



Service Science

Publication details, including instructions for authors and subscription information:
<http://pubsonline.informs.org>

From System Science — A New Way to Structure and Manage the Company for Sustainable Success

William F. Christopher,

To cite this article:

William F. Christopher, (2010) From System Science — A New Way to Structure and Manage the Company for Sustainable Success. Service Science 2(1-2):62-75. <https://doi.org/10.1287/serv.2.1.2.62>

Full terms and conditions of use: <https://pubsonline.informs.org/Publications/Librarians-Portal/PubsOnLine-Terms-and-Conditions>

This article may be used only for the purposes of research, teaching, and/or private study. Commercial use or systematic downloading (by robots or other automatic processes) is prohibited without explicit Publisher approval, unless otherwise noted. For more information, contact permissions@informs.org.

The Publisher does not warrant or guarantee the article's accuracy, completeness, merchantability, fitness for a particular purpose, or non-infringement. Descriptions of, or references to, products or publications, or inclusion of an advertisement in this article, neither constitutes nor implies a guarantee, endorsement, or support of claims made of that product, publication, or service.

Copyright © 2010, INFORMS

Please scroll down for article—it is on subsequent pages



With 12,500 members from nearly 90 countries, INFORMS is the largest international association of operations research (O.R.) and analytics professionals and students. INFORMS provides unique networking and learning opportunities for individual professionals, and organizations of all types and sizes, to better understand and use O.R. and analytics tools and methods to transform strategic visions and achieve better outcomes. For more information on INFORMS, its publications, membership, or meetings visit <http://www.informs.org>

From System Science - A New Way to Structure and Manage the Company for Sustainable Success

William F. Christopher

Management Innovations

The Kensington #237, 1580 Geary Road, Walnut Creek, CA 94597-2744, USA

wfcmgmt.innovations@yahoo.com

This paper proposes a system science restructuring of today's management practices. The paper discusses what we have learned from system science that gives us a new and different understanding of what the company is, and how it works; and a new way of understanding the world outside the company where company success is created. System science restructures management practices at a new level of understanding; structuring the company to achieve its purpose, and changing and very much improving the way the company is managed. Stafford Beer's viable system model is a useful model for this restructuring.

Key words: organization design; management principles; black boxes; variety; key performance areas; information

History: Received Oct. 15, 2009; Received in revised form Nov. 9, 2009; Accepted Feb. 15, 2010; Online first publication Apr. 10, 2010

1. Introduction

Today's management practices evolved from the continuous improvement of past management practices. Over time, one fundamental prevailed: Company success is created in the world outside the company—in the commercial environment, the economic environment, the technical environment, the social environment, the political environment, the educational environment, and the ecological environment.

All these environments evolve too, and rapidly. Today we see accelerating change in the environments outside the company where the company lives and works, and achieves its success. Can today's slowly-evolving management practices drive success in the fast-changing world outside the company?

We see increasing dissonance, a growing misfit; management practices causing problems instead of creating solutions. Current practices limit management's ability to deal successfully with the huge complexity inside the company, and the much greater complexity and change in the world outside. The management practices that led to the financial crisis of 2008 provide one example of this dissonance and misfit. How will we deal with exploding complexity and change, and achieve sustainable success?

2. Restructuring Management Practices at a Higher Level of Understanding

The history of science shows us that in times of dissonance and conflict, the chaos can be resolved in a restructuring, a whole new approach at a new level of understanding. $E=mc^2$ restructured science at a new level of understanding and inspired new learning and growth. (Christopher, 1974)

A new science, system science, gives us the knowledge needed for a restructuring of management practices to deal with the world of today and tomorrow. System science gives us a new and different way to "see" the company, and a new and more realistic understanding of what the company is and how it works. We see and understand a different way to structure the company; and new, different, and better management practices for achieving success in changing times. This new structure, Figure 1, is very different from the conventional view of the company. This new structure, with an understanding and application of the system science and cybernetics represented by its lines and boxes, can guide the company to sustainable success through the changing times ahead.

3. Systems

A system is a group of related entities that together accomplish a purpose. Systems can be simple, complex, or very complex. A home heating system is a simple system. A corporation is a very complex system.

Systems can be deterministic or probabilistic. The home heating system is a simple, deterministic system. We set the thermostat at 72 degrees and we get 72 degrees. If we don't get 72 degrees we know what to do to repair or replace parts of the system so that we will get 72 degrees. A corporation is a very complex, probabilistic system. We set a sales revenue budget of \$xx. But we don't get \$xx. We get something else, and we don't know what to fix or change to get to \$xx. Throughout the corporation, everything is probabilistic. Today's management practice budgets and controls deterministically. The company performs probabilistically. A corporation is a very complex, purposeful, probabilistic system. We *can't* change probabilistic performance. We *can* change management practices.

The natural environment, and the world of human affairs, are structured in hierarchical systems. The earth's biosphere is a system, with many levels of sub-systems. A corporation is a system, an operating unit in the corporation is a first-level sub-system, a business in the operating unit is a second-level sub-system. Each of these corporation systems has its sub-systems, and is itself a subsystem in a higher-level system. All are very complex, purposeful, probabilistic systems.

System science studies systems to learn their characteristics and how they function. Over recent years system science has discovered characteristics and functions common to all systems, including:

- Cybernetics—the science of communication and control in systems
- Variety—the measure of complexity in systems
- Requisite variety—for effective control the requirement that the variety in control equal the variety in what is being controlled
- Black boxes—lower-level systems whose complexity cannot be understood, and effective operating decisions made, by management in a higher-level system. A higher-level decision lacks requisite variety.
- Homeostats—the parts of system structure that maintain stability
- Heterostats—the parts of system structure that innovate the new, different, better
- Recursion—all systems, such as a corporation, are made up of sub-systems, and these sub-systems are also made up of sub-systems, which are also made up of sub-systems. Each set of sub-systems is a level of recursion from the higher-level system. All systems and sub-systems have the same characteristics and functions. A management model that's useful in one system will be useful in all systems.
- Self organization—a system's capability to organize itself
- Self control—a system's capability to control itself toward the achievement of the system's purpose
- Environment—the environments outside the system are included in system structure
- Information—information controls performance and flows both ways within the system and between the system and its outside environments. In a system view, information is a part of structure.

Looking at this short list of system characteristics and functions we begin to see a new way to look at the company, and to understand the company in a different, better, simpler way. Instead of a "reporting to" pyramid, we begin to see the company as a network of systems, each with the characteristics and functions listed above. As we learn more and more about systems, we begin to see everything in system terms. Everything relates to everything else. Cause and effect becomes event and consequences. A problem may signal needed change elsewhere in the system. Wherever we manage in a corporation, we manage a system. We manage the system's internal relationships and its relationships with other systems inside the company and related systems in the environments outside the company. System thinking is new; it's different; it's better. But management has not yet learned system structure and management:

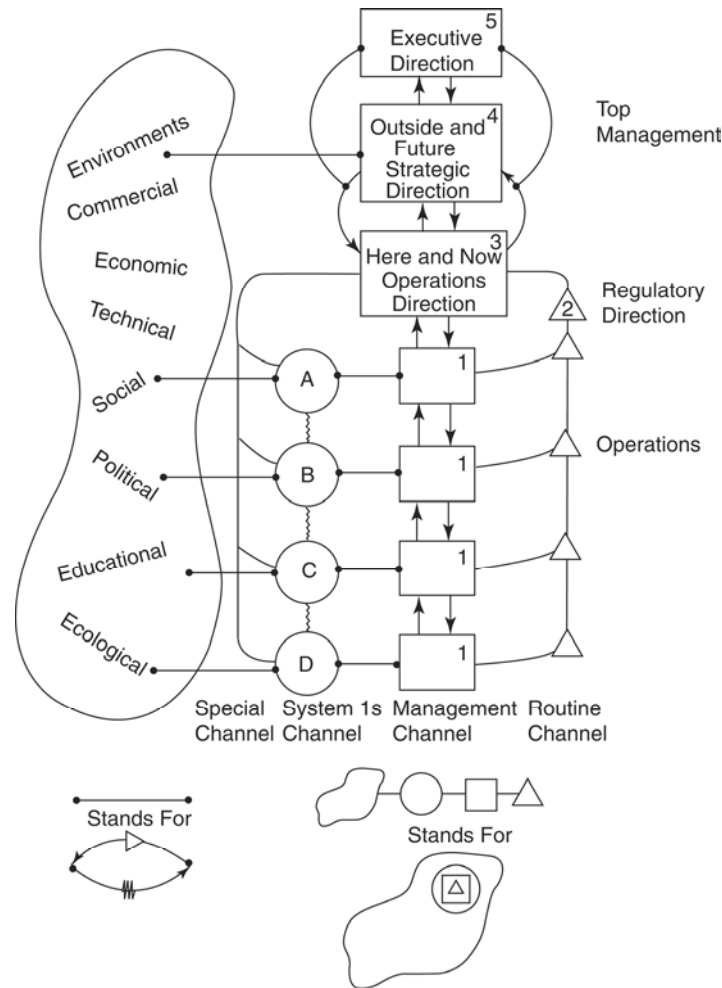
"It is characteristic of man's way of thinking to contemplate entities rather than systems; to disconnect systems rather than to relate their parts; to record inputs and outputs to systems rather than to measure systemic behavior itself. When it comes to managing affairs, we characteristically try to deal with the dismantled system—piece by piece—rather than to redesign the totality so that it actually works." (Beer, 1965).

For management in today's world, system science gives us a way to design the viable, very complex, purposeful, probabilistic system that is a corporation, a government, or any other organization so that it actually works.

4. A Guiding Model

Stafford Beer pioneered the application of system science in corporations, governments, and other organizations. From this work he developed his Viable System Model (VSM), shown in Figure 1 in a form Stafford used in discussing the model with clients.

Figure 1 Stafford Beer's Viable System Model (VSM)



Reprinted with permission of John Wiley & Sons, Inc.

Figure 1 is very different from a typical organization chart. An organization chart identifies key executives and shows who reports to who. But it doesn't tell much about what the company is and how it works. Figure 1 does not identify executives. And, with an understanding of the system science meaning in the lines and boxes, shows what the company is and how it works.

5. Models

When I was working with Stafford applying his VSM in the large corporation I then worked for, we had a long discussion about models. Stafford described to me how a model of a viable, very complex, purposeful, probabilistic system can never be completely right. No model of any complex system can be completely right. The variety in the

system and their interactions is much more than can be captured in a model. So models are neither right nor wrong. Models are more or less useful.

When considering a model think about the variety (complexity) in what is being modeled. How likely is it that the model captures enough of the variety of what is being modeled to be useful? What experienced authority developed the model? With satisfying answers to these questions, the model is worthy of in-use testing for its usefulness. For Stafford's VSM, we get very satisfying answers to these questions. And in using this model in my work with more than a hundred businesses in sixteen countries I have seen very positive results from its use: improved performance; decisions made where control variety can equal variety in what is being controlled; improved profitability and a stronger, high-performance organization. Stafford's VSM is a very useful model.

Along with the system science and cybernetics in the VSM, something more is needed for company success. The VSM gives us a new and different way to think about structure. It gives us new and different management principles. But after we know about how to structure, and after we know about how to manage, there remains the question of what to manage. Managers can manage what comes up. And they do. Managers can also manage what matters most. And often they don't.

Peter Drucker has given us a model for what matters most. Peter's model is not expressed in lines and boxes, or in mathematical notation. It is expressed in words—a short listing of the key performance areas that determine every company's success. These few areas are what matters most. (Drucker, 1954)

6. Key Performance Areas

Peter wrote that "objectives are needed in every area where performance and results directly and vitally affect the survival and prosperity of the business." (p. 63) He defined eight of these areas, writing, "At first sight it might seem that different businesses would have entirely different key areas . . . But the areas are the same, whatever the business, whatever the economic conditions, whatever the business's size or stage of growth." (Drucker, 1954)

The areas Peter identified as the key performance areas are still the key performance areas today. But because the world outside has changed, I have found it useful to revise the original eight into a new seven. Everything from the eight, and more, is included in the new seven.

Peter Drucker's Key Performance Areas The Eight Original	The Seven as I Now Use Them
1. Market Position	1. Creating and Keeping Customers
2. Innovation	2. Innovation
3. Productivity	3. Quality and Productivity
4. Physical and Financial Resources	4. Physical and Financial Resources
5. Profitability	5. Profitability
6. Manager Performance and Development	6. Organization Capability
7. Worker Performance and Attitude	7. Public and Environmental Responsibility
8. Public Responsibility	

Peter emphasized that successful companies need to perform well in all the key performance areas, all the time. Emphasizing one or two and ignoring the others will not bring success. Profitability is critically important, and so are all the others. "To emphasize only profit, for instance, misdirects managers to the point where they may endanger the survival of the business." (Drucker, 1954)

Peter also observed that the measures needed to set objectives and guide performance in these areas did not exist, even in the key performance area of profitability. That was half a century ago. And, illustrating the slow evolution of management practices, we still lack useful measures today in all of these areas, except for quality and productivity. For quality and productivity, the quality revolution, led by the Japanese, has provided very useful technologies and measures. But even where we now have useful methods and measures, there is always the opportunity for continuous improvement, and the new, different, better.

Good work has also been done in the other areas, too. New technologies, new methods, and new performance measures are now available in all the other key performance areas. But little of this work has yet appeared in management practices. With the work already done in each of these areas, management of these key performance areas can be very much improved. And all of the key performance areas can be recognized, and emphasized, as

profitability is now. New and different technologies, methods, and measures will help managers, and those working in these areas, achieve desired results.

This short paper deals with the structure and management of the company as a viable, very complex, purposeful, probabilistic system. System science and cybernetics offer a new way to see the company and to understand what the company is and how it works. We see a new, different, more inclusive company structure, a structure designed to achieve company purpose. We learn a better way to manage. That's what is explained briefly in this paper.

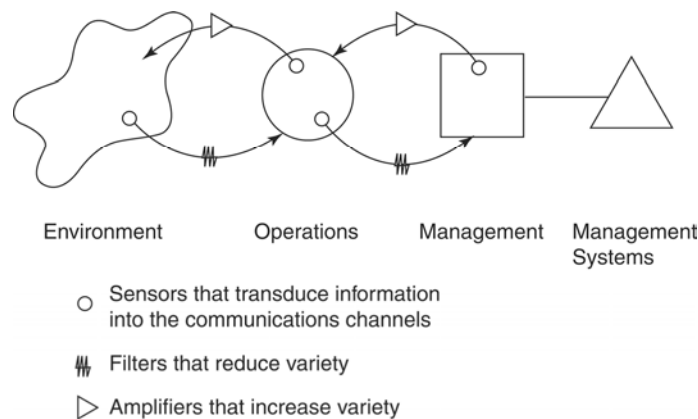
The technologies, methods, and measures useful in managing all seven of the key performance areas will be an additional subject. (see Christopher, 2007)

7. A System Science Structure for the Company

Figure 1 is Stafford Beer's Viable System Model (VSM), in a form Stafford used in the work we did together. The model can be drawn in greater detail and looking more complex. But this simple model applied with a knowledge of system science and cybernetics can guide management to a new, different, and better way to structure and manage the company.

This model builds on a very simple, basic model of a business system. This basic model has five parts: management, management systems, operations, and the environments outside the company:

Figure 2 Basic Model of a Business System



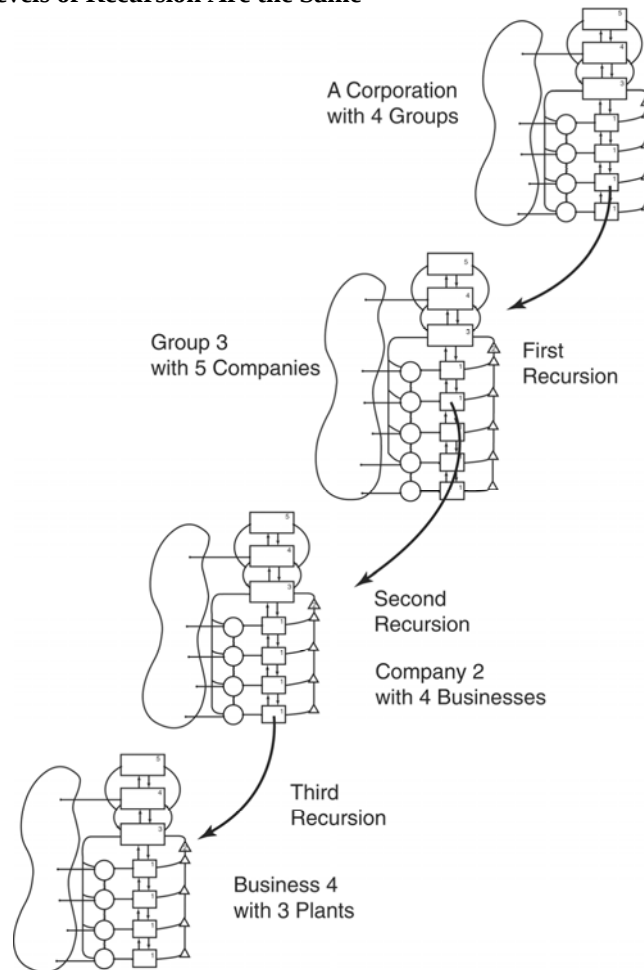
Reprinted with permission of John Wiley & Sons, Inc.

In Figure 2, management uses management systems to design and control operations for desired results in operations and in the world outside. Communication flows between management, operations, and the outside environment as indicated. Figure 1 uses this model for each of four system 1 operating units in the company model.

Figure 1 is the viable system model for the total company. Each of the system 1 basic models in Figure 1 is an operating unit of the company. Each is a viable, very complex, purposeful, probabilistic system. Each can be modeled with the VSM. These four VSM models and the units they represent are the first recursion from the company model. Each of these four VSM models in this first recursion will have its own system 1 operating units. Each of the system 1s in the four VSMs in the first recursion can also be modeled with the VSM. They are the second recursion from the company model.

The number of system 1 operating units in any Viable System Model will be in the range of 2 to 8. If more than 8, a whole level of recursion is probably missing. Recursions go on for as many levels as useful, as shown in Figure 3.

Figure 3 Models At All Levels of Recursion Are the Same



Reprinted with permission of John Wiley & Sons, Inc.

All models at all levels of recursion can be the same because the model models characteristics and functions, and all systems have the same characteristics and functions.

8. Key System Characteristics

The company, viewed as a viable, very complex, purposeful, probabilistic system, has characteristics not recognized, and little used in current management practices.

System Characteristics:

1. The total company system and each of its sub-systems has a purpose
2. The structure of each system is designed to achieve the purpose of the system
3. The company system and each of its sub-systems continuously relate to their outside environments
4. The outside environments are included in each system structure
5. Each system is largely self-organizing and self-controlling
6. Information flow relates to purpose
7. Feedback measures from the work itself control performance
8. The system itself manages complexity by matching decision variety with the variety in what is controlled

From the above list we can see that the management job at the company level system, and in the subordinate systems at each level of recursion includes:

1. Establishing purpose
2. Designing the structure to achieve the purpose
3. Defining relations and communications with the outside environments
4. Assigning responsibilities for environmental relations and communications
5. Using the self-organizing and self-controlling capability of all systems to have decisions made at the level where control variety can equal the variety in what is controlled
6. Designing information channels
7. Developing measures that guide performance in each of the key performance areas as the work is being done
8. Complying with Ashby's Law; assuring that decisions are made where there can be requisite variety

9. System Structure Resolves Management Problems

The above list characterizes a system structure and management that resolves many current management problems. For example, the on-going question of centralization or decentralization is resolved in the system structure described in this paper. The system structure is centralized and decentralized at the same time. Look at the recursion idea (Figure 3). Look at the five systems in each VSM business (Section 11). The question of centralization or decentralization is no longer relevant; the VSM model is both.

Similarly, the concern about "delegation" simply disappears. The system structure itself assigns all responsibilities where they can be most effectively managed.

Another example. Much is written and much attempted in the area of "empowerment," empowering employees in the work they do to make decisions and act in ways that will best help the worker's unit (and the company) achieve desired goals. The difficulty is that present structure and management practices are designed to empower management. It is not easy to insert a new concept into an environment designed to exclude it. With system science, cybernetics, and the VSM, the situation changes. The business enterprise becomes a structure and management of empowered organizations, groups, teams, individuals. All are involved in organizing and controlling the work they do. We no longer need to seek empowerment. Empowerment is inherent in the system.

Another problem area resolved by the viable system structure and management . . . Conventional management has often lacked effective communication channels to and from the outside environments where company success is created. The American tobacco companies had open communication channels to the political environment and to the social environment. But the incoming communication channels from these environments were not working. The companies lacked awareness of what was happening in the political environment and the social environment that would affect their business. The outcome became huge costs, on-going liabilities, and increased government restrictions. The viable system model structures effective outgoing and incoming communication channels to and from the company's environments to help prevent such unfavorable outcomes, and to help create favorable outcomes. The outgoing and incoming communication channels will be essential for dealing with the increasing threats and opportunities in the ecological environment.

As these examples indicate, system structure and management resolves problems and inadequacies in current practice.

10. Variety

In system science, variety is the measure of complexity in the system. Complexity is defined as states of the system. In a viable, very complex, purposeful, probabilistic system that is a corporation, or a sub-system of a corporation, variety is incomprehensibly huge; too large to be measured meaningfully in numbers; so complex everyone must be involved in some aspect of control.

Looking at a large corporation at an instant in time, it does not seem very complex. There it is, an organization of people, capital, and organizational units. The total structure and its parts are quite understandable, not probabilistic, not very complex. But that total, and those parts are organized for a purpose. And in the pursuit of that purpose all of the people, and all of the capital equipment are continuously in action. In the corporation, doing what it was organized to do, variety includes all the actions of all the people, all production and service activity, all sales and delivery activity, the functioning of all the machines and equipment, matters relating to all the physical and financial resources, all the communications inside the company and between company people and people and events in the outside environments, transactions of all kinds, and more. The corporation, at work, is probabilistic, and very complex. How can management wisely manage this huge variety?

Many managers and executives use accounting measures, ignore the variety in the system, ignore the probabilistic behavior of the system, and make decisions on a simple view of the reality they are dealing with. And with this simple view they often make decisions that don't deal effectively with the situation, and may harm rather than improve performance. And higher-level decision makers, ignoring variety, often make decisions more effectively made by decision-makers at a lower level. Stafford Beer emphasized that, whatever the view of the decision-maker, incomprehensibly huge variety is an inherent characteristic of the corporation, and each of its business units, doing what they were organized to do. His definition states very clearly the inherent characteristics of a business enterprise: "a viable, very complex, purposeful, probabilistic system." (Beer, 1976) The management task is to control this complexity and manage this probabilistic behavior to achieve desired performance.

Managers can, and do, ignore variety and make decisions using other guidelines. System science gives us a better way: Ashby's Law. W. Ross Ashby, a pioneer in system studies, stated what became his law: "Only variety can absorb variety." This technically precise statement tells us that, for effective control, the variety of the controller must be equivalent to the variety in what is being controlled. Ashby's Law is the system science principle of "requisite variety."

Stafford noted that present management practice must be assuming that as individuals advance up the hierarchy, their mental capacity expands exponentially in order to deal with the complexity, the huge variety, in what must be managed. But, like everyone else in the company, the Chairman/CEO, and the Business Unit President, have brains that run on two thousand million neurons. Applying Ashby's Law and a VSM structure, the company can use the wisdom of the many with decision/control happening throughout the company where requisite variety can be achieved for the decisions being made. (Beer, 1976)

In the Beer model of a business enterprise, top management structures, maintains, and alters the total company as appropriate, and manages the corporate functions. Throughout the company everyone, all the brainpower and capability, participates in controlling the complexity and managing the probabilistic behavior to achieve desired performance in their areas of work. With everyone involved, requisite variety can be accomplished.

The huge variety in operations and in the outside environment can be reduced by first selecting what matters in relation to organization purpose, and then developing useful measures of what matters. The variety in management can be very much increased by black boxes, and by making decisions at levels where there can be requisite variety. Executives and managers at the corporate level, as charted in the VSM, make decisions for the corporation. Executives and managers in a black box (a lower level business operation), also charted by the VSM, make decisions for that operating unit.

11. Stafford Beer's Viable System Model

The rest of this paper describes the system science and cybernetics expressed in Stafford's Viable System Model (Figure 1). The model, with its embedded system science and cybernetics, gives us a new, different, better way to structure and manage a business enterprise. The viable system model itself is made up of five systems:

- System 1. A typical VSM includes 2 to 8 system 1s. These are the systems (units) that develop, produce, and market the company's products and services. A system is what it does. The company is what the system 1s do.
- System 2. System 2 is the company's coordinating system
- System 3. System 3 is the "here and now" operations direction of the company
- System 4. System 4 is the "outside and future" planning and innovation center for the company.
- System 5. System 5 is the executive direction of the company

11.1. System 1 - Operations

A system 1 in the company VSM is an operating unit of the company, offering products and services to customers in the marketplace. In restructuring a company organization chart into a VSM, these will typically be the operating units shown on the company's organization chart. But there may be changes. What system 1s will best enable the company to achieve its purpose? A good answer to this question may result in some restructuring of existing operations. Perhaps acquisitions are needed; or divestitures appropriate.

The definition of the system 1s is a major management task. In the company VSM, company management (Systems 5, 4, and 3) will collaborate with each system 1 management to define that business. A good model for defining the business is the "Resource Bargain" developed by Stafford Beer. The resource bargain includes:

- The name of the system 1 operating unit

- Purpose of the system 1
- Definition of the system 1's products and services, and markets and customers served; now and future
- Boundaries of the system 1 operations
- Resources assigned to the system
- Key long-term goals and performance measures for the system

At each level of recursion, system 1s will be defined in a similar way, by the management at the next higher level of recursion working with the management of the system 1.

11.2. System 2 - Regulatory Direction

System 2 provides a coordinating function, assisting System 3 in its direction of operations. System 2:

1. Monitors each system 1 in relation to its Resource Bargain and advises its management as appropriate.
2. Coordinates the interactions among the system 1s.
3. Acts as a "homeostat" to keep things running smoothly in and among the system 1s.
4. Directs the system 1s planning and budgeting to meet the requirements of systems 3 and 4.
5. Plans and monitors the information flowing in the routine communication channel from the system 1s to system 3, to assure that this information is as needed by systems 3, 4, and 5.
6. Communicates company policies to the system 1s, and monitors compliance.

In most companies today, the system 2 coordinating functions are performed poorly or not at all. Instead of coordinating to prevent problems, problems come up and are dealt with on an ad hoc basis by the manager(s) involved, or a manager assigned to the problem. In the VSM, system 2 is an important homeostat, keeping things running smoothly, preventing problems, dealing with any problems that do come up.

System 2 is so closely coordinated with system 3 that the system 2 triangle could be shown inside the system 3 box.

11.3. System 3 - Here and Now Operations Direction

System 3 directs the system 1s; all the "here and now" functions of the company; all the company does to produce sales revenue and operating income.

System 3 directs the system 1s, but does not manage them. System 3 directs the system 1s like the Board of Directors directs the company—providing guidance and support, and making structural changes as appropriate and needed to achieve the system 1's purpose. But system 3 does not insert itself into a system 1 and make system 1 operating decisions. The system 1 is a very complex, very high variety system that cannot be controlled effectively by decisions made from a higher-level system. Higher-level management lacks requisite variety. Ashby's Law prevails.

Operations in a system 1 can only be effectively controlled by the people in the system 1. System 1 business opportunities can only be effectively developed by the people in the system 1. System 1 problems can only be resolved, or dissolved, by system 1 people. For the system 1 to deal with these situations, the system must be well-structured with measures that reduce variety in what is controlled, and involvement that increases variety in management.

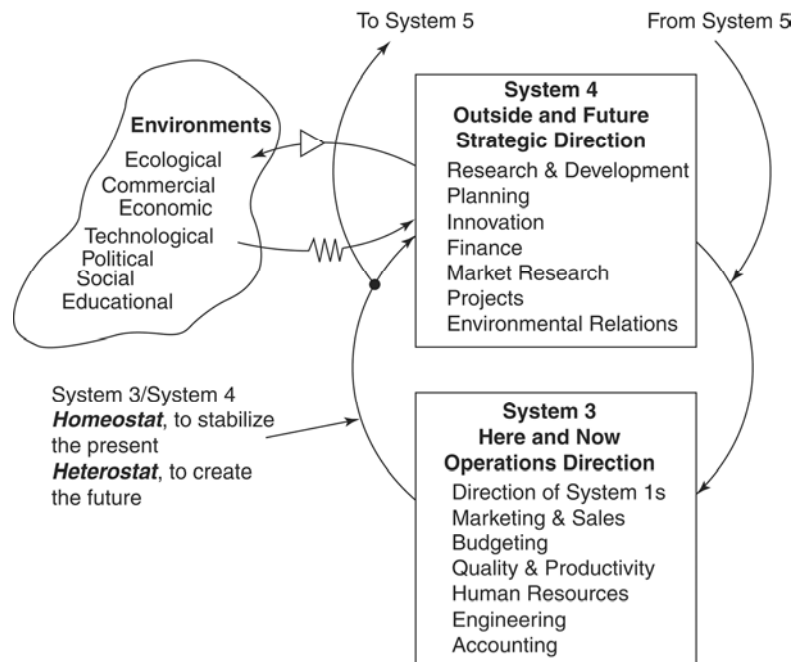
Few managers have an understanding of variety as a measure of complexity, and the huge, incomprehensible variety in any business operation. So a typical System 3 COO, and even a System 5 CEO, will not hesitate to make operating decisions for a system 1 business. Business history is full of the disruptive, but unreported, results, which the system 1 management must then deal with.

In addition to the direction of the system 1s, system 3 also provides all the "here and now" business functions, including marketing and sales, accounting, human resources management, engineering, legal services, and whatever else is needed for "here and now" operations.

11.4. System 4 - Outside and Future Strategic Direction

System 4 in the company VSM includes the functions needed to get the company from where it is today to where it intends to be in the future, short-term and long-term. The system 4 at each of the subordinate units at all levels of recursion includes the functions needed to get that unit from where it is today to where it intends to be in the future, short-term and long-term. See Figure 4.

Figure 4 System 4 and Linkages With System 3



Reprinted with permission of John Wiley & Sons, Inc.

System 4 maintains continuous communications and collaboration with system 3 to provide:

- Intelligence on changes and events in the company's environments (commercial, economic, technical, social, political, educational, and ecological) that might affect what the company does
- Intelligence on strategic change

The linkage between system 4 and system 3 provides a powerful homeostat to keep things running smoothly. It also provides a powerful heterostat for the change and innovation that creates the company's future. At the company level, and at all levels of recursion this system 4/system 3 collaboration is needed to secure the present, and to create the future:

"Concepts and models of equilibrium, homeostasis, adjustment, etc. are suitable for the maintenance of systems, but inadequate for phenomena of change, differentiation, evolution, negentropy, production of improbable states, creativity, building up of tensions, self-realization, emergence, etc.; as indeed Cannon realized when he acknowledged, beside homeostasis, a "heterostasis" including phenomena of the latter nature." (Bertalanffy, 1969)

System 4 in mapping a course ahead confronts a future of environmental change new in all of human experience, and made startlingly new and threatening over the last fifty years. What's happening:

1. Diminishing availability of clean water
2. Spreading food shortages
3. Increasing degradation of the biosphere we live in
4. Increasing contamination of the earth's air, land, and water
5. Loss of species in a sixth extinction now happening
6. Global warming
7. Increasing social problems: health care, education, poverty, crime, violence, wars and civil wars, intolerance, terrorism

Environmental factors causing what's happening:

1. Huge growth in world population: <2 billion in 1900; 2.5 billion in 1950, 6.7 billion now; 9.2 billion around mid-century (UN projection)

And

2. World industrial production up more the seven times since 1950, to serve the needs and wants of the ballooning populations

The task ahead will be surviving and prospering in a biosphere that experts say can sustainably support some 2 to 4 billion people. The threat is great, greater than ever before confronted in the human experience; the opportunity great for companies that find and develop solutions. Companies managing with the VSM structure and management methods have communication linkages with the environment and with governments and others responding to environmental change. These companies will be better able to deal with the threats, and to develop the new products and services that will be needed to deal with environmental change. These companies will be finding and developing solutions.

System 4 includes the functions needed to achieve its purpose, including research and development, strategic planning, innovation projects, finance, market research, and environmental relations.

11.5. System 5 - Executive Direction

System 5, at the company level, is the executive direction of the company. System 5 includes the Board of Directors, the CEO, and other executives participating in the executive direction of the company. System 5 leads the company, now and into the future, and sets the overall character, ethos, of the company.

The company system 5 has the responsibility for the most important of all executive actions—determining the purpose of the company, designing the structure of the company to achieve its purpose, and establishing performance measures, and management practices that will achieve the purpose. To assure sustainability, all of these executive actions must be undertaken in relation to the changing external environments. At each level of recursion system 5 in each unit has this same responsibility—determining the purpose of the unit, designing structure to achieve purpose, and establishing performance measures and management practices; all in relation to environmental change.

Very important at the company level and at all levels of recursion is the system 5 linkage with the system 4/system 3 homeostat/heterostat. There can be conflict between the system 4 outside and future actions and the system 3 inside and now actions. System 5 as the top homeostat resolves the conflict.

Paul Rubinyi offers a long list of system 5 responsibilities, including:

1. Designing the enterprise, including defining the company and the operating units, providing resources, and establishing the company indicators and information flow centered on these indicators
2. Implementing decisions of the Board of Directors
3. Informing the Board on the state of the company and the implementation of Board decisions
4. Establishing and maintaining the top management team, assigning responsibilities and performance measures
5. Determining corporate parameters (company policies and other matters that must be dealt with in the same way throughout the company)
6. Determining the company's ethical values, communicating them throughout the company, and establishing an audit system to assure compliance
7. Representing and promoting the company to the outside world

(Rubinyi, 1998)

Many companies today see themselves as almost all system 3; concentrating entirely on profitability this month, this quarter, this year. With no system 4, research and development focuses almost entirely on the here and now needs of the system 1s; planning focuses on today's operations. With no outside and future system 4, system 5 collapses into system 3. When everything is system 3 the company can have no future. (for an example of an enterprise with its system 5 collapsed into system 3, see Markus Schwaninger, "Developing a Viable Organization: The Critical Role of the Meta-System," (in Christopher, 2007)

For continuing success, all management systems, 5, 4, 3, and 2 are needed.

12. A Model of Functions, Not Jobs

The viable system model is a model of functions. An individual will be assigned in a function, but may at times work in other functions. A CEO, for example, is the top executive in the company system 5. But the CEO may also work on an innovation project in system 4, and may be a member of the Board of Directors in the system 5 of a first recursion system. Every individual will be assigned in one function, but may also work in other functions.

In my most recent position in industry, my job was in the corporate system 3. I worked also in corporate system 4 and system 5, and in a problem-solving way in the systems 1, 2, 3, 4, and 5 at first and second levels of recursion.

The company, a large, multi-national corporation, was not structured as a viable, very complex, purposeful, probabilistic system. But in working in such a company it is helpful to visualize the VSM structure for the part of the company you are working in, and work accordingly. You will be surprised with your increased effectiveness. That's because the VSM is a more realistic representation of what the company is and how it works than is the view of conventional management.

When working in a system different from the assigned system, it is important for the individual to know where (s)he is working, and work according to the functions and connectivity of that system.

13. Communication Channels

Figure 1 shows a company VSM with four communication channels. Each serves specific functions:

1. Routine communication channel
2. Management communication channel
3. System 1s communication channel
4. Special, or three star (3*) communication channel

These communication channels connect the system 1s with each other and with higher-level management. There are also communication channels between systems 3, 4, and 5, and with the outside environments. At all levels of recursion, the VSM for each business unit has the same communication channels. The design of each channel must consider the variety to be handled, capacity needed, amplifiers and attenuators needed, and content. With conventional thinking, the capacity of all four channels together would need the capacity to handle all the variety in all the system 1s, plus the variety in systems 2, 3, 4, and 5. With conventional management thinking, communication channels are greatly overloaded with data and information better left at the point of origin. Viewing the System 1s as black boxes greatly reduces the amount of data and information travelling in the internal communication channels.

13.1. Routine Communication Channel

The routine communication channel is a high variety, high capacity communication channel, with communications moving in both directions. Information flowing from the system 1s to system 2 and higher-level management includes: data needed for company financial reporting, system 1 operating income statements, other required management reports, compliance reporting, information relating to company parameters, and whatever other information higher-level management asks for, or that a system 1 wishes to send to top management.

Information flowing from system 2/system 3 to the system 1s includes: company chart of accounts and accounting information, company policies, and other company parameters along with instructions relating to them, information on required reporting, information on company purpose and performance, company news, and any other routine communication between top management and the system 1s.

Most internal communications flow in the routine channel. Managing the system 1s as black boxes reduces the volume of communications in the routine channel by an order of magnitude.

13.2. Management Communication Channel

The management communication channel is a high-variety, low-volume channel. System 1s transmit essential planning and performance information to higher-level management. Also in the management communication channel is any information on the system 1's Resource Bargain and any changes being considered. Information moving in the management channel is mostly informal notes, phone calls, emails, text messages, or personal meetings between system 1 and system 3 managers. If all is on track as desired the message is, basically, "I'm OK." Measures not on track will be noted along with comment on actions taken. Better than expected measures and new opportunities will be reported and commented on.

Best measures are not comparison with budget and explanation of variances. In today's environment that method of budgetary control doesn't work. Much more useful, much simpler, and much more effective in achieving desired performance are progress measures toward objectives in the seven key performance areas that determine every company's success. (Christopher, 2007, Ch. 5)

13.3. System 1's Communication Channel

The squiggly line between the system 1's is the channel carrying operations information between and among the company's system 1s. It is a medium capacity, high variety channel. Communication includes information on

technologies and methods, buy/sell relationships between system 1s, mutual purchasing relationships, information on customers who are also customers of another system 1, and information on any other relationship between or among the company's system 1s.

13.4. Special, or 3 star (3*) Communication Channel

This is a low capacity, high-variety channel. Information on any emergency situation that needs to be communicated from or to top management flows in this channel. Emergencies might be a natural disaster (flood, tornado, hurricane, fire, earthquake, etc.); injury, death, or incapacity of a key person; a strike threat or settlement; a product liability problem; a security threat, or any other emergency situation requiring urgent action. Information will flow in both directions by fastest available means.

Top management may at times need special information or audits from the system 1s. Audits are not only financial. Audits might include capital equipment audits, audits of compliance with company parameters, project audits, audits of compliance with government regulations, or audits in any other performance area. All of this kind of information flows in the special communications channel.

13.5. Other Communication Channels

In addition to the four internal communication channels described above, there are internal communication channels between and among systems 3, 4, and 5 as shown in Figure 1. Not shown in Figure 1 is a heavily used communication channel from system 3 to the commercial, economic, technical, and social environments. People in system 3 here and now operations deal daily with organizations and people in these environments in making and selling their products and services.

14. Summary

Key ideas presented in this paper include:

- Structuring and managing the company as a viable, very complex, purposeful, probabilistic system significantly improves performance, provides meaningful work for all, and strengthens both customer and employee satisfaction. Management knows all the parts of the system but can't know how it will perform in relation to expectations. The system science and cybernetics embedded in the viable system model tells management how to lead and coordinate all the probabilities and manage all the complexity to continually improve performance and the achievement of desired results.
- The viable system model includes as parts of its structure: (1) information, and (2) the company's outside environments.
- Cybernetics, the science of communication and control in systems, is embedded in the viable system model.
- Variety is the measure of complexity in systems. Management must deal with the huge variety in operations and also the very much greater variety in the company's environments. The viable system model instructs us in how to manage this huge variety.
- Ashby's Law states that for effective decisions, the variety in the controller (management) must equal the variety in what is being controlled. The viable system model instructs us in how to achieve this requisite variety.
- Higher level management lacks requisite variety for dealing with situations in lower level operations, which, to higher-level management must be managed as black boxes. The black boxes, each a viable, very complex, purposeful, probabilistic system, manage themselves.
- Homeostats maintain stability and normal functioning. The VSM designs homeostats into system structure.
- Heterostats create change, learning, evolution, creativity, improvement, and innovation. The VSM designs heterostats into system structure.
- Recursion describes the company not as a hierarchy, but as a network of systems. All of the systems, at all levels of recursion, have the same functions and characteristics. Each can be modeled with the viable system model.
- All systems in the company network of systems are self-organizing, resolving the questions of decentralization, delegation, empowerment, and other management problems in a new, different, and more effective way.

- All systems in the company network of systems are self-controlling. They can and do control themselves to achieve desired performance using the principles embedded in the VSM. Self-control improves performance.
- Communication channels communicating to and from the company's rapidly changing external environments will enable the company to survive and prosper in the changing times ahead. With these channels working, the company: (1) can deal with threats and create new products and services from change in the commercial, economic, technical, social, political, and educational environments, and (2) in the years ahead, will understand the threats and opportunities in the changing ecological environment, and take appropriate actions.

15. Conclusion

System science and cybernetics restructures management practices at a higher and more realistic level of understanding of what the company is and how it works. With this new understanding we structure the company in a new and different way to achieve its purpose, and manage in a different way to achieve desired performance.

References

- Beer, S. (1975) *Platform for Change*, John Wiley & Sons, New York, p. 309.
Beer, S. (1976) In discussions during learning sessions, November 10-12, 1976.
Bertalanffy, L. (1969) *General System Theory*, George Braziller, New York, p. 23.
Christopher, W. F. (1974) *The Achieving Enterprise*, Amacom, New York, pp. 2-6.
Christopher, W.F. (2007) *Holistic Management*, John Wiley and Sons, New York
Drucker, P. (1954) *The Practice of Management*, Harper and Row, New York, Ch. 7.
Rubinyi, P. (1998) *Unchaining the Chain of Command*, Crisp Publications, Menlo Park, CA.
Figures in this paper are reprinted from, *Holistic Management, Managing What Matters for Company Success*, William F. Christopher, John Wiley & Sons, 2007. Used with permission.



Bill's business is Management Innovations and its Literary Agency, **William F. Christopher** Publication Services. Previously Bill held management positions in General Electric, Hooker Chemical, and Occidental Petroleum. In industry and in consulting he has worked with more than one hundred businesses in sixteen countries in sales, marketing, R&D, new products, new ventures, new technology, quality and productivity improvement, cost management, profit improvement, planning and budgeting, and information systems and management reporting; all managed in the context of system science and cybernetics, and the key performance areas that determine every company's success.

Bill's worldwide experience gives him the knowledge and the contacts for his current work in consulting, writing, editing, and publishing. Bill has conducted many seminars and speaking assignments for business audiences. He has written more than fifty articles and papers for business and professional publications; and authored thirteen management books, two winning national awards. Recent publications include information on environmental change that now threatens life, liberty, and the pursuit of happiness for us all.

Education: B.A. DePauw University, Phi Beta Kappa, M.S. Columbia University, Beta Gamma Sigma.

William F. Christopher, Management Innovations, 1580 Geary Road, #237, Walnut Creek, CA 94597-2744. Tel: (925) 943-5584. Fax: (925) 943-5594. E-mail: wfcmgmt.innovations@yahoo.com