

# Systems Thinking and the Internet

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## INTRODUCTION: EVOLUTION OF MODERN THINKING

Despite our most impressive advances in science and technology, our prevailing worldview and the way we work and relate are deeply rooted in the thinking that emerged during the Renaissance of the 17<sup>th</sup> century. This thinking was influenced by the sciences of that era and, in particular, by Newtonian physics. Newton viewed the world as a machine that was created to serve its master—God (Ackoff, 1993). The machine metaphor and the associated mechanistic (positivist) worldview, which was later extended to the economy, the society, and the organization, has persisted until today and is evident in our thinking and vocabulary. The mechanistic view of the enterprise became less tenable in the 20<sup>th</sup> century, partly due to the emergence of the corporation and the increasing prominence of human relation issues in the workplace. As the futurist Alvin Toffler (1991) declared, “the Age of the Machine is screeching to a halt” (Toffler, 1991).

In the early part of the 20<sup>th</sup> century, a new breed of scientists, in particular, quantum physicists such as Werner Heisenberg (Uncertainty Principle) and Norbert Weiner (Cybernetics), began to challenge the Newtonian precepts (Zohar & Marshal, 1994). The 1960s saw the publication of Austrian biologist Von Bertalanffy’s seminal text, *General Systems Theory* (1968), a major milestone in this field. Later, Jay Forrester of MIT introduced and demonstrated the applications of feedback control theory in simulation models of organizations (Forrester, 1958). Forrester’s seminal work marks the birth of the professional field known as System Dynamics. System Dynamics is concerned with applications of systems theory and computer modeling in business, economics, and environment. System Dynamics is the forerunner and the scientific foundation of Systems Thinking.

## BACKGROUND: CRITICAL ISSUES

Machine-age thinking, still prevailing today, is based on the following assumptions.

- Complete understanding of the universe is possible.

- All relationships can be described through simple cause-and-effect relationships.
- The world could be understood through analysis (breaking the wholes into pieces).

For well over a century, the western world has subscribed to a way of thinking known as analysis (Ackoff, 1995). In analysis, in order to understand something—a concept, a product, a law, an organization, the human body—we break it into pieces and study the pieces separately. This approach tends to overlook the interdependencies and connections among the constituent parts that are responsible for change and dynamics in systems.

On the one hand, this divide-and-conquer approach has served us well. It has enabled efficient mass production of goods and services, which has brought a new social and economic order and has produced unprecedented wealth and standards of living in the industrialized world. On the other hand, this thinking has resulted in the fragmentation of functions and has created complexity and cross-purposes within organizations.

The major intellectual and philosophical precepts that form the bedrock of our modern society, such as division of labour, free-market economics, mass production, and scientific management, are characterised by the following (Zohar & Marshal, 1994).

- The hierarchy
- Need for certainty, stability, and the absolute
- Treating organizations and the society as consisting of isolated, separate, and interchangeable parts
- Relationships based on conflict and confrontation
- Desire for control and bureaucratic methods
- Persistence of single points of view leading to friction and polarisation
- Overemphasis on specialist expertise, leading to fragmentation and loss of relevance

## SYSTEMS THINKING

Systems Thinking (ST) is a discipline for understanding the dynamics of change and complexity underlying business, economic, scientific, and social systems. Systems Thinking has three distinct but related dimensions: para-

Table 1. Why we need Systems Thinking (Maani & Cavana, 2000)

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| <ul style="list-style-type: none"> <li>• Increasing complexity in our lives</li> <li>• Growing interdependence of the world</li> <li>• Revolutions in management theories and practice</li> <li>• Increasing global consciousness and yet local decision-making</li> <li>• Increasing recognition of learning as a key organizational capability</li> </ul> |
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digm, language, and methodology. These dimensions are outlined below (Maani & Cavana, 2000),

- **Paradigm:** Systems Thinking is a way of thinking about the world and relationships. This paradigm relates to the dynamic relationships that influence the behaviour of complex systems. A number of expressions that we use in daily language reflect the Systems Thinking paradigm—vicious/virtuous cycle, ripple effect, snowballing, spiral effect, domino effect, and chronic behaviour.
- **Language:** As a language, Systems Thinking provides a tool for understanding complexity and dynamic decision-making. The Systems Thinking language is known as Causal Loop (or Influence) Diagrams.
- **Methodology:** Systems Thinking provides a sophisticated computer modeling technology and associated learning environments for group interactions and learning.

## FUTURE TRENDS: SYSTEMS THINKING AND THE INTERNET

In the past few decades, two movements have had a profound influence on the way we think and communicate—the Internet and Systems Thinking. Both are grounded in science and technology and complement each other in principle and practice. While one has become a household name, the other still remains relatively obscure. The Internet was born in military and academic quarters in the late 1960s. In the 1990s, the Internet moved into the public domain and rapidly became a mass movement. Today, the Internet and its associated e-commerce is the engine driving the globalization and convergence of various markets, services, and industries (Query et al, 2003).

Systems Thinking likewise originated in scientific circles and is slowly growing in appeal and applications. It offers a way of thinking based on the primacy of the whole and relationships. Systems Thinking deals with hidden complexity, ambiguity, and mental models. It provides tools and techniques to leverage change and to create lasting interventions (Maani, 2001).

For centuries, information and knowledge were the preserve of the clergy and the aristocrats who used them to dominate and manipulate the masses. In the past century, knowledge privilege extended to the boss, the manager, and the teacher who assumed this as part of their role and superiority. This knowledge divide, for its part, has strengthened the hierarchy and widened the gap between the haves and have-nots.

Although they may be regarded as purely technical advances, both Systems Thinking and the Internet challenge the age-old paradigms and the ways information and knowledge are disseminated. At a more fundamental level, they challenge the hierarchy and authority, power, and leadership. In essence, the Information Age has ushered in a new culture, new social movements, and new politics around the globe (Webster, 2001).

The Internet, through its unimpeded access and speed, has brought down in effect the boundaries that define business, trade, and even nationhood. Likewise, through compelling and coherent scientific principles, Systems Thinking breaks down the superficial dichotomies of the whole vs. the part; the individual vs. the community; integration and autonomy; and business, nature, and society. Together, the Internet and Systems Thinking can provide powerful synergies blending new concepts, tools, and technologies.

Over the past 20 years, new concepts and models have emerged that have dramatically challenged the prevailing assumptions and practices in business and management. Among these are the just-in-time philosophy and techniques, total quality management, and, more recently, supply chain management and enterprise systems. These paradigms have progressively removed the conventional boundaries between the organization, the customer, the supplier, and, to some extent, the competition.

An example of the Internet-Systems Thinking synergy is the supply chain management (SCM) practiced in businesses worldwide. The conceptual underpinning of SCM is systemic in nature in that the business or organizational boundaries span to cover the entire chain of supply. In this model, the stakeholders regard themselves as partners and collaborators in an enterprise system who seek the good of the whole. This notion stands in sharp contrast to the business models preceding it, which were

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