Systems thinking.

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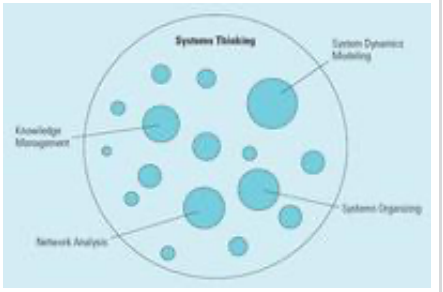
The concept of systems thinking involves examining the connections among individuals or components and how they interact. By focusing on the "big picture" rather than a great many isolated parts, systems thinking allows for a holistic perspective on a system that can lead to insights on its structure, connections, assumptions, change over time, and consequences. The relationships among the various components and their functions are fundamental to the concept. In fact, individual components or details must be balanced according to their importance to the system, because it is only as part of the whole that they have value or utility.



Approaches to Systems Thinking. System dynamics modeling, one approach to systems thinking. By National Cancer Institute [Public domain], via Wikimedia Commons

Overview

The most important aspects of any system are its components, the connections among its components, and the purpose of the connection of the parts. The elements also must be organized in such a way that they affect the system's behavior together, but not separately. That is, if a system is separated into its parts, such as a box full of components instead of a computer, it is no longer a system. However, both a set of bookshelves and a living cell can be considered systems, because their components work as part of the whole for a common purpose.

Systems thinking generally seeks to provide solutions to complicated problems, rather than simply observing situations or collecting data. While systems thinking can apply to an ecological system, a machine, or an educational model, it is frequently applied to business

organizations and problems that do not have clear solutions or for which conventional problem solving has failed. A business system can involve a physical operation, such as an assembly line , or the flow of data, such as in the design and implementation of a computer network . In business applications, systems thinking allows leadership to spot challenges and organize appropriate responses, while in social systems it can integrate a wide array of interactions that affect a single issue.

The Holistic View

While systems thinking has been practiced throughout history, its current uses in business, philosophy, and the social sciences are an outgrowth of observations in the natural sciences. Beginning in the 1940s with the study of organisms and their environments and purposes, researchers began to consider how to improve the natural systems they observed. However, these natural systems proved to be extremely complex. Subsystems within the systems interacted to make the whole greater than the sum of its parts. As a result, complexities could arise when a narrow perspective was relied on to solve a problem, leading to failure. For example, if a safe and effective pesticide were used against a particular insect that was destroying a crop, it would seem to be logical that the more insects that were killed, the less crop damage would occur. However, this does not take into account the possible effects on the natural balance over time. Systems thinking, taking a wider and more holistic view, might reveal that the targeted insect was a predator of another pest that would also eat the crop and would vastly increase in numbers without the predator insect to control it. Thus, what seems to be the logical solution could in fact result in more problems rather than less.

Visual Strategies for Systems Thinking

Most problem solvers learn to tackle issues head-on, looking for the one best solution and then working toward it. It is not always easy to see the bigger picture or the connections

among various facets of a problem.

One strategy for developing systems thinking is to view problems in diagram form. Looking for not only the various activities and behaviors of a situation but also connections among them and a variety of possible outcomes gives the problem solver a wider perspective. Like the problem in which killing the plundering insects caused more crop loss, rather than less, many situations have connected issues that must be considered. Investigating such situations requires an unconventional approach.

Diagrams are often used in systems thinking to illustrate the connections within complex problems. The tools help simplify ideas and display information more abstractly, as long as system connections are retained.

Researchers and analysts have developed various illustrations to help map systems, encourage flexible thinking, predict outcomes, and increase insight. Visual strategies include graphing behavior over time, using iceberg illustrations to reveal the underlying causes and assumptions that lead to problems, and employing causal loops to show causality and relationships among elements in the system.

Systems Thinking in Education

Systems thinking is also employed in many educational contexts. Rather than memorizing facts and dates, students are encouraged to learn relationships among historical events, for example, or among the plants and animals of a specific environment. This approach helps students grasp concepts such as cause and effect, structure and function, and life cycles and change. Because critical thinking is a fundamental part of most school curricula and educational standards, developing skills in systems thinking helps students widen their scope, interpret relationships, infer meaning, and draw reasonable conclusions. A common vocabulary, inquiry and discussion skills, and communication through dialogue are verbal

strategies that encourage systems thinking. Kinesthetic strategies, including games, role-play, and computer simulation, use physical means to demonstrate systems thinking and predict behavior.

Bibliography

Aronson, Daniel. "Overview of Systems Thinking." *Thinking Page* , 1996–98. *Temple MIS* , community.mis.temple.edu/mis3534sec001spring2022/files/2021/12/Overview-of-Systems-Thinking.pdf. Accessed 17 July 2024.

Henry, B. Charles. "New Paradigm of Systems Thinking." *International Journal of Economics, Finance and Management* , vol. 2, no. 5, 2013, pp. 351–55, www.ejournalofbusiness.org/archive/vol2no5/vol2no5_2.pdf. Accessed 17 July 2024.

Packham, Roger. "Systems Thinking." *The SAGE Encyclopedia of Action Research* , edited by David Coghlan and Mary Brydon-Miller, vol. 2, Sage Publications, 2014, pp. 752–54.

"What Is Systems Thinking?" *Association for Project Management* , 2024, www.apm.org.uk/resources/find-a-resource/what-is-systems-thinking/. Accessed 17 July 2024.

Wieck, Gian. "Systems Thinking—What Is It All About?" *Medium* , 5 Feb. 2021, medium.com/systemic-design-group/systems-thinking-what-is-it-all-about-1e5135de97b3. Accessed 17 July 2024.
