



A General Model of Simple and Complex Systems

By David Alderoty © 2015

Chapter 11) Evolutionary Systems, and Related Developments, and Problem Solving

Over 2,250 words

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

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*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.

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Evolutionary Systems, and Related Concepts

What Are Evolutionary Systems?

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The concept discussed in this section is an expanded conceptualization, based on [Charles Darwin](#)'s theory of [evolution](#). This conceptualization is an **evolutionary process** that applies to certain types of nonliving systems, social groups, organizations, cultures, as well as plants and animals. I am defining this concept **in the following two paragraphs**.

Based on the way I am using the terminology, **evolutionary systems** are systems that evolve in a **series of stages**, over a period of time. This can be partly or totally the result of environmental dynamics, and/or the intervention of one or more human or nonhuman systems, such as a computer control device. In each **stage**, a number of systems may evolve with different traits or properties, and **selective dynamics** may facilitate the development of some of these systems, and the extinction of

other systems. The selective dynamics can be the result of **various environmental factors**, and/or the intervention of one or more human or nonhuman systems. The evolutionary process described above, involves a **selection** and **rejection** process, which is more or less similar to the trial and error process.

The subsystems, and traits, of a system can also evolve with the **evolutionary process** described above. The evolve subsystems, and traits, can be passed on to other systems, as a result of environmental dynamics, by a process of reproduction, and/or by the intervention of one or more human or nonhuman systems. Subsystems and traits of a system can **also become extinct**, with the **evolutionary process** described above.

Note with the definition presented in the previous two paragraphs, the concept of a system and subsystem have an expanded meaning, which includes all of the following: a technique, a methodology, a blueprint, a plan, an idea, a body of knowledge in a specific field, a language, a computer language, or any system comprised of information, and/or matter.

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Examples of Evolutionary Systems

Conventional Concept: Evolutionary System For Plants and Animals

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The most obvious example of an evolutionary system involves the development of plants and animals, as explained in [Charles](#)

[Darwin](#)'s theory of [evolution](#). A very simplified and partial description of this theory is presented below.

The plants and animals that are most suited for their environment survive and reproduce. Plants, and animals that are **not** fit for their environment, will decline in number, and eventually be eliminated from the environment. This selection process, often involves **competition** for food, habitable living space, and mates.

Each environment will optimally support specific types of animals and plants. For example, cold geographical areas will favor animals and plants that can tolerate the cold, and consume food that is available in the cold climate. The same idea applies to tropical environments, deserts, and aquatic habitat in lakes, rivers, and oceans. Generally, plants and animals evolve for specific environments. Plants and animals that cannot adjust to the environmental conditions will die out.

Also important for survival of a species is the ability to avoid predators. However, a high rate of reproduction of a species can compensate for many predatory kills.

There are many types of evolutionary systems, which do not involve plants or animals. This will become obvious from the following subtopics.

There are [thousands of languages](#), and most of them probably developed in an evolutionary process, except for [Esperanto](#). The selection process includes the frequent and/or increase use of specific words. The rejection process includes the progressively less frequent use of a word. This may continue until a word is no longer used in a language. The meaning of a word, its pronunciation, spelling, and connotation, might also change in the evolutionary process. The grammar, and the way words are used, and organized in a sentence may also change in an evolutionary process.

The evolutionary process of a language can be influenced by the intermingling of two or more cultures. This can involve two or more cultural groups that speak different languages, or speak different dialects of the same language.

Often, the intermingling of cultures, involves a dominant and powerful society, and a less powerful cultural group. When this is the case, the language of the dominant society will usually prevail, but it will most likely be modified as a result of the intermingling of the two cultures.

The Evolutionary Development of Tools and Machinery

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Tools, and machinery, appear to have developed in an evolutionary process, which started in the Stone Age. This initially involved building simple stone tools, which were used to build progressively more complex tools, over a period of many

years. The complex tools were used to create new tools that are even more advanced. This development involved in evolutionary process, involving selection and rejection, based on the utility, and durability of a tool. This involved comparing tools that serve the same function, with each other, and selecting the best option, or the best way of constructing the tools. For example, the simple tools of the Stone Age were essentially selected out of existence, when metal tools were developed, because of their superior strength and utility. However, some of the Stone Age tools, such as axes, knives, and hammers, exist to the present day, but they have evolved and continue to evolve. [Knives have evolved, to the point where some of them are operated by electricity.](#)

Eventually, the metal hand tools were used to create machine operated tools. This includes construction cranes, jackhammers, bulldozers, drilling equipment, and machinery used for mass production. The evolutionary process continued with the machine operated tools. This initially involved use of animal power and water wheels. This was eventually replaced by the steam engine. Eventually the gasoline engine and electric motors replaced most of the steam engines. The evolutionary process continues with the development of machines operated by computers. This includes robotic manufacturing devices.

Technology has Developed in an Evolutionary Process, Facilitated by Scientific Discoveries

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Technology has developed in an evolutionary process, which is similar to the above. That is, the development of primitive technology and scientific concepts was used to create technology that was more advanced. This continues to the present day. The selection and rejection process of technological devices are primarily based on consumer demand. The consumer demand is ultimately the result of the utility, and price of the technological device.

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The Evolutionary Process, and the Development of Business Establishments

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Businesses function in a competitive environment that involves the evolutionary process. This involves competition for customers, and a number of other factors that are explained in the following paragraphs.

Some businesses will attract enough customers to survive, expand, and/or develop and diversify their product line. These businesses, and their products, generally have many traits that attract customers. Businesses that survive, and develop, also have effective management, and marketing strategies, which result in adequate profits.

Less successful businesses eventually become extinct. This may involve a failure to compete successfully with other

businesses, especially in terms of attracting customers. Business failures can also involve poor management, and/or inadequate marketing strategies.

In general, the most productive businesses succeed, and evolve, and the less successful businesses ceased to exist. Another important factor is adjustment to environmental conditions. Specifically businesses that can adjust to the changes in consumer demands will evolve over time, and businesses that cannot adjust will become extinct.

The Development of Cultures, with The Evolutionary Process

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Most of the cultures throughout the world probably evolved in an evolutionary process. This involves modifications and developments of cultural components, coupled with a selection and rejection process of cultural factors. Examples of cultural components are customs, ceremonies, values, religious beliefs, style of dress, social roles, food selection, and commonly used artifacts.

A cultural component may be modified, in a series of stages, over a period of many years. Sometimes new cultural components, or the modification of existing components, might initially evolve in a subculture. The newly developed components may be accepted or rejected to varying degrees by the main culture. Components that are accepted may increase in

popularity, and/or evolve into new cultural components. Some new and old cultural components may decrease in popularity, and eventually become extinct.

The evolutionary process of a culture can be influenced by many factors, especially by the intermingling of two or more cultures, by geography, by changing environmental conditions, by education, by technological developments, and by increased financial resources. Prevailing philosophies, as well as various psychological factors, may also influence the development of a culture. War, and natural disasters, can also be significant factors that influence changes in a culture.

The Evolutionary Development of the Human Psyche, in an Individual, from Birth to Old-Age

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The psyche (the mind of an individual) develops in a series of pages, from birth to death. This is essentially an evolutionary process. This involves the selection and rejection of various activities, goals, as well as developing and avoiding various behavioral traits.

All of the following partly or totally evolves with an evolutionary process, as an infant grows into adulthood: personality, behavioral traits, habits, moral values and related behavior patterns, eating habits and food preferences, mannerisms, style of communication, attitudes, learning style, and skills. The components into the above may involve an initial

trial, or an evaluation in the mind, which lead to an acceptance or rejection. Components that are accepted may develop, such as habits, food preferences, and skills.

Components may be accepted or rejected by the individual, if they are rewarding, and/or if they are approved and/or encouraged by family members, authority figures, or peers. Components that are not rewarding, and/or not approved by family, authority figures, or peers, might be rejected. However, some components may be accepted or rejected for other reasons such as neurological and physiological factors, complex emotional needs or dynamics, or emotionally traumatic experiences. In some cases, this can involve the rejection of components that are rewarding and/or approved by family, peers, and authority figures, and vice a versa. This is especially the case with dysfunctional behaviors and thinking patterns associated with psychological disorders.

The evolutionary development of the psyche can be influenced by the family, the neighborhood, culture, subculture, social class, the educational system, financial resources, and how the individual is treated, or mistreated, by family members, authority figures, and peers.

A Note on the Transmission of Traits by Learning and Culture, Based on my Personal Opinion, and Evaluations

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Many of the sources I have encountered appear to be confusing the traits produced by culture, subculture, and the evolution of the psyche, with the biological process of genetic transmission of traits. Thus, they erroneously conclude that many dysfunctional behavior patterns are the result of genetics. This confusion is understandable, because cultural and psychological traits are commonly passed down from one generation to another, with the socialization process and learning. This can resemble the genetic transmission of traits.

With lower animals, especially with insects, fish, amphibians and reptiles, simple behavioral traits are genetically passed down from one generation to another. However, human beings have highly evolved brains, and the behavior patterns of humans are highly complex. This includes complex dysfunctional behavior patterns, such as antisocial behaviors, excessive alcohol consumption, over eating and related obesity, and drug addiction. These dysfunctional behavior patterns are too complex to be even partly transmitted by genetics. However, all of the underlined words above represent behavior patterns that are often attributed to genetics by some sources.

Applying the Concept of Evolution, to Problem Solving, and Goal Attainment

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The evolutionary process is essentially a type of trial and error problem solving, which evolved in nature, before human beings

existed. This is obvious, if you read the material presented above, and/or Charles Darwin's theory of evolution.

To illustrate the concept of evolutionary problem solving I will start with a **set of** similar, but **not** identical systems. You can think of the systems in the set as either animals, or man-made devices. Then, the most fit or desirable system is selected out, which I am calling system-1. System-1 can be reproduced several times, to produce another set of systems, each with its own variations and potential improvements. From this second set, the most desirable system can be selected out, which I am calling system-2. This sequence of reproducing variations, and selecting out the best system, can be continued to obtain progressively superior systems, such as system-3, system-4, system-5, etc. This is essentially the process that took place in nature, which led to the diverse forms of life that exist on our planet. (The ideas presented in this paragraph, are presented by another author, with different wording and descriptions, in a video, which can be accessed from the following link: [Complexity Theory](#).)

Evolutionary problem solving is most likely to be successful if you are knowledgeable about the science and technology that relates to your problem or goal. However, even if you lack such knowledge, you still may have successful results. This is because the evolutionary process involves a series of trial and error

evaluations of potential solutions, with a focus on selecting the best solution.

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