A General Model of Simple and Complex Systems

By David Alderoty © 2015

Chapter 8) Control Mechanisms and Programmed Systems Solving a Problem, by Building a System

Over 1,250 words

To contact the author left click for a website communication form, or use:
David@TechForText.com

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THE FOCUS AND PURPOSE OF THE SYSTEM PERSPECTIVE PRESENTED IN THIS E-BOOK

To prevent confusion, I am placing the following statement at the beginning of each chapter in this e-book. Keep the ideas presented in the following three paragraphs, in mind as you read this e-book.

The main utility of a systems theory, especially the **General Model of Simple and Complex Systems,** is to assist in the study of systems, especially in terms of problem solving, goal attainment, and observational and experimental research. From a system perspective, all the relevant factors of a system are considered to obtain an objective. This can include the behavior and overall functionality of the system, its environment, its components, its structure, and related dynamics, cause-and-effect sequences, inputs, outputs, forces, energy, rates, time, and expenditures.

Examples of a system are atoms, molecules, chemicals, machines, electronic circuits, computers, planets, stars, galaxies, bridges, tunnels, skyscrapers, forests, rivers, streams, oceans, tornadoes, hurricanes, microorganisms, plants, animals, human beings, social groups, small businesses, organizations, political parties, cultures, and the human mind of an individual, including related behaviors and personality traits.

A systems perspective is also useful for writing projects. This involves writing about all the relevant factors of a system, in terms of a thesis, or topic.

The purpose of this e-book is to discuss and explain the many details associated with the systems perspective described above. This required twelve chapters, which are relatively short.

Control Mechanisms of a System

Simple Control Mechanisms of a System

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Some systems have mechanisms that control and/or direct their behaviors. At the simplest level, this involves one or more sensing devices, and one or more feedback and control devices. An example is a heater with the thermostat. The thermostat senses the room temperature, and turns off the heater when the temperature reaches the level that was set on the thermostat. When the temperature drops below the level set, the thermostat turns on the heater. Thermostats are also used on air-conditioners. Similar control devices are used to control humidity, or pressure with certain industrial processes.

Highly complex systems have programs and/or memory-devices, which may be coupled to feedback correction devices. This will be explained under the following subheading.

Some systems have **complex control mechanisms,** which involve programs, and complex information processing. The programs, and related processing mechanisms, may be coupled to feedback and control mechanisms, and various sensing devices. The **complex control mechanism** might be coupled with a memory device, all of which are usually located in one subsystem. These mechanisms direct and control the behavior of a specific category of system, which I am calling a **programmed system**.

Examples of programmed systems include cells with their nucleus and DNA, human beings, with their complex brain, and a manager supervising employees to operate a business.

The programs that control systems can malfunction. Examples are malfunctioning DNA in a cell, can result in cancer, a deformed baby, or a virus based illness, such as the common cold. (Viruses, insert their own programming in the form of DNA or RNA into a cell, and interfere with the cells normal programs. Then they redirect the mechanisms of the cell to produce more viruses.) Another example is the judgment of an owner of a small business, can be compromised as a result of illness, or psychological stress. This will most likely interfere with the functioning of the business. (With this example, the owners judgment is a program that functions in the brain.) A difficulty

similar to the above can happen in a large organization, with the CEO, or with a leader of an entire nation. This is discussed in the following two paragraphs.

If the judgment of the CEO is dysfunctional in a large organization, the board of directors, and the stockholders might function as a feedback and correction mechanism. This may result in adverse feedback, and eventually dismissal of the CEO. However, if the CEO owns a substantial portion of the company, such as 51%, he or she cannot be fired. In such a case, the entire organization may become dysfunctional, resulting in financial losses. This could lead to the closing of the business. (An interesting study would be to determine how often the above occurs.)

Sometimes the judgment of the leader of an entire nation is dysfunctional, which can lead to many problems, including war. The officials and people of such a nation may have faith in their leader, and **not** perceive the dysfunctional planning and actions. An extreme example is Adolf Hitler. However, there are many less extreme examples of leaders with dysfunctional judgments, which resulted in war, and other problems.

From the perspective of a general systems model, information can be defined as a relatively weak flow of energy that controls or directs a more powerful source of energy to perform work. Some examples are presented below:

- The work is building of cellular structures, which is controlled by a weak flow of chemical energy directed by DNA

- The work is building of the organs and bone structure that comprise an animal, which is also controlled by a weak flow of chemical energy, directed by DNA

- The work is the building of a skyscraper, which is controlled by a *weak flow of electrochemical energy in the brains of architects, and engineers* (With this example the week energy flow ultimately controls construction crews, and their machines that carry out the work.)

Specifically, the above concept involves a weak flow of energy that carries instructions, which is coded onto the energy. This can be done a number of ways, including the following:

- Waves that very and frequency and/or wavelength (Example radio transmission)

- A series of short and long energy pulses (Example Morse code)

- Energy pulses that vary in strength, or turn on and off (Example computers)

The control process involved with the week energy flow, and the source of energy, usually involves complex intermediate mechanisms, such as the human brain, and limbs, a computer and robotic manufacturing machines, the genetic mechanism consisting of DNA, RNA, and other chemicals.

A Simplified Example to Clarify all of the Above

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All of the above can be summed up with this example: A chief engineer of a construction project giving orders by voice to a construction crew. With this example, the sound waves that comprise the voice of the engineer, is the week energy flow that represents information. The construction crew, and there machines represent a powerful source of energy, that ultimately carries out the work.

The Growth of a System

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Most of us would associate growth with biological systems. However, various types of systems comprised of human beings also grow, such as organizations, corporations, social groups, and societies. Systems that are under construction, such as skyscrapers, involve a type of growth. This consists of precise placement and fastening of steel beams, and other building blocks of the skyscraper.

Growth is generally a complex process, which requires information, to direct a source of energy to carry out a specific type of work that is needed to increase the size of a system. With the example of the skyscraper, the information is supplied by construction engineers and architects, which directs the energy supplied by construction workers, to perform the required work.

Solving a Problem, or Obtaining a Goal, by Building a System

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Sometimes the best method of solving a problem or obtaining a goal is to build a system. Solving problems in this way can be feasible, assuming you understood the subtopics presented above.

Keep in mind, a system is **not** a plan or method, based on the way the terminology is used in this e-book. A system is a device, machine, or a group of people working together, in an organized way, with appropriate equipment, to achieve an objective. An example of solving a business problem by building a system is presented below:

If you have a business that involves an **excessively large** number of technical emails and letters, a system-based solution can involve the following: Obtain office space, purchase a few computers, and higher a few employees trained to answer technical correspondence. However, if you decide to outsource

the work, you are solving the problem **without creating a system**. This is usually simpler, and if the workload is not extremely large, this might be a more economical solution. However, if the workload is extremely large, it may be less expensive to solve the problem by building a system. (Keep in mind the above is just a hypothetical example.)

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