# Chapter 3
# An Initial Examination into the Associative Nature of Systems Concepts

**Charles E. Thomas**
*Illinois State University, USA*

**Kent A. Walstrom**
*Illinois State University, USA*

## ABSTRACT

*Systems thinking is the application of general system theory to problem solving. The concepts of general system theory are foundational in the field of Information Systems, especially information systems analysis and design. It has been stated that the principles underlying systems thinking are extremely intuitive (Senge, 1990). This study examined the intuitive nature of basic system theory constructs. Some system theory constructs are more intuitive than others. The constructs of Input and Output were found to be more intuitive than the constructs of Relationship and Boundary. The constructs of Component and Interface were not intuitive. In an introductory exposure to systems constructs, respondents were able to identify, on average, 2.5 out of 6 constructs correctly.*

## INTRODUCTION

In the Information Systems (IS) field, understanding the concepts of systems theory is important. Systems thinking is the application of systems theory. It is the "conscious use of the particular concepts of wholeness captured in the word 'system', to order our thoughts." (Checkland, 1981). Systems thinking is used to "order our thoughts" about the information systems we analyze and design. We use it to understand the organizations within which information systems operate.

Systems thinking is considered one of the four basic sets of analytical skills required to be a systems analyst. The other three sets of analytical skills are: organizational knowledge, problem identification, and problem analyzing and solving (Hoffer, et al., 2002). Organizational knowledge can be acquired in the foundational business courses required of all undergraduate students. An introductory management

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course offers theory and practice of organizational structure, organizational behavior, organizational strategy and organizational human relationships (Rue and Byars, 1989). Problem identification should be covered in the capstone business course. Problem analyzing and solving should be included in many business courses and several of the non-business general education courses such as: general math and general science. While there may be insufficient coverage in training systems analysis, coverage is still present.

Only systems thinking is left without a clear home for discovery by the future systems analyst. One might assume since systems theory began in the biological sciences, an upper-level majors-only biology class would give some attention to systems thinking. But such a class would not be available to the student taking general education biology courses. Therefore, to make systems thinking available to systems analysis students, it is important that systems theory is taught in contemporary college of business IS curriculum.

Systems thinking is crucial for professionals in all organizational learning environments. The importance of organizational learning was identified by Don Michael in 1973. The importance of systems thinking to organizational learning was identified in 1993 by Diane McGinty Weston. The basis of systems thinking is systems theory. The basis of systems theory is the concept of a system. The constructs related to a system must be understood if we are to accurately and effectively use systems thinking as a tool. Petkov et al. concluded "it is essential to introduce the systems idea in relatively simple form at the undergraduate level . . ." (Petkov et al., 2008)

Senge (1990) claimed that the underlying worldview of systems thinking is extremely intuitive. Intuition is "the act of knowing or sensing without the use of rational processes" (Soukhanov, 1992). It can be difficult to examine whether someone is using rational processes or not. We can measure knowing or sensing by testing the lower levels of Bloom's taxonomy: remembering and understanding. Therefore, we can measure knowing or sensing among respondents who we believe to have no formal training or instruction in the concepts under consideration. Such knowing or sensing may be based on: (1) intuition; (2) previous instruction; (3) concept travelling from other areas of knowledge of instruction or training; or (4) some combination of the above.

However, the knowing or sensing is achieved, if it is done correctly, some type of association had to take place. If association is the connection or joining together in the mind or imagination (Soukhanov, 1992), then we can measure whether the association is correct or not. The purpose of this study is to examine the associative understanding of basic systems theory constructs.

## LITERATURE REVIEW

### General Systems Theory Constructs

Ackoff (1971) defined the term 'system' and identified 31 important types of systems. Understanding each of the 31 types of systems is predicated on understanding the term 'system'. Examining the 31 types of systems are beyond the scope of this study. However, understanding the foundational term 'system' is at the center of this study. Hall and Fagan (1956) define a system as "a set of objects together with relationships between the objects and between their attributes." von Bertalanffy (1968) defines a system as "a complex of interacting elements." Ackoff (1971) defines a system as "a set of interrelated