments

Another very significant initiative is being implemented by ISPI, the International Society for Performance Improvement (www.ispi.org). ISPI has developed 10 Standards for people to meet who wish to earn the designation of Certified Performance Technologist. The Standards help define good work in our profession, whether we call it organizational behavior management, behavioral systems analysis, or human performance technology. The Standards can be found at www.certifiedpt.org

One of the best summaries I have heard of the nuts and bolts of behavioral systems analysis came from a student in one of my graduate classes. The student was not trained in behavioral systems analysis (before the class) but was in a graduate program in engineering. His summary? "I get it! As an engineer I learned to sweat the details. Now I know that's only part of it. First, get the big picture in focus! Then sweat the details!"

That engineer was right. Detailed technical knowledge is necessary in every endeavor, from laying bricks to designing space vehicles to designing and managing modern organizations to helping our children and grandchildren survive and prosper in the twenty-first century. But, to use expert knowledge, first get the big picture in focus. Behavioral systems analysis has powerful tools for doing that and is developing tools to enable us all to do it better, cheaper, and faster.

I felt honored when asked to share these concepts and applications at the 2002 annual conference of the International Association for Behavior Analysis and doubly honored when asked to share them again with people who visit the Cambridge Center for

Behavioral Studies web site. I have been both excited by and proud of the work done by a few dozen, then a few hundred, and now a few thousand people who are building a better world using behavioral systems analysis concepts and technology. The fundamental concepts are deceptively simple, yet require considerable effort to master. The technology being developed is intricate and detailed but it is something that any educated person can understand. If past successes are an indicator, it is worth learning about.

References

Carelton, R. & Lineberry, C. www.vectorscan.com

Dean, P.J. & Ripley, D.E. (Eds.) 1997. Performance Improvement Pathfinders: Models for organizational learning systems. ISPI Publications: Washington, D.C.

Goldratt, E. & Cox, J. (1984). *The Goal: Excellence in manufacturing*. Croton-on-Hudson, NY: North River Press, Inc.

LaFleur, D. & Brethower, D. M. (1998) *The Transformation: Business strategies for the 21st century*. Grand Rapids, MI: .Impact Groupworks.

Kaufman, R. www.megaplanning.com

Malott, M. www.wmich.edu/aba/

Rummler, G. www.performancedesignlab.com

Langdon, D. & Whiteside, K. www.performanceinternational.com

Rummler, G.A. & Brache, A.P. 1995. Improving Performance: How to manage the white space on the organization chart. 2nd Edition. San Francisco: Jossey-Bass.

Sasson, J., Rummler, G., & Brethower, D. (2001) Increasing Organization Intelligence and the Use of Process Templates. Symposium presented at the International Society for Behavior Analysis annual conference

Dams, P. (2001). The Intern as Performance Consultant to Local Government: A New Internship Paradigm. Kalamazoo, MI: Ph.D. Dissertation, Western Michigan University.

Gilbert, T. (1996). *Human Competence: Engineering worthy performance*. Amherst, Mass & Washington D.C.: HRD Press, Inc. & The International Society for Performance Improvement.

LaFleur, D. & Brethower, D. M. (1998) *The Transformation: Business strategies for the 21st century*. Grand Rapids, MI: .Impact Groupworks.

Rummler, G.A. & Brache, A.P. (1995). *Improving Performance: How to manage the white space on the organization chart*. 2nd Edition. San Francisco: Jossey-Bass.

Behavior Analysis Training System http://unix.cc.wmich.edu/~malott

Brethower, D. M. (1970). *The Classroom as a Self-modifying System*. Ann Arbor, MI: Ph.D. Dissertation, University of Michigan.

Brown, M.G. (2000). Winning Score: How to design and implement organizational scorecards. Portland, Oregon: Productivity Press.

Eickhoff, S.M. 1991. *Organizational Development through the Implementation of Strategic Plans*. Kalamazoo, MI: Ph.D. Dissertation, Western Michigan University.

Kaplan, R. & Norton, D. (1996). The Balanced Scorecard: Translating Strategy into Action. Cambridge, Mass: Harvard Business School Press.

McSween, T.E. (1995). The Values-Based Safety Process: Improving your safety culture with a behavioral approach. NY: Van Nostrand Reinhold.

Kaplan, R. & Norton, D. (1996). The Balanced Scorecard: Translating Strategy into Action. Cambridge, Mass: Harvard Business School Press.

Miller, J.G. 1978. *Living Systems*. New York: McGraw-Hill.

Brethower, D. M. (1970). *The Classroom as a Self-modifying System*. Ann Arbor, MI: Ph.D. Dissertation, University of Michigan.

Braksick, L. W. (1999). Unlock Behavior, Unleash Profits: How your leadership behavior can unlock profitability in your organization. New York: McGraw-Hill.

Daniels, A. C. (1989). *Performance Management: Improving quality productivity through positive reinforcement.* (3rd Edition) Tucker, GA: Performance Management Publications.

Dubois, D. (1998). *The Competency Casebook.* Amherst, Mass & Washington, D.C.: HRD Press, Inc. & The International Society for Performance Improvement.

Gilbert, T. (1996). *Human Competence: Engineering worthy performance.* Amherst, Mass & Washington D.C.: HRD Press, Inc. & The International Society for Performance Improvement.

McSween, T.E. (1995). The Values-Based Safety Process: Improving your safety culture with a behavioral approach. NY: Van Nostrand Reinhold.

Malott, R.W. (1974). A behavioral systems approach to the design of human services. In D. Harshbarger & R.F. Maley (Eds) *Behavior Analysis and Systems Analysis: An integrative approach to mental health programs.* Kalamazoo, MI: Behaviordelia.

The following references provide valuable background on Organizational Behavior Management:

Brown, P. L. (1982). *Managing behavior on the job.* New York: John Wiley.

Bucklin, B. R., Alvero, A. M, Dickinson, A. M., Austin, J., & Jackson, A. K. (2000). Industrial-organizational psychology and organizational behavior management: An objective comparison. *Journal of Organizational Behavior Management, 20(2),* 27-75

Daniels, A. C. (1989). *Performance management (3rd ed.).* Tucker, GA: Performance Management Publications.

Johnson, Redmon, & Mawhinney (in press). Introduction to Organizational Performance: Behavior Analysis and Management. In Johnson, C. M., Redmon, W. K., & Mawhinney, T. C. (Eds.), *Handbook of organizational performance:Behavior analysis and management*. New York: The Haworth Press, Inc.

Mawhinney, T. C. (1984). Philosophical and ethical aspects of organizational behavior management: Some evaluative feedback. *Journal of Organizational Behavior Management, 6,* 5-31.

Mawhinney, T. C., & Fellows-Kubert, C. (1999). Positive contingencies versus quotas: Telemarketers exert countercontrol. *Journal of Organizational Behavior Management, 19,* 35-57.

Mawhinney, T. C., & Mawhinney, R. R. (1982). Operant terms and concepts applied to industry. In R. M. O'Brien, A. M. Dickinson, & M. Rosow (Eds.), *Industrial behavior modification* (pp. 115-134). New York: Pergamon Press.

O'Brien R. M., & Dickinson, A. M. (1982). Introduction to Industrial Behavior Modification. In R. M. O'Brien, A. M. Dickinson, & M. P. Rosow (Eds.), *Industrial Behavior Modification* (pp. 7-34). New York: Pergamon Press.

Poling, A. & Braatz, D. (in press). Principles of learning: Respondent and operant conditioning and human behavior. In Johnson, C. M., Redmon, W. K., & Mawhinney, T. C. (Eds.), *Handbook of organizational performance: Behavior analysis and management.* New York: The Haworth Press, Inc.