Chapter 18
Interoperability of Web-Based Education Systems

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ABSTRACT

The global society is becoming a reality. Inevitably this leads onto questions around the generation and exploitation of knowledge. Education systems grow to be more complex and interdependent. The Web makes a large number of learning resources within reach of anyone with Internet access. However, many valuable resources are difficult to use due to the lack of interoperability among various education systems. In this chapter, the fundamental principles of interoperability of complex and dynamic global education system are presented. The contemporary approaches to systems theory, entropy and autopoietic theory, social system theory, sociocybernetics, the strengths and limitations of these approaches, and their potential applications in education are examined. The nature of educational systems can be linked to biological concepts. When education principles and cybernetics are combined, the resulting theory turns on scientific principles instead of philosophical speculations. Proper utilization of such principles provides methodology that increases the effectiveness of web-based education systems.

INTRODUCTION

Education around the world is facing challenges that are an outgrowth of globalization, challenges that manifest themselves in ways that are increasingly common among different countries.

The speed at which the world is changing, the increasing complexity of life, and the complex nature of work are the defining characteristics of the modern time (IMF, 2000). The global society is becoming a reality. Inevitably this leads onto questions around the generation and exploitation of knowledge. An increasing group of scholars and lawmakers is arguing that the incoherency and fragmentation of the traditional education is a growing problem. What is needed is systemic reform that connects educational systems around the globe allowing the possibility of re-using
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instructional materials both within the same e-learning system and, even more, across different systems (Kuehn, 1999).

The assumption we start from is that an e-learning system (or a set of interoperating e-learning systems) can be interpreted and understood in the same way researchers approach complex systems.

Modern systems theory provides a new paradigm for the analysis of society. While social system theory, entropy and autopoietic theory have been familiar approaches within general systems theory for years, they were, until recently, generally seen as applications within physical science or biology, with little or no application to education. According to systems theory, society is its communications: they are its empirical reality; the items that can be observed and studied. Systems theory identifies how communications operate within a physical world and how different sub-systems of communication operate alongside each other. Four fundamental systems approaches – BERTALANFFY’ General Systems Theory (1968) Miller’s living systems theory (1978), LUHMANN’ Social Systems Theory (1995) and Bailey’s (1994) social entropy theory are examined.

There are several important ideas linked to the emergence of education systems: first, that education systems evolve in response to the human need to survive in an environment where they are competing with many other systems for scarce resources; second, that humans survive and flourish by efficiently using their resources and energies; and third, that the evolution of education systems is a function of an ongoing cybernetic process involving all societal systems and their components.

The chapter is organized as follows. First, systems approach to education will be discussed with attempt to connect social system theory, entropy and autopoietic theory to modern view of the teaching/learning process. The nature of education systems can be linked to biological concepts. When education principles and cybernetics are combined, the resulting theory turns on scientific principles instead of philosophical speculations.

Second, several meanings of the concept of modularity in education systems are presented and discussed. “From molecules in a cell to organs in a body, from animals in a colony to ecosystems in the biosphere, patterns exist everywhere. But patterns are also the realm of art and human enterprise” (Callebaut, 2005, P. 181). There is a universality of patterns, which permeated education systems on various levels. Perhaps the concept of modularity would open the door to the elaboration of standards that promote higher functionality and interoperability of such systems.

The third section discusses the importance of interoperability. Interoperability is the ability of two or more networks, systems, devices, applications or components to exchange information between them and use the information so exchanged (OSJTF, 2009). In globalized society the increasing diversity of systems and applications, interoperability makes possible the development of a mass market and avoids the undesirable effects of fragmentation. There is desperate need at increasing the reuse of “learning objects”, reducing their development effort and providing interoperability of content across delivery and management systems. Additionally, there exists a diverse collection of both public and private content repositories and digital libraries containing these learning and content objects (Miklos and Sobering, 2008).

**IMPORTANCE OF SYSTEMS APPROACH TO EDUCATION**

Human experiences are accumulated as a reservoir of knowledge, which influences positive changes in society known as a progress. The maximum adaptation in society depends on availability and proper utilization of knowledge by individuals as well as social groups. When members of a society or communities/institutions fail to acquire proper