

Chapter 1: Introduction

Introduction



A system is composed of interrelated parts

By definition, a **system is composed of interrelated parts**. In systems theory, the degree of interrelationship is termed the "**wholeness**" of the system. If the operation of every part of a system **is related to every other part**, wholeness is said to be **high**. And in fact, an outcome measure taken from any part of such a system will represent **the effectiveness of every part** of the system to the extent that other parts enter into the outcome. Because all parts are interrelated, all of the outcome measures taken from this system will be complex measures reflecting the operation of every other part of the system and will be substantially **intercorrelated**.

For logical purposes, it is useful to **contrast a system of high wholeness to a nonsystem** in which **no parts are interrelated**. *Measures of outcome would not reflect the operation of other parts measured and would not be Intercorrelated.* This is so obvious that it seems silly. But the converse, stated above, is not so easily grasped: outcome measures from different parts of a system are correlated because those **outcomes** are jointly **determined by common parts of the system**.

What we hope is obvious is that the parts of the system themselves are **interrelated** but are theoretically **independent in their unique operation**. The only way to demonstrate this independence is to obtain **less complex measures** of outcome of that particular part of the system which are free of the effects of other parts of the system. *As an example, the quality of the library staff would be one variable contributing to library size, A test of librarianship skills could be devised and administered to the library staff It would certainly be expected that the results of this test would be less correlated with university quality than would be library size.* That is, the more molecular the measure, the less intimately it would be expected to be related to global indices of system functioning. However, more molecular measures would give more specific information about system functioning,

We believe the same holds true for **mental ability**. Certainly the **human mind is a well-integrated system having a high degree of wholeness**. Wholeness is reflected in complex measures of human ability, which explains the high correlations between standard tests of intelligence. Simpler, more molecular measures should be individually less highly correlated with more complex measures but should provide more specific information about the operation of the system.

Management sciences have learned a great deal about

organizations and how they work. Much of this learning has come from adopting the perspective that organizations are entities (systems, defined later), much like people, plants and animals. There are many benefits to leaders who adopt this systems view of their organizations.

Systems thinking is fast becoming a powerful tool for decision-making and organizational change.



Systems thinking has its foundation in the field of system **dynamics**, **started in 1956 by MIT professor Jay Forrester**. Professor Forrester recognized the need for a **better way of testing new ideas about social systems**, in the same way we can test ideas in engineering. *Systems thinking allows people to make their understanding of social systems explicit and improve them in the same way that people can use engineering principles to improve their understanding of mechanical systems.*

Systems thinking are fast becoming a **powerful tool for decision-making and organizational change**. All employees in a company should be equipped with the skills necessary for systems thinking. It is imperative to have some awareness of the origin of systems thinking and **how it can be of benefit to various types of organizational change**, *such as reengineering, systems integration, process redesign, Total Quality Management, and teamwork*. In order to apply systems thinking to challenges that occur in the work place, some of the tools and methodologies used in systems thinking should be taught. Some of the best known strategies used to implement systems thinking include systems modelling, simulations, causal loops, archetypes, and scenario planning. To meet the complex changes that are inevitable, systems thinking can no longer be esoteric knowledge held by few managers, but should be accessed by all.

The **approach of systems thinking** is fundamentally different from that of traditional forms of analysis. **Traditional analysis focuses on separating the individual pieces** of what is being studied; in fact, the word “**analysis**” actually comes from the root meaning “**to break into constituent parts.**” **Systems thinking**, in contrast, **focuses on how the thing being studied interacts with the other constituents of the system** – a set of elements that interact to produce behavior – of which it is a part.

The character of systems thinking makes it extremely effective on the most difficult types of problems to solve: *those involving complex issues, those that depend a great deal on the past or on the actions of others, and those stemming from ineffective coordination among those involved.* Examples of areas in which systems thinking has proven its value include:

- **Complex problems** that involve helping many actors see the “big picture” and not just their part of it.
- **Recurring problems** or those that have been made worse by

past attempts to fix them.

- **Issues** where an action affects (or is affected by) the environment surrounding the issue, either the natural environment or the competitive environment.

System Thinking stresses the systemic pattern of thinking (Systemic is the attribute of thinking derived from systems approach)

Basic
Definitions

1.1 Basic Definitions

A system



- **Is an object/process** that has components bound by a mission and has a surrounding environment.
- **Is an ordered, interdependent assemblage of components** in a field that has boundaries defined by a clear mission.

Systems Thinking

- Is seeing through “the system’s structure generating changes and creating the problems.”
- Is a global way of thinking taking into considerations all factors bounded by the mission of the system.

What is a
System?



1.2 What is a System?

Very simply, **a system is a collection of parts** (or subsystems) integrated to accomplish an overall goal (a system of people is an organization). Systems have input processes, outputs and outcomes, with ongoing feedback among these various parts. If one part of the system is removed, the nature of the system is changed.

Systems **range from very simple to very complex**. There are numerous types of simple systems. For example, there are biological systems (the heart, etc.), mechanical systems (thermostat, etc.), human/mechanical systems (riding a bicycle, etc.), ecological systems (predator/prey, etc.), social systems (groups, supply and demand, friendship, etc.) and psychological systems (memory, thinking... etc.).

Complex systems, such as social systems, are comprised of numerous subsystems, as well; These subsystems are arranged in hierarchies, and integrated to accomplish the goal of the system. Each subsystem has its own boundaries of sorts, and includes various inputs, processes, outputs, and outcomes geared to accomplish an overall goal for the subsystem.

A pile of sand is not a system. If one removes a sand particle, you have still got a pile of sand. However, a functioning car is a system. Remove the carburetor and you have no longer got a working car.

1.2.1 Importance of Looking at Organizations as Systems

Importance
of Looking at
Organizations
as Systems

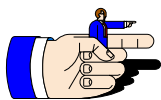


The effect of this systems theory in management is that **it helps managers to look at organizations from a broader perspective.** In the past, managers typically took one part and focused on it. Then they moved all attention to another part. The problem was that an organization could, for example, have wonderful departments that operate well by themselves but do not integrate well together; consequently, the organization suffers as a whole.

Now, **more managers are recognizing the various parts of the organization,** and, in particular, the interrelations of the parts, for example, the coordination of central offices with other departments, engineering with manufacturing, supervisors with workers, etc. Managers now focus more attention on matters of ongoing organization and feedback. Managers now diagnose problems, not by examining what appear to be separate pieces of the organization, but by recognizing larger patterns of interactions. Managers maintain perspective by focusing on the outcomes they want from their organizations. Now, manager's focus on structures that provoke behaviors that determine events – rather than reacting to events as was always done in the past.

1.2.2 Systems Theory, Systems Analysis, and Systems Thinking

Systems
Theory,
Systems
Analysis,
and Systems
Thinking



One of the major breakthroughs in understanding the complex world is systems theory. The application of this theory is called systems analysis. One of the tools of systems analysis is systems thinking. Very basically, systems thinking is a way of helping a person to view the world, including its organizations, from a broad perspective that includes structures, patterns and events, rather than just the events themselves. This broad view helps one to identify the real causes of issues and know where to work to address them.

1.3 Basic Concepts and Characteristics

Basic
Concepts
and
Characteristics

A System

1. A system

- Must have practical boundaries.
- Can be greater than the sum of its components.
- Can be closed or open.
- Must have feedback.

An Open System



2. An Open System

- Must ingest enough input to offset its output and consumption.
- Has no unique solution to the same problem. You need to optimize.
- In effective systems, work adds value and eliminates all sorts of waste.

Systems theory has identified numerous principles that are common to systems, many of which help us to better understand organizations.

Basic principles

1. Have boundaries

2. Influence behavior

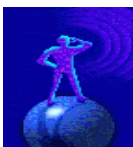
3. System volume

Systems thinking reposes on basic principles:

1. **Any system must have boundaries** that separate it from its environment. This principle is essential for studying a system or improving it. If the system is big, it should be broken into subsystems with clear, practical boundaries.
2. **Structures influence behavior**: when there are problems at work, mainly because structure elements do not work together, performance (a result of behavior) fails to live up with what is planned. People tend to react in three different ways:
 - **Addressing systemic structure** because systems generate behavior (generative reaction).
 - **Addressing patterns of behavior** because behaviors produce events (responsive reaction).
 - **Addressing results or events** when they produce (reactive response: most common and the easiest way to react). Addressing structures prevents reproduction of behaviors that result in problematic events. Therefore, to improve a system, consider improving the structure that runs this system.
3. **A system can always be more than the sum of its components.** That a system can always include the effect of synergy. If not, then there is something within not working in harmony with the other components. There is always a position where the function of the system is optimum or effective. This position has to be sought. Effectiveness is not a static property; it changes with change of circumstances and external environment. System effectiveness is apparent when its outputs exceed the sum of the individual outputs. This can be accomplished when there is unity of direction and commonness of objectives of its members and where teams or individuals in the organization see where they stand in relation to the company's other work, especially in cross-functional groups. The fact that sum of the system can be greater than the sum of the individual work of its employees, proves that effective systems have synergy. Such state of synergy is reached when waste is minimal, and when all actions add value to the mission of the system.

4. Closed or opened
4. **A system can be considered closed or open at a certain period of time.** An open system has some kind of exchange with the environment. A closed system does not have this exchange: a system in the universe cannot have any exchange with the environment unless for a limited period of time. The car is a closed system, to some extent, when it is parked and not used. When used, the car becomes an open system and exchanges certain product with the environment.
5. Survival of open system
5. **For an open system to survive,** it must ingest enough input from its environment to offset its output as well as the energy and material used in its operation. This is referred to as “steady state.” Steady state conditions are dynamic: the system must be able to change in order to adapt to the dynamic situation of the environment of the system. Before reaching a steady state, system can be in a re-enforcement state. Re-enforcement can be positive (if performance is increasing as a result of positive feedback) or negative (when performance is decreasing as a result of negative feedback). Open systems tend to specialize and elaborate their elements and structure and enlarge their boundaries with time, with size and maybe with the change of the environment.
6. no unique solution for open system
6. **In open systems,** there is no unique solution to the same problem: there are many ways to produce the same output or there are many outputs for the same input.
7. feedback
7. **A system must have feedback:** information that the system needs to maintain steady state and to know that it is not in danger of destruction.
8. Cause and effect
8. **In systems thinking,** every influence is both cause and effect: i.e. a cause can also be an effect of something else when regarded in different way.

Stages of Systemic Thinking



1.4 Stage of Systemic Thinking

The Input-Output technique developed by the American General Electric Company can be helpful. Although it need not be, its use has been restricted mainly to technical problems in which the input is energy, light, heat, electricity, etc. - with a desired output in some way dependent upon it. Whiting gives, for example, the problem of devising a fire warning system. The input is fire and the required output a warning that fire is present, with a number of constraints in between: the warning must be foolproof and continuously available; it must be quick-acting to minimize damage; and it must be discernible at points remote from the fire. The problem may not be solved in one step. A warning system requires several intermediate steps, starting with the fire itself and ending with some physical warning system. Whiting warns against trying to short-circuit any intermediate point – this is more likely to lead to a stereotyped solution, since it fails to consider the opportunities for branching into the alternative paths offered by multiple outputs generated at some stages.

Input output
principle
forms



The Input-Output principle forms much of what might be considered the heart of a 'Systems' approach. This removes the limitations of a problem defined in purely technical terms and extends the definition of input, output and constraints to include the whole situation – men, money, materials, machines and methods. It thereby provides an overall view and allows us to arrive at a more comprehensive, unified and long-lasting solution than any piecemeal approach can make possible.

Applying
system
approach

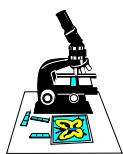
Thus, **in applying a system approach, say, to a problem involving the manufacture of a chemical,** we would not be limited to the technicalities of the process, choice of materials of construction, design and performance of mechanical and electrical equipment and methods of measurement and control. We should, in addition, be involved with the problems of processing and handling raw materials, methods of transport, and use and disposal of finished products; with the recruitment, training and working conditions of the management and men needed to run the plant; with the effects of the product and its manufacture on the local environment – the noise, smell, smoke and general pollution produced; with the long-term effects of our presence as an employer and a source of opportunity. Even then the list is far from complete, but we are beginning to paint a fuller picture of the total situation and thereby identify more of the important variables having claim to consideration alongside those of technology.

Potential
impact on
people

Clearly, the more complex a problem and the greater its potential impact on people, the more appropriate a systems approach becomes. But it would surely be wise to consider all but the most narrowly defined technical problem in a context which includes the human element, if we wish to avoid unpleasant reactions and resistance to our solutions when we create them.

Jenkins suggests that there are four main stages in the systems approach: analysis, synthesis, implementation and operation.

Analysis



1. Analysis

What is the problem and how should it be tackled?

What is the nature of the primary system in which the problem is embedded and the wider environment in which it, in turn, is contained?

What are the objectives of these respective levels in the systems hierarchy? Are they stated clearly and are they consistent with each other?

Has all relevant information been collected? Have all constraints been identified (and all false constraints eliminated)?

Synthesis

2. Synthesis

What are the expected changes in the systems under consideration?

How accurate are the forecasts likely to be?

What models can be built of part or the whole of the situation describing behavior, processes, operating conditions, etc.? In what form should these models be – graphical, tabular or mathematical? Can the models be manipulated to simulate changes in the system?

What is the optimum for the whole system? What system is 'best', taking all aspects into consideration with a proper weighting for each? How reliable is this system and what uncertainties remain?

What can be done to ensure that the 'best' system is realized in practice?

Implementation

3. Implementation

Is the final design fully understood, its **implementation adequately planned** and its integration into the wider system properly organized?

Have the design and plan of action been 'sold' to users or operators? Are all changes understood and accepted?

Are there an adequate commissioning plan and a scheme for evaluation performance?

Operation

4. Operation

Have operation and maintenance procedures been prepared and put into use?



Is there a continuing feedback of operating experience to designers and are worthwhile improvements introduced?

Is ultimate obsolescence and replacement catered for?

Techniques of use in such a comprehensive approach include just about every thing in Management Theory, including Critical Examination to get the problem right, Critical Path Scheduling to plan and time the project, Management by Objectives to define the aims of the whole venture and to get people committed, Modeling and Simulation, Risk Analysis, Reliability Studies and Control Systems to aid design.

Development

A useful development of the Systems approach is given by Nadler. He suggests that if we can disengage our thoughts from the present situation when defining a complex problem and think instead

of an ideal solution, that is, one which is not restricted by money, method or resources, then by keeping this ideal solution in mind, we will come nearer to it in practice than by trying to inch forward with the present as our reference point. **Nadler** describes three stages in the achievement of a workable solution: the Ultimate Ideal System, the Technologically Workable Ideal System and the Technologically Workable Ideal System Target. **An Ultimate Idea System** represents the best system likely to be achieved through the development of existing knowledge. But it is achievable, even though at a later date, and can be made a target for improvement in the future, giving a fixed aim point rather than a projection forward from the present situation. **A Technologically Workable Ideal System** is one based on technology which already exists, but which does not take into account real-life restrictions such as money, available skill, etc. By designing several systems to this criterion and selecting one as a guide, a recommended system, the **Technologically Workable Ideal System Target**, as a guide, can finally be described which does take into account all real-life restrictions.

Systems do not have to be complicated



Example



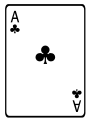
Systems do not have to be complicated or unintelligible, or even dressed in jargon. A system *is just an arrangement of circumstances that makes things happen in a certain way*. The circumstances may be metal grids, electronic components, warm bodies, rules and regulations or anything else. In each case, what actually happens is determined by the nature of the system. One can take the function of the system for granted and become interested in how it is carried out.

If young children are asked to invent a potato-peeling machine they draw a winding tube through which a string of potatoes is seen traveling towards a simple box with the explanatory note, 'In here the potatoes are peeled.' Another tube carries the peeled potatoes away. There is nothing mysterious about the box; it just performs the potato-peeling function. One takes it for granted that is the function of the box and that somehow the function gets carried out. In some of the inventions the potatoes are then carried to a metal grid through which they are forced in order to make chips. The making of the chips is not taken for granted but explained, because it is explicable.

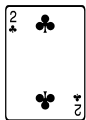
If you put water instead of oil into a frying pan you would not expect to be able to fry chips. If you were to use fat or oil you would get some ordinary chips. If you add a little water to the oil before you put the pan on the fire, then the temperature of the oil will rise more slowly and the chips will be soft on the inside and crisp on the outside - much more so than if only the oil had been used. The nature of the system determines what happens.

The brain is a system in which things happen according to the nature of the system. What happens in the brain is information. And the way how it happens is thinking.

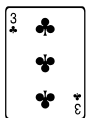
Since thinking in this broad sense determines what people do on any level from the most personal to the most international, it could be worth looking at some aspects of the brain system.



The first useful thing that can come out of knowledge of a system is the avoiding of those errors that arise through thinking the system to be something that it is not.



The second useful thing is awareness of the limitations of the system. No matter how good they may be at performing their best functions, most systems are rather poor when it comes to performing the opposite functions. One would no more go racing in a shopping car than shopping in a racing car. Where one can, one chooses the system to fit the purpose. More often there is no choice, and this means that a single system will perform certain functions well, but others not so well. For instance, the brain system is well suited to developing ideas but not always so good at generating them. Knowing about the limitations of a system does not by itself alter them. But by being aware of the nature of the system one can make deliberate adjustments.



The third way in which one could use knowledge of a system would be to make use of the characteristics of the system to improve its performance or to achieve some end.

How brain system handled information

Some understanding of how the brain system handled information could be very useful. It might then be possible to recognize some of the errors and faults inherent in this type of system, to show, for example, that there was a tendency to arbitrary and self-enhancing divisions which were extremely useful in most cases but could also be the source of a lot of trouble. Apart from becoming aware of the errors of the system, it might also be possible to make more effective use of it through understanding its nature in order to make the learning process easier and more economic. It might be possible to do something about communication.

Language, notation and mathematics

Language, notation and mathematics are useful artificial aids to thinking. There may be other artificial aids which could be invented if one had sufficient understanding of the brain system. With new notation it might prove possible to generate ideas as easily as we now develop them once they have been generated. For instance, it might be possible to invent a new word which would be functional in nature like 'and', 'if', 'but' or 'not'. The function of this new word would be to compensate for the inherent limitations of the information - processing system in the brain and open up new ways of talking and thinking. The word would ultimately have to justify its usefulness in practice, but its invention may not have been possible without an understanding of the nature of the system.

Some
necessary
properties

There are a few necessary properties of systems that need to be stated before proceeding. The most basic of these is that systems exhibit some degree of **stability, or constancy**. If they do not, it would not be possible to identify them as the same system over time. A system may be closed, which means that it is a self-contained, self-regulating entity that is insulated from, and does not interact with, other systems. Or, it may be open, or interactive. For open systems to be stable they must exhibit equilibrium through negative, or compensating, feedback, because if they do not, their form would change and the necessary property of stability over time would be lost. The "hunting" of servo-mechanisms and the homeostasis of vegetative biological functions in animals are examples of open systems maintaining equilibrium through negative feedback.

Individual's
psychological
resources

The individual's psychological resources for coping with the social world-what we call in everyday terms the person-can be construed as a system in this sense. Analogies with systems in the social sciences usually concentrate on the behavior of thermodynamic systems. *The second law of thermodynamics states that all closed systems are subject to increasing entropy.* The entropy of a system is the measure of unavailable energy; energy that still exists but which is lost for the purpose of doing work. In thermodynamics, of course, the energy referred to is heat and the law can be roughly understood as the idea that all (hot and cold) material within a thermally insulated area will eventually come to have the same temperature. The more general version of this principle is that all closed systems are subject to loss of differentiation. A correspondence has been established between the entropy of a system and the loss of information in that system in the sense of information theory. So, this principle can also be taken to mean that the information in a closed system diminishes over time.

Concept of
entropy of
living
organisms

Schrödinger, applying the concept of entropy to living organisms, writes: "*Thus a living organism continually increases its entropy-or, as you might say, produces positive entropy-and thus tends to approach the dangerous state of maximum entropy, which is death.* It can only keep aloof from it, i.e., alive, by continually drawing from its environment negative entropy".

A closed
system



A closed system, in thermodynamics or biology or whatever, like the concept of infinity in mathematics, *is an ideal or pure state, unreal when applied to the physical world.* But although closed systems are probably never perfectly realized in practice, the pure concept serves as a useful anchor for theories in the study of material things. The same is true of the concept of system applied to the social world. Consider, for instance the "ideal" but incredible notion of a person as a closed system, completely insulated from other systems, from the rest of the community. Such insulation would take the form of never talking with anyone and never doing anything (doing, that is, in the sense of acting and choosing as non-automatic, non-habitual justified performance). Borrowing from the thermodynamics analogy, one of

the properties of such a closed person-system would be its increasing entropy; the gradual decline in the harnessable energy, or differentiation, or information, within it.

Understanding
the Nature of
the System in
Organizations



1.5 Understanding the Nature of the System in Organizations

Effective leader-managers have a common affinity for understanding the nature of the larger system within which they work. Whenever they take on new job assignments, they make a special effort to understand the inner workings of the larger system of which their work unit is a part. Realizing that the needed information can not be uncovered simply from printed documents; they are relentless in their probing. They observe, inquire, and integrate until they are satisfied that they have a valid conceptual model of the system.

Good judge

John Dewey, the philosopher and educator, **was astute in his portrayal of the "good judge."** This is a person "who has a sense of the relative indicative or signifying values of the various features of the perplexing situation; knows what to let go of as of no account; what to eliminate as irrelevant; what to retain as conducive to the outcome; what to emphasize as a clue to the difficulty." In essence, this is a person who has a profound understanding of the larger system within which he or she works.

Good grasp

In *The Human Organization*, **Rensis Likert stresses that the manager should have a good grasp of two aspects of the system: *the nature of the system and the state of the system.*** In this regard, he likens the manager's job to that of the physician:

A physician needs two different kinds of information to make a correct diagnosis. First, *he must know a great deal about the nature of human beings.* This knowledge is based on extensive research which relates symptoms to causes and measurements of body conditions to the health of the organism, thereby revealing the character of the human body's normal and abnormal functioning. This knowledge gives the doctor insights into how the system ought to function, so that he can know what he needs to measure and how he needs to interpret the measurements. **The second kind of information needed by the doctor to discover the patient's state of health at any particular time is that revealed by the appropriate measurements and tests made on that patient at that time.**

Progress
measurement

It is generally understood that **measurement of progress is dependent on accurately assessing the state of the system at any point in time.** It also must be understood that accurately assessing the state of the system is dependent on understanding the nature of the system.

Variables to understand the nature of the system	<p>To understand the nature of the system, Likert stresses that the manager must grasp the relations between and among three types of variables:</p> <ol style="list-style-type: none"> 1. Causal variables: independent variables that determine the course of developments within an organization and the results achieved by the organization. 2. Intervening variables: mediating variables that reflect the internal state and health of the organization. 3. End-result variables: the dependent variables that reflect the achievements of the organization.
1. Casual	
2. Intervening	
3. End-results	
Interrelation of variables	<p>As an illustration of how these three classes of variables interrelate, we can consider the example of the effect of leadership style on productivity. In many situations, it would be assumed that a participative leadership style would be more effective than an autocratic style. This premise can be tested by correlating leadership style (causal variable) with employee motivation (intervening variable), and then correlating employee motivation with productivity (end-result variable). In this way it could be demonstrated that leadership style has an effect on productivity, but via employee motivation.</p>
Understanding the nature of the system	<p>Given this framework for "understanding the nature of the system", we will illustrate the notion by considering the dollar flow in a for-profit engineering firm. You may not have any particular interest in an engineering firm, but the principles elucidated here would apply to any type of organization.</p> <p>The dollar flow of the illustrative firm is shown in Figure 1.1. We will consider the business volume to be the causal variable, the net income to be the end-result variable, and everything else to be intervening variables.</p> <p>The business volume is broken down into these categories: labour, use of equipment and service centres, all other project costs, overhead (engineering department overhead, general overhead, and cost of capital), and fee. The general overhead is apportioned as direct expenses of engineering operations (funds allocated to the engineering departments) and indirect expenses (funds used to operate the company as a whole).</p>
Effective managers needs	<p>Effective managers understand the causal relations in this financial system. For example, they realize that increasing labour (time on projects) by one percent can have at least a 10-percent impact on net income. They realize that a two-percent overrun in project losses can cause a 20-percent decrease in net income. Further, they realize that a fee increase of three percent can have a 30-percent impact on net income. These multiplier effects are indeed noteworthy, and they are ever-present in the mind of the effective manager.</p>

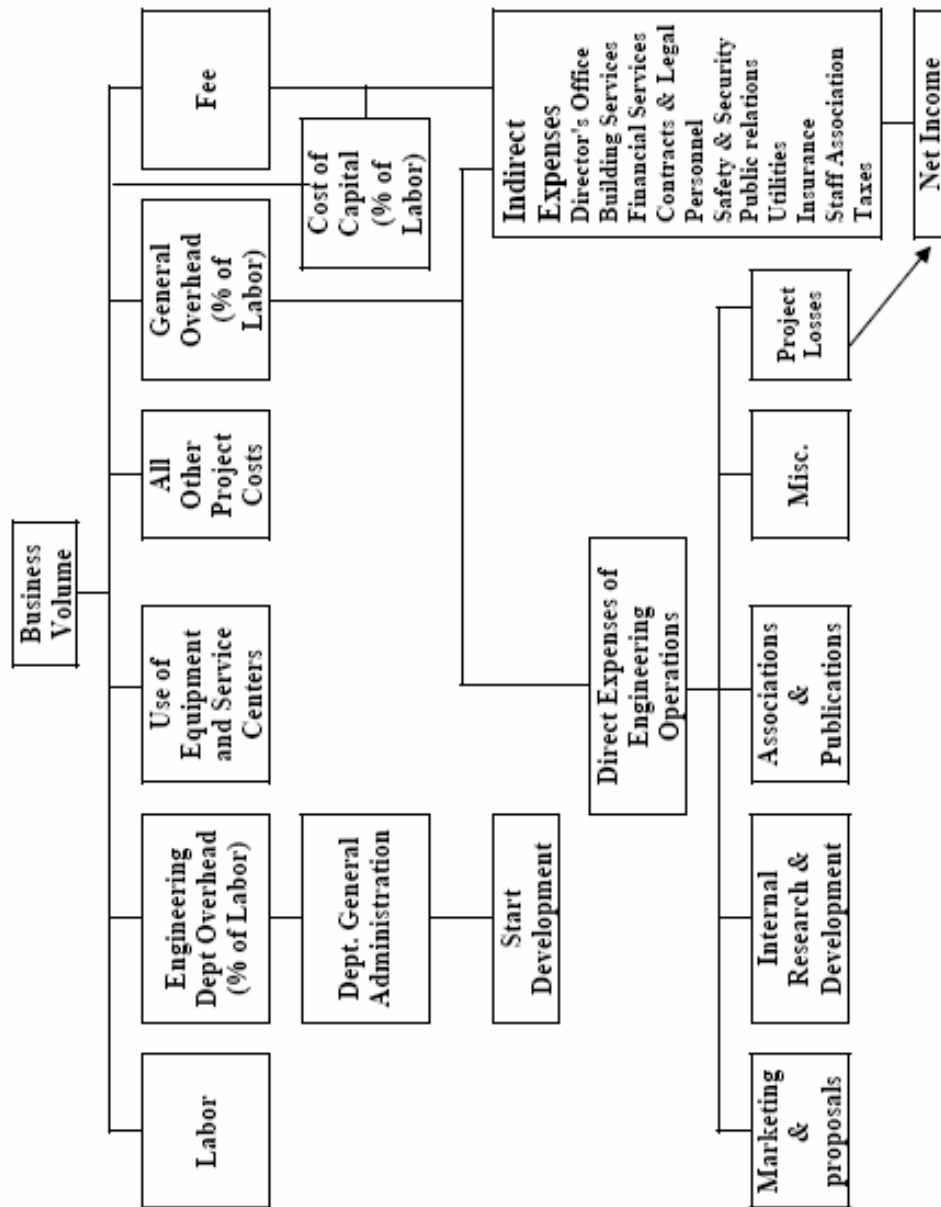
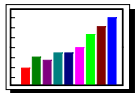


Figure 1.1: Dollar flow in an engineering firm

Important decisions

Managers who understand this financial system also **realize that it presents them with a number of important decisions.** For example, will the return-on-investment with the marketing and proposals funds be better in the industrial arena or in the government arena? With the funds allocated for internal research and development, is it better to invest in a small number of really good ideas or in a large number of possibly promising ideas? With the funds for associations and publications, which particular associations and publications should be pursued? These are important questions, and the answers generated will determine the success or failure of the manager.

Other casual
relations

There are **numerous other examples of important causal relations in the system**, but these will illustrate the point that for you to be able to measure your unit's progress, it is essential that you understand the inner workings of the larger system.