TEACHING SYSTEMIC THINKING: EDUCATING THE NEXT GENERATION OF BUSINESS LEADERS

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Are we failing to adequately prepare our business leaders? Since an article in the *Harvard Business Review* on the topic more than 30 years ago, many researchers have raised concerns about how well management curricula at universities prepare students for the "real world." The criticisms can generally be grouped into two categories. One line of criticism essentially claims that business curricula are too theoretical and do not provide enough opportunities for students to apply the theories they are learning. The second area of criticism argues that business curricula are too functionally isolated and do not provide students with an understanding of how the parts of an organization should work together.

Over the years, universities have tried to address these concerns. To provide some real-world context, many business schools use case studies and require class projects. To help students see the interconnectedness of the business functions, some programs have integrated two or more course topics (such as finance and marketing) into one class. Unfortunately, there is little evidence that these or other actions have significantly improved how students perform once they graduate.

Of course, graduating from a business program is not the end of a manager's education, but the beginning. New hires are trained by their employers and given opportunities to learn on the job. In addition, virtually all large organizations have some form of management development program. In fact, it can be argued that business schools provide a broad foundation in general management skills and organizations provide the finishing touches as they groom middle- and upper-level executives to suit their company's specific needs and corporate culture.

Unfortunately, based on empirical evidence, company-run management development programs do not perform much better than business schools in educating managers in the nuances of organizational life. Every day, financial reports come out showing that companies are failing to perform as expected. Poor performance has resulted in a high turnover rate

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among upper-level executives. In 2000 alone, 40 CEOs of *Fortune*'s top 200 companies were fired or asked to resign. A recent study of firms listed on the *Fortune* 500 showed that about 30 companies drop off the list every year. The average life of firms on the S&P 500 is only a paltry 25 years.

There are many explanations for the phenomena described above. The rate of change in business has accelerated at an unprecedented rate. The product life cycle in most industries is rapidly decreasing. A company's innovative ideas are quickly copied by its competitors and just as rapidly become the industry standard. Given these circumstances, it is not surprising that businesses have short lives, and more and more upper-level managers are making bad, even illegal, business decisions.

This brings us back to the original question—*Are we failing to adequately prepare our business leaders?* If the answer to this question is yes, as the evidence seems to indicate, then we must ask two more questions: How are we failing? And what exactly do we need to change?

This study hypothesizes that, at least in part, the answer to both questions is related to the development of systemic thinking skills. During the last decade of the 20th century, several well-respected management experts, including Peter Senge, Russell Ackoff, W. Edwards Deming, and Jay Forrester, published books and articles emphasizing that businesses are complex social systems, and management practices must change to be effective in this environment.

At first glance, it appears that universities have embraced the experts' recommendations. In fact, the word "systems" has become omnipresent in business programs. Students are taught about production systems, accounting systems, information systems, financial systems, and so on. In addition, the quality movement introduced the need to manage processes, which by their nature cut across functions. Consequently, managers must learn to manage cross-functionally. As a result, many business curricula teach these concepts.

But are these actions adequate to prepare managers to be successful in what some are calling the Systems Age? We would argue that teaching students *about systems* is not the same as teaching students *to think systemically!*

We don't mean to indict current teaching practices. There is no question students must learn about sys-

tems. Studies have shown that a student's acquisition of operational skills is heavily dependent on the conceptual knowledge they are provided at earlier stages of their education. For that reason, students must first be made aware of how businesses fit the systems paradigm and what types of subsystems are embedded within them. They also need to learn about the various elements that make up the different types of subsystems in a business, along with how they work and interact. Similarly, working on cases and projects helps students better understand the idea of systems. Nevertheless, none of these activities is the same as helping managers to think systemically.

Defining Systemic Thinking

What exactly does it mean to think systemically? Unfortunately, there is no simple answer to this question. Ackoff acknowledged this difficulty when he provided the following definition: "Systemic thinking is holistic versus reductionistic thinking, synthetic versus analytic." While this definition is accurate, it is not precise. It provides a correct definition of the concept, but it doesn't help us understand what cognitive processes are involved in thinking systemically.

Undoubtedly, when experts such as Ackoff define systemic thinking, they are implicitly including these processes. However, implied skills are of little use from a teaching perspective. If educational programs are going to help students learn to think systemically, they must make these cognitive processes explicit and teach techniques for developing the skills associated with them. Therefore, we developed a specific operational definition of systemic thinking for this paper. This definition is based on the integration of ideas from several researchers in systems theory. The focus of the definition is on the cognitive processes necessary to gain holistic insight into a situation and the implications of making changes to the status quo.

Synthetic Thinking. In part, the difficulty in defining systemic thinking lies in the fact that it encompasses multiple skill sets; therefore, we have developed the definition in parts. The first segment focuses on the concept of holistic/synthetic thinking included in the definition provided above by Ackoff. In a 1981 publication, Ackoff explained that for the past 400 years, we have been trained using the analytical paradigm. Consequently, we view the terms "analysis" and "thinking" as synonyms. In reality, analysis is only one method of perceiving the world around us.

Ackoff goes on to differentiate analytical thinking and synthetic (holistic) thinking. *Analytic thinking* attempts to understand a system by breaking it into its smaller parts and studying these parts in isolation. Once the analyst understands the parts, he or she tries to explain the behavior of the whole based on the behavior of the parts. In contrast, *synthetic thinking* starts by trying to understand the larger context that the system operates within. Once the individual understands the role of a system within its larger context, he or she tries to explain the behavior of the system based on that role.

Looking at the two types of thinking from a different perspective, analytical thinking helps people understand *what* the parts do and *how* they work, while synthetic thinking explains *why* the parts do what they do. Ackoff points out that when a system is disassembled, it loses its essential properties and so do its parts. Furthermore, a crucial factor for understanding system behavior is observing how the parts interact. Consequently, he maintains that it is impossible to truly understand a system through analysis, thus making the case for developing synthetic thinking skills.

Synthetic thinking is particularly important in today's businesses, which have evolved into multi-minded, multi-purpose social systems. We now recognize organizations as being part of a larger purposeful system (society) with many subsystems (functional areas and/or teams) and parts (employees), all seeking to fulfill their own individual purposes. Ackoff and Jamshid Gharajedaghi (2003,

http://www.acasa.upenn.edu/System_MismatchesA.pdf) assert that many of the problems we currently see in business and other social systems are, at least in part, due to our managing social systems as if they were mechanical or biological entities. If leaders don't properly recognize and manage the various purposes held by the business, its subsystems, and its parts, organizations will experience high employee turnover, functional infighting, and a whole host of other problems.

To manage a multi-minded, multi-purpose social system, managers must understand why the various elements of the system behave as they do so they can acknowledge, prioritize, and subordinate these objectives as necessary over time. In short, a holistic approach to decision-making is necessary. Consequently, the first part of the definition of systemic thinking used in this paper is synthetic or holistic thinking.

Characteristics of Complex Systems. While holistic thinking is an essential part of systemic thinking, it does not sufficiently describe all of the cognitive processes necessary for thinking systemically. Forrester noted that social systems are a particularly complex kind of system. In addition, he identified several characteristics of complex systems that make it difficult for people to understand and work with them. These factors include:
• Cause and effect are often separated in terms of both time and space.
• Problem resolutions that improve a situation in the short term often create bigger problems in the longer term and vice versa.
• The subsystems and parts of a system interact using multiple, nonlinear feedback loops. This complex flow of interactions often results in counterintuitive behavior.
• Due to the time delays between cause and effect, people become accustomed to situations. They then reduce their goals and objectives to accommodate what they originally viewed as an unacceptable situation.

Notice that two of the factors identified by Forrester focus primarily on time and two focus primarily on complex interactions. Consequently,

an operational definition of systemic thinking should include capabilities related to understanding behavior over time and interactions between the parts of the system.

Most people learn the concept of cause and effect at an early age through simple situations. If I touch a hot stove, I get burned. If I don't watch where I am walking, I'll stumble over something, and so on. John Sterman points out that these simple situations teach us to have an event-oriented view of the world. Under this view, people see the world as a series of simple cause-and-effect relationships, where an effect has a single cause that occurred shortly prior to the effect. This perception prompts us to treat problems as isolated incidents and view solving them as a discrete, linear process: We recognize a problem, identify alternatives, select and implement solutions, and resolve the problem. While this belief holds true when working with simple systems, it creates serious problems when dealing with complex social systems.

Peter Senge succinctly articulated the common misperception of event-oriented thinking in his classic book, *The Fifth Discipline*: "Today's problems come from yesterday's solutions." As stated previously, the parts in a social system all have objectives and are constantly interacting. Because of the interdependency of the parts, we cannot make changes in isolation. There are always feedback loops that create unintended consequences, and they commonly include time delays.

Dynamic and Closed-Loop Thinking. Barry Richmond used the term "dynamic thinking" to describe a decision-maker's ability to see a phenomenon as the result of behavior over time rather than as a reaction to an isolated event. Dynamic thinking also includes viewing the structure of a system as contributing to the problem rather than merely attributing it to outside forces, as we often believe. Richmond referred to the capability to understand how the interactions of the parts of a system and its environment feed back to shape the ultimate result of any intervention as "closed-loop thinking." The definition of sys-

temic thinking developed for this study is the combination of these three cognitive processes:
Synthetic Thinking–studying the role and purpose of a system and its parts to understand why they behave as they do
Dynamic Thinking–examining how the system and its parts behave over time
Closed-Loop Thinking–investigating how the parts of a system react to and interact with each other and external factors

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>
> **—Peter Senge**

Because people generally have an event-oriented view of the world, they do not readily apply these skills. In fact, Forrester asserted that the human mind is incapable of truly understanding the behavior of complex social systems without the assistance of tools and technology. In 2000, Linda Booth Sweeney and John Sterman tested this claim. Administering an exercise to graduate students at MIT, they found that people have difficulty conceptualizing the behavior of even simple social systems. This difficulty appears to transcend age, national origin, educational background, and other demographic variables. Because most people don't have the ability to think systemically, in order for us to understand and work effectively with social systems, we must be trained in systemic thinking tools and concepts.

Do our education systems provide this training? The next section provides initial results from a survey of faculty working in business colleges at several major universities in the U.S. The survey focused on the teaching of systemic thinking in academic business programs.

Teaching Systemic Thinking

Despite the evidence that systemic thinking is a necessary skill for managers and that they need training to develop that skill, we found that management educators are still uncertain

about the role higher education is playing, or should play, in facilitating this task. A quick exploration of various business curricula revealed that relatively few programs offer a course that explicitly refers to systemic thinking.

The purpose of our study is to provide some initial insights into this issue and stimulate further research and discussion on the topic. Here we present some preliminary results from the survey related to the following questions:
• How do faculty define the concept of systemic thinking?
• What level of importance do faculty assign to systemic thinking skills relative to other curriculum objectives?
• To what extent is systemic thinking taught in graduate business schools?
• Do faculty differentiate between teaching about systems and teaching systemic thinking?

The data used to answer these questions was obtained from a web-based survey that was distributed electronically to approximately 2,900 randomly chosen faculty members teaching at the top 63 business schools in the U.S. Over a period of about four weeks, 297 responses were received. The following sections provide the basic statistics from the survey results related to the four questions above.

How Do Faculty Define the Concept of Systemic Thinking?
Respondents were provided five different options for defining systemic thinking and asked to select the one they felt best described the concept. In addition, they were given space to supply their own unique definition or supplement/combine any of the available definitions. Since the purpose of the question was to ascertain *how respondents defined systemic thinking*, it was important not to provide an obvious best answer. Consequently, none of the definitions incorporated all three of the elements discussed above. The specific question, the alternatives available, and the resulting selections made by respondents are provided below.

Which of the following best describes how you would define systemic thinking?

16% – Eliciting inputs from multiple disciplines and perspectives to develop a more complete understanding of a situation

13% – Identifying the optimal combination and arrangement of resources needed to achieve a desired outcome

19% – Studying how the different parts of an organization interact to achieve a desired outcome

7% – Mapping work flows to determine how information and material cut across an organization to create value

35% – Understanding how different parts of an organization interact, react to changes over time, and send feedback to affect performance

10% – Other

6% – Never heard of systemic thinking/have no idea how to define it

3% – All of the above

1% – All of the above plus an understanding of how it interacts with the environment

What Level of Importance Do Faculty Assign to Systemic Thinking Skills?

There were three questions in the survey related to this issue. The first two questions asked the respondents to rate how strongly they agreed with the following statements:

Teaching students to think systemically is an essential part of a graduate business program.

33.7% – Strongly Agree
40.7% – Agree
20.2% – Unsure
3.0% – Disagree
1.6% – Strongly Disagree
0.7% – No response

Systemic Thinking should be part of every class in a graduate business program.

12.8% – Strongly Agree
39.0% – Agree
24.6% – Unsure
12.8% – Disagree
3.0% – Strongly Disagree
7.7% – No response

The third question asked the respondents to rate how important systemic thinking was relative to other thinking skills. The thinking skills were: Critical Thinking, Analytical Thinking, Systemic Thinking, and Creative Thinking. In addition to the four choices, a space was provided for them to write in a different skill that they felt should be included. They were then asked to divide 100 points across these skills, based on how they perceived their relative importance. The only restriction on the allocation of the points was that the sum across all the skills had to equal 100.

Please allocate 100 points across the following thinking skills, according to how you perceive their relative importance.

Critical Thinking 27.14 (Average score across all respondents)
Analytical Thinking 26.35
Systemic Thinking 22.01
Creative Thinking 21.14
Other (Communication skills, Core business knowledge etc.) 3.22

It is interesting to note that a majority of faculty believes that systemic thinking is an essential part of a business education, but it is still ranked significantly below analytical thinking in relative importance.

To What Extent is Systemic Thinking Taught in Graduate Schools of Business?

The survey included several questions related to this issue, but most of them dealt with how the different disciplines (Accounting, Finance, Marketing, etc.) addressed the topic.

The first question simply asked the respondents if systemic thinking was taught in their curriculum; 42% answered "yes," 18% answered "no," and 40% were "not sure." The follow-up questions were then directed to the 42% who answered "yes" to the initial question. The follow-up question and responses are shown below.

Does the program at your school do an adequate job teaching systemic thinking?

9.7% – Strongly Agree
36.3% – Agree
39.5% – Unsure
12.9% – Disagree
1.6% – Strongly Disagree
0 – No response

Do Faculty Differentiate Between Teaching About Systems and Teaching Systemic Thinking?

If respondents said that they taught systemic thinking, they were referred to a list of systems-related topics that were unique to their chosen field and asked to identify which of the items they used in their teaching. For example, in operations management, the list included Lean Production Systems and Supply Chain Management. In addition, some items were listed that could be used to provide a more holistic view of an event but were not related to behavior over time or feedback loops. In operations, these included Value Stream Mapping, Fishbone Diagrams, and the DMAIC Cycle.

Finally, all the lists had tools specifically designed for systemic thinking. These included causal loop diagrams, stock and flow maps, and system archetypes. The intent of the question was to differentiate those teaching about systems from those teaching tools that could be used to think systemically. We haven't yet completed a detailed analysis on this data. However, preliminary results appear to support our hypothesis that the majority of faculty are teaching about systems and not teaching students to think systemically. This belief is based on the fact that few of the faculty that identified themselves as teaching systemic thinking used traditional systemic thinking tools. In fact, most said they taught systemic thinking by covering various systems concepts and teaching about different types of systems.

Conclusion

There are two huge ironies related to this study. First, we used an analytical process to define systemic thinking! Second, we used survey methodology to study the teaching of systemic thinking. Surveys are a research methodology in which findings are based solely on correlation, while systemic thinking is about understanding causation. Perhaps this is a necessary transition from one research paradigm to another (that is, you use elements of the old paradigm to define the new). At least that is the excuse we are giving!

Despite these ironies, we hope that this study will stimulate serious discussion on this topic. Several experts

have predicted a growing need to think systemically, and empirical evidence supports their predictions. It is our view that we are at a point where systemic thinking should no longer be viewed as merely an interesting concept, but that it has become a necessary managerial skill. As such, those responsible for grooming the next generation of managers must incorporate the tools and techniques designed to develop these skills into their training programs and curricula. If we don't, can we really expect better performance from future managers? ◘

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For Further Reading

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