International J. Soc. Sci. & Education
2017 Vol.7 Issue 3, ISSN: 2223-4934 E and 2227-393X Print

Strategic Conflict: A Systems Based Pedagogical Simulation

By

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Abstract

The paper describes a pedagogical simulation that allows students to explore strategic goal conflict within the context of systems theory. Systems theory emphasizes, among other things, complexity, non-linear relationships, unintended consequences, time delays, and dynamics. Another important aspect of systems thinking is contextual thinking, where objects or relationships cannot be taken as standalone or absolute, but are critically dependent on system structure and the environment. And while strategic planning has long emphasized the importance of environment, it may be difficult for students to experience or appreciate its importance in the planning process. The simulation provides an experiential exercise for a strategy course. The paper provides a summary of systems thinking and strategic goal conflict, a description of the simulation, teaching notes, and experience with the exercise.

Keywords: *strategic issue, systems theory, goal conflict, critical thinking.*

1. Introduction

> *'The study of relationships concerns not only the relationships among the system's components, but also those between the system as a whole and surrounding larger system"'*— Fritjof Capra (2009)

We live in a complex world and there have been calls in the management pedagogy literature to go beyond simple explanations and examples to prepare students for the complexity they will face not only in their work, but also in their personal lives. These calls are often couched in terms of critical thinking. For example, Glen, Suciu, and Baughn (2014) emphasize the need for students to 'make decisions in complex situations' (p. 663), while Waddock and Lozano (2013) couch it as a crisis:

> "We face a world in which management education is by many assessments in crisis for too narrowly and analytically orienting future managers who will need to lead in a complex, socially and ecologically fraught world, where simple answers just do not work." (p. 265).

The need for more complexity is particularly relevant in a strategic planning or business capstone course where the focus is on integrating the functional areas of business. And yet, we do not want to overwhelm students with complexity, inhibiting learning. At the risk of a direct contradiction, we want to provide relatively simple examples of complexityThis is what we propose in this exercise. We present an interactive online simulation where students can experience goal conflict that is conditioned on the environment. It is relatively simple and yet exposes students to interconnections and the importance of environmental factors.

In the simulation described in this paper, university administrators want to maintain student enrollments while simultaneously increasing the retention rate,both of which are explicitly listed as goals in the strategic plan. At first glance, these goals appear straight-forward and independent. However, when we add consideration of high school graduation rates, an environmental demographic trend, the complexity increases. Before presenting the simulation, however, we want to frame the exercise within the context of teaching strategy, goal conflict, and systems thinking.

2. Background and Literature Review

Teaching Strategic Management

A course in strategic management (a.k.a. business policy, strategic planning) may cover what strategy is, who does it, how, when and how often it is done, and the results of doing it. While strategyis usually presented in textbooks as a linear or cyclical process (e.g. strategy formulation, strategy implementation and strategy evaluation), in reality it is a messy (Franklin, 2003), chaotic (Eisenhardt and Brown, 1998), and complex(see e.g. Stacey, 1995) process about which, after over half a century of research, there is not a universally accepted academic paradigm.

Mintzberg's(1990) oft reproduced framework whichcategorizes the strategy literature in terms of ten "schools" of thought has been refined to two main approaches covered in mainstream textbooks—the resource-based (RBV) view(see e.g. Barney, 1991) and the industry organization (IO) view (see e.g. Porter, 1981) of strategy. Since both of these views claim to help organizations achieve above-average returns and are presented with regularity in textbooks, which view should we teach as the "correct" approach to strategy? Is it (a) RBV (b) IO view (c) both (d) none of the above (e) it doesn't really matter?Arguing the best answer to this multiple-choice question is beyond the scope of this paper--although we do give our opinion in the conclusion. We instead focus on fundamental concepts that should be taught regardless of one's overall approach to strategy: strategic issues, paradoxes/goal conflict, and systems thinking.

Strategic Issues

A strategic issue, as identified by Ansoff (1980), is … "a forthcoming development, either inside or outside of the organization, which is likely to have an important impact on the ability of the enterprise to meet its objectives"(133). Astrategic issue management system (abbreviated as SIMS, or SIM system), then, is a procedure used by an organization to identify and prioritize these strategic issues. Although a thorough examination of SIMS is not an objective of this paper, we introduce the concept as one of the base theoretical frameworks for the simulation, i.e. where it 'fits' in a strategy course. For an overview of SIM systems see e.g. Dutten & Ottensmeyer (1987) or Perrott (2011).

The specific SIM system that An off introduces to the readership of the *Strategic Management Journal* in his 1980 paper was Albert S. Humphry's ubiquitous Strength-Weakness-Opportunity-Threat (SWOT) framework, possibly the most commonly used (or misused) framework in strategic management classrooms. While we do not explore Ansoff's techniques in implementing the SWOT framework here, we highlight his three *rules* for successful SIM systems use: (1) the approach must be responsive to the complexity of the challenges;(2) the approach must be as simple as the complexity permits; and (3) the approach must be feasible given the organization's resources (Ansoff, 1980:141). For this paper, then, the desire to represent complex issues with simple tools is the first key takeaway from the literature—and what we believe pedagogical simulations can achieve.

As mentioned above, a primary purpose of a SIM system is to identify trends and/or events that may have an impact on an organization's ability to meet its goals and objectives. An organization may be making comfortable returns and meeting all of its strategic objectives, when an environmental issue emerges, hindering its ability to meet one or more of its objectives. Or perhaps an issue causes a situation where managers must make a decision as to which goals to meet and which must be sacrificed. In either instance, when a strategic issue arises that makes one goal incompatible with another, we term it *strategic goal conflict*.

Goal Conflict, Dilemmas, and Paradoxes

The concept of goal conflict is well covered in the general management, organizational behavior, and leadership literature, although the majority of content appears to be applied to inter- and intra- personal goal conflict. There is also a plethora of research that applies quantitative solutions to resolving goal conflict in organizations: multi-attribute utility theory (MAUT); simple multi-attribute ranking technique (SMART); Technique for Order Preference by Similarity to Ideal Solution (TOPSIS); Analytic Hierarchy Process; Fuzzy Goal Programming; Data Envelopment Analysis; and Case-Based Reasoning. Other relevant studies address goal conflict in public policy and administration (see e.g. Resh and Pitts, 2012; Wenger et al., 2006; ENDS, 2013), higher education (Meyer et al., 2011), and as it applies to management by objectives (MBO) (see e.g., Barton 1981).

Studies on strategic goal conflict also abound in the literature of the closely related ideas of paradoxes and dilemmas. A paradox, within the context of strategic management, occurs when two seemingly incompatible strategic goals exist. Smith and Lewis (2011) identify this situation as 'performing paradoxes', which arise from the need to satisfy the firm's multiple stakeholders' goals. In strategic management classrooms, a frequently taught example of a performing paradox is Michael Porter's (1996) generic strategies model that asserts that an organization cannot profitably pursue both a cost leadership and differentiation strategy. Other common examples of paradoxes in management are concern for task vs. concern for people(Blake and Mouton 1964), global standardization vs. local adaptation strategies in international business (Bartlett & Ghoshal, 1990), the productivity dilemma—efficiency vs. innovation in manufacturing (Abernathy, 1978), and of course the concern for profit and concern for people and the planet.

Strategy Evaluation

In the strategy literature (and textbooks), however, perhaps the most widely recognized framework—and most relevant to this paper—is Rumelt's (1979, 1980) criteria for strategy evaluation. Here the constructs of feasibility, consensus, consistency, and advantageare introduced as 'tests' for the appropriateness of strategic alternatives. Of these, *consensus* and *consistency*specifically address strategic goal conflict. In Rumelt's framework, consensus, or external strategic alignment, measures the degree to which the organization's strategies/goals are alignedwith trends in the external environment. He maintains that if the strategy does not 'represent an adaptive response to the external environment and to the critical changes occurring within it…'(Rumelt, 1980:360*),* the strategy should be dropped. Consistency, on the other hand, is a measure of internal alignment, i.e., how well the organization's resources are aligned with its goals/strategies. Rumelt proposes a goal consistency test, whereby...'a strategy must be rejected if it contains mutually inconsistent goals, objectives, and/or policies' (Rumelt, 1979: 210).

Whether termed a performing paradox, dilemma, or strategic goal conflict,what is needed in teaching strategy is a simple technique to help illustrate complex interactions of strategic issues stemming from environmental forces. We find that the *Strategic Conflict* simulation fits this need. And while the simulation explored in this paper can stand alone in illustrating the impact of environmental shifts on performance goals, we believe it is best used in conjunction with an introduction to systems thinking.

Introduction to Systems Thinking

While systems thinking certainly has ancient roots, as a field of study, it is relatively recent, with Ludwig von Bertalanffy (1968) often cited as the father of systems theory. The theory culminated out of work done initially in biology in the 1920s and 1930s, but was rapidly diffused to other fields. Boulding (1956), Johnson, Kast, and Rosenzweig (1964), and Mockler (1968) provide some of the early applications to business. Recent applications of systems theory to strategy include Puche, Ponte, Costas, Pino, and de la Fuente (2016); Lyons (2005); Hammer, Edwards, and Tapings (2012); Yadav, Taticchi, and Sushil (2015); and Brandenburg and Rebs (2015). Relevant to our simulation, Sterman (2014b);

Snabe and Größler (2006);Warren (2005); and Hirsch, Burggraf, and Daheim (2013) specifically apply system dynamics models to strategy.

Systems theory, and what we will generalize to systems thinking, was, in part, a reaction to the 'clockwork' view of the world and the tendency to reductionism, to deal with complexity by breaking down something into its parts. Systems thinking emphasizes interdisciplinary approaches and a focus on wholeness, interconnectedness, and dynamics. Russell Ackoff was a major system advocate and authored the classic strategy text *Creating the Corporate Future: Plan or be Planned for* in 1981. Much of his work was advocating for the systems view (e.g., Ackoff 1999a, 1999b). Ackoff's work in systems emphasized integrated design (idealized design); it is not the parts that count, it is the relationships among the parts in the furtherance of the whole.

Another major advocate for systems thinking stems from Jay Forrester's work at MIT in the 1950s and popularized by one of his students, Peter Senge. Forrester founded the field of system dynamics and Senge's text, *The Fifth Discipline*, (1990/2006) synthesized organizational dynamics and system dynamics as a model of the learning organization. It is a veritable quotable quotes for systems thinking. Forrester and Senge emphasize not only wholeness and interconnectedness, but also dynamics, where feedback loops are predominant in structure to drive organizational performance and behavior.

Management Flight Simulators

Another student of Forrester's is John Sterman, who is continuing the legacy for system dynamics at MIT. In addition to advancing the field of system dynamics, he has been an advocate for *Management Flight Simulators*, an alternative tool for learning. In management pedagogy, Sterman (2014a) reiterates the need to go beyond traditional lecture methods, and the need to go beyond what are acknowledged as alternative methods: 'constructionism, interactive learning, learner-directed learning or action learning (p. 90). The weaknesses of the alternative methods occur where systems involve significant time delays, where experimentation is improbable, or when the consequences of mistakes are high. This is where simulations, in general, and Management Flight Simulators, specifically, come into play.

Management Flight Simulators quickly evolved with system dynamics (for a brief history, see Meadows, 2007), often used after a major modeling effort to transmit knowledge (for an early example, see Senge, 1993). In management pedagogy, Graham, Morecroft, Senge, and Sterman (1992) developed an early simulator connected to the traditional case method and Sterman (2014a, 2014b) supplies several more examples.

The *Strategic Conflict* simulation is a system dynamics model and management flight simulator that allows students to explore an environmental impact and its effect on achieving strategic objectives: the environmental change creates a situation whereby executives are faced with a choice of achieving one or the other objective, as both can no longer be achieved. Students interact with the model to experience the dilemma executives would face. They can then 'unfold' the model to see how the change in the environment is creating the conflict. The following section describes pedagogical tool that simulates strategic goal conflict--the effect of an environmental force on an organization's ability to meet its operational goals.

3. Exploring the *Strategic Conflict* Simulation[1]

The simulation is viewed from the perspective of university administrators, whose explicit goals are (1) maintain student enrollments, (2) maintain or increase student retention rates, and (3) maintain quality of education (academic standards). The systems dynamics model is shown in Figure 1. It begins on the left with the university's pool of applicants (secondary school graduates) and ends with the number

[1]The simulation is available for review at: https://forio.com/simulate/pstepanovich/strategic-conflict-netsim

graduating from the university on the right. It tracks the flow of students from lower level (first and second year students) to those continuing to the upper level (third and fourth year students) and to those who exit the model (graduates).

For this simulation, we hold constant the number of upper level students, with the assumption that students who drop out are replaced by students transferring in from other universities. This allows us to focus on the effects of a change in the external environment—a smaller applicant pool caused by fewer secondary school graduates. Such a decrease in the size of the applicant pool, as has been experienced by many U.S. universities in recent years, could be a result of a temporary decline in birth rate approximately18 years ago as well as a permanent regional population shifts.

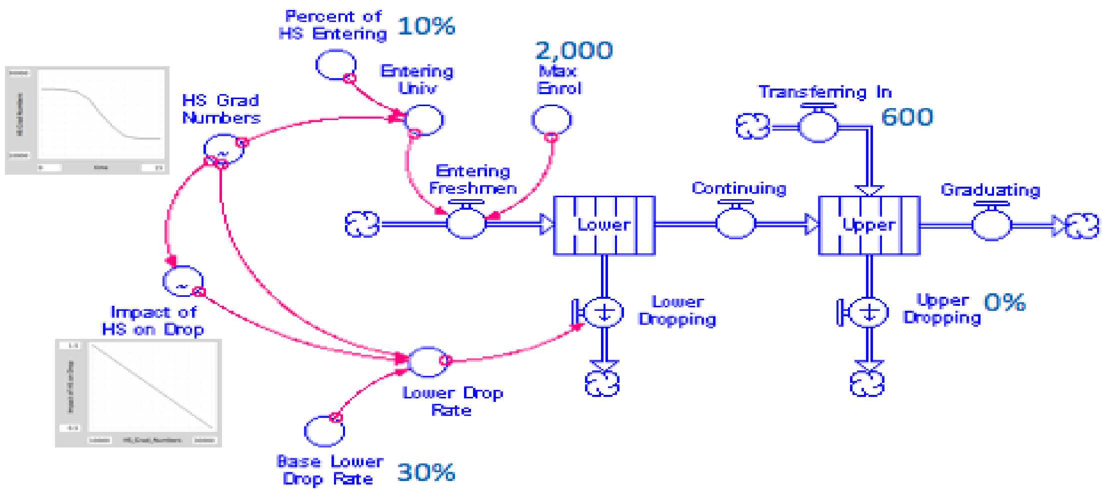
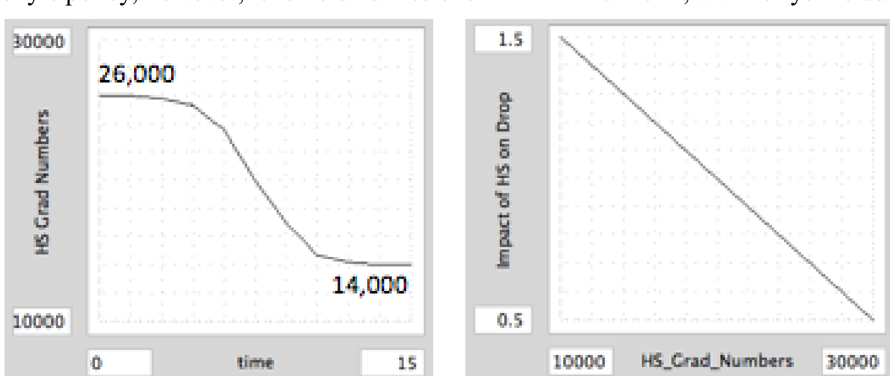


Figure 1. The Model

The secondary schoolgraduation numbers vary among the model's three runs. In the first run, it is simply a constant at 20,000 students. The percentage entering the university as first-year students is constant throughout all three runs at 10%. Thus, in the first run, there are 2,000 students entering the first year class. In rounds two and three, however, the number of secondary school graduates will vary over the 15 years of the simulation according Figure 2 a. It starts out high at 26,000 and moves to 14,000 at the end. The first-year class size will vary between an opportunity to bring in 2,600 students and 1,400 students. The university's policy, however, is to hold admissions at a maximum of 2,000 first-year students.



a. HS Grad Numbers
b. Impact of HS on Drop

Figure 2. Secondary School (High School or H.S.)Graduates and Dropout Impact

The lower left portion of Figure 1 illustrates the model's assumptions regarding the relationship between the number of secondary school graduates and the university's retention rate—in the model this is reversed as a dropout rate. As shown in Figure 2 b., the relationship is linear, where the lower the number of graduates will reflect a higher dropout rate. The assumption is that the greater the number of secondary school graduates, then the greater the opportunity for the university to select the 'best and the brightest,' or at least the 'better and the brighter,' from the candidate pool. These students will be more likely to be able to handle the work and fewer will be 'screened out.' The base dropout rate is set at 30% and does not change. The '*Impact of HS on Drop'* is multiplier to this base rate. The product of the impact and the base rate yields the dropout rate for the first and second year students.

On a more technical note and as an introduction to system dynamics modeling, the main chain of the model is represented by a series of stocks and flows. The number of entering first-year students is a flow ('Entering Freshmen') into the stock of lower level students ('Lower'). The stock has two drains, 'Continuing' and 'Lower Dropping.' The level of the 'Lower' stock is determined by a differential equation involving the flows.

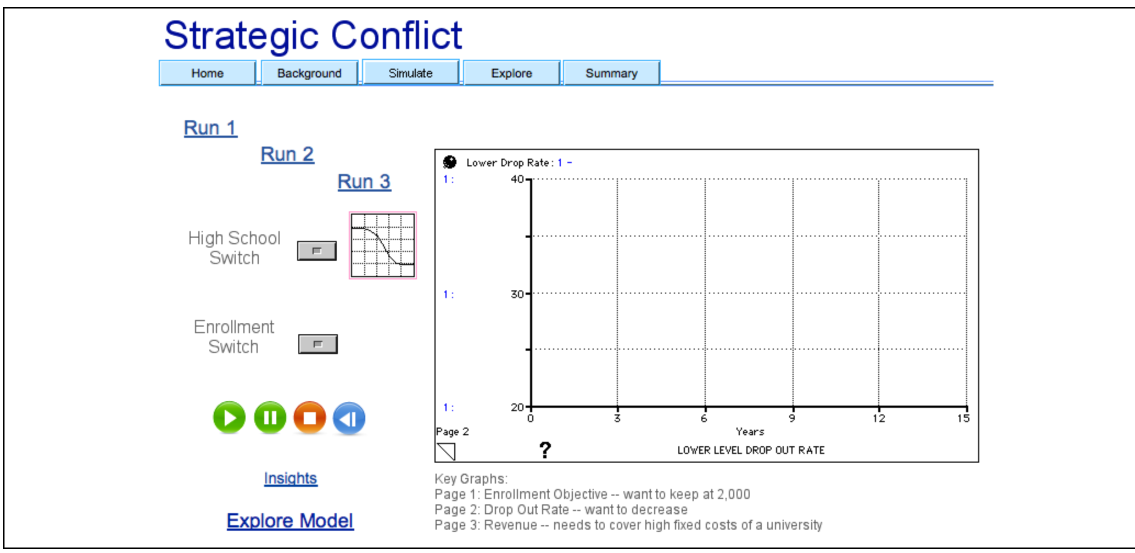


Figure 3. The Simulation Interface.

Fortunately, neither the model's developers (the authors) nor the students running the simulation have to deal with these equations. The model was developed using *ithink* software from iSee Systems which allows simple algebraic equations to drive the model. Students interact with the model from an interface shown in Figure 3. Here students can read about the three runs, which direct them to activate either or both of the switches, they can run the model and see results, and they can explore insights and the model details.

Run 1 of the model demonstrates a steady state where enrollments and dropout rates are constant at 2,000 and 30%, respectively. As shown in Figure 4, the results for both enrollments and the dropout rate are constant. This is the steady-state assumption. In run 2,the students activate the '*High School Switch'* which turns on the graphical representation of graduating secondary school students, where it varies from 26,000 to 14,000 over the course of the simulation. When the pool of secondary school candidates is higher than 20,000, enrollments are maintained and the dropout rate is low (see Figure 4, run 2). Administrators, in this environment, are able to achieve both of the strategic goals. However, as the number of candidates drops below 20,000, the picture changes. In this run of the model, administrators are sticking to their standards, regarding the quality of incoming students. As the pool drops, they are not able to meet their enrollment goal.

In run 3 of the simulation, the '*High School Switch'* remains activated but now the students turn on the '*Enrollment Switch*,' which tells the model to maintain enrollments at 2,000, regardless of the secondary school graduations. The results are shown in Figure 4, Run 3. Now enrollments are maintained, but the dropout rate increases to nearly 40%. After completing the three runs, students can explore insights and unfold the model, with a step-wise explanation of Figure 1.

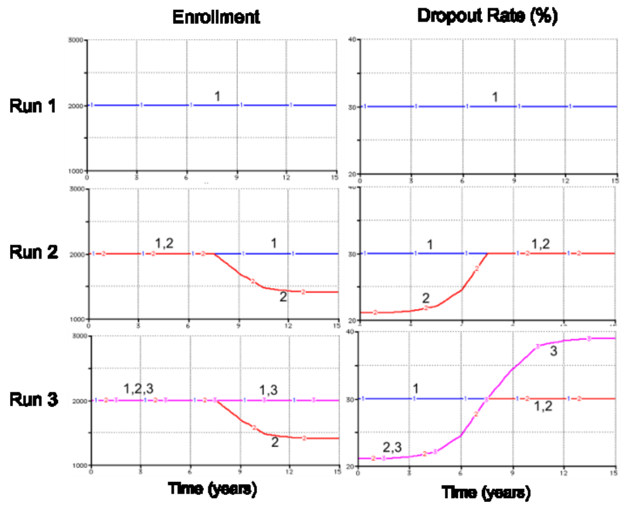


Figure 4. Simulation Results.

4. Teaching Notes

There are two main lessons. The first deals with complexity; we often don't get it right with even mild complexity. The second relates toassumptions and the need to get them out of our head and onto the table.

Complexity

On the surface, the simulation appears simplistic, with only one relevant stock, one inflow, and two outflows. But there is evidence that we struggle with simple dynamic models. In the classic example, Sweeney and Sterman (2000) used very basic and simple stock and flow processes to test whether our general inability to cope with complexity and dynamics stemmed from overall complexity involving size and scope or whether it was from a more fundamental level. They found that students at the MIT Sloan School of Management, all highly educated with exceptionally strong mathematical backgrounds, "have poor understanding of some of the most basic concepts of system dynamics, specifically stocks and flows, time delays, and feedback" (p. 278); andSterman (2001) summarized a lesson from Jay Forrester's Beer Game: "Complex and dysfunctional dynamics arise from a game you can play on your dining room table and whose rules can be learned in 15 minutes" (p. 11). Subsequent studies have borne out this inability to think through simple dynamics (Cronin, Gonzalez, & Sterman, 2009; Sterman & Dogan, 2015).

In the *Strategic Conflict* simulation, we are not dealing with significant delays, which is often the issue, but with an interaction among issues. And yet students are surprised by the results. It may be particularly powerful to have students construct concept models in class, similar to the *Draw Toast* exercise (Wujec, n.d.), individually or in groups, providing the background and asking them to predict the implications of high school graduation rates on the achievement of the objectives. The impact of high school graduation rates will likely not be immediately relevant, providing an opportunity to introduce and explore environmental impacts in the simulation—it may look easy after-the-fact, but difficult to predict.

Assumptions
Another important lesson deals with assumptions, one of the benefits of system dynamics modeling. "All models are wrong, but some are useful," and the usefulness often comes from the quality of the assumptions. In system dynamics, it is important to get the models out of our heads (mental models) and onto the table, so that they can be critiqued (Richmond, 2001, Ch. 1). The initial obvious assumptions deal with high school graduates as the only freshmen (no transfers or adult learners), a constant capture rate, the base dropout rate, and the linear impact of the size of the candidate pool on the dropout rate. These are done for simplicity and discussions can tease out their accuracy and implications.

A more interesting, but perhaps more tangential assumption, deals with professors holding to a particular standard. Why must lowering the admissions criteria increase the dropout rate? Do professors 'educate' or do they 'screen out'? In the larger picture, is the role of academia, in general, to 'educate' or 'screen'? And in an even larger sense, do only admissions criteria impact the dropout rate? Discussions might include First Year Experience programs, boot camps, or remedial courses.

The simulation effectively stops at the lower level, but discussions could focus on how the model could be extended. For example, what happens with upper level transfer students, which in our experience tends to be under-emphasized, and upper level dropout rates? Could quality be added, with a feedback loop to admissions? Might an increase in dropout rates short-term lead to higher quality admissions and lower dropout rates in the future, a 'worse before better' system archetype?Resources for the systems aspects include Sterman (1994), Meadows (2008), and Senge (1990/2006).

5 Conclusion

"A hallmark of true expertise is making a complex subject understandable."(Rumelt, 2011:28). Strategic management is, arguably, one of the most complex subject taught in business schools. As an integrative, or capstone, course, students should be required to draw on all business disciplines in learning how businesses create, implement and evaluate strategies. At the outset we introduced two prevailing schools of thought for teaching strategy—the resource-based (RBV) and the industry organization (IO) view, and posed the question, 'which should be used?'. Our response, is, that regardless of which view is used, a systems approach to teachingstrategy is critical for representing the complexity of the subject. We also believe the *Strategic Conflict* simulation is a useful tool for presenting this complexity in an understandable manner. Similarly, the exercise can be used to introduce or reinforce systems thinking independent of a strategic planning application, as the format and structure of the interactive exercise provides an opportunity to illustrate systems theory.

In closing, we offer not necessarily proof, but certainly evidence, that the simulation is an effective teaching tool. After using the simulation students commented on their classroom experience:

> *"I got to see that there are assumptions and relationships in certain views and when it comes to certain conflicts and goals, you have to test out policies and decisions to see what will work."*
>
> *"This 'strategic conflict' stimulation showed me the benefits to changing my way of thinking to a systems view in order to successfully achieve my goals."*
>
> *"I did not know that complexity contains inherent conflicts and contradiction. It was interest in reading that if you meet one goal you would fail to achieve another."*
>
> *"Rather than having a one-way cause and effect, where one idea or decisions directly effects the next, the systems view represents a circular cause and effect due to the fact*

that it forces a bigger picture…"

"With this simulation, it is definitely necessary to look at the 'big-picture.' Relationships and interconnectedness needs established in order to understand all perspectives."

References

Abernathy, W.J. 1978.*The Productivity Dilemma.*Baltimore, MD: Johns Hopkins Press.

Ackoff, R.L. 1981.*Creating the corporate future: Plan or be planned for*. New York: Wiley.

Ackoff, R.L. 1999a.*Ackoff's best: His classic writings on management*. New York: Wiley.

Ackoff, R.L. 1999b.*Re-creating the corporation: A design of organizations for the 21st century*. New York: Oxford University Press.

Ansoff, H. Igor. 1980. "Strategic Issue Management". *Strategic Management Journal 1*(1): 131-148.

Barney, J. 1991. "Firm resources and sustained competitive advantage".*Journal of Managemen t17* March :99-120.

Barton, R. 1981. "An MCDM approach to resolving goal conflict in MBO". *Academy of Management Review 6*(2): 231-241.

Bertalanffy, L. von. 1968.*General systems theory: Foundations, development, applications*. New York: George Braziller.

Blake, R. and J. Mouton. 1964.*The Managerial Grid: The Key to Leadership Excellence*. Houston: Gulf Publishing Co.

Boulding, K. 1956. "General systems theory: The skeleton of science". *Management Science 2*(3): 197-208.

Brandenburg, M. andT. Rebs.2015. "Sustainable supply chain management: A modeling perspective".*Annals of Operations Research 229*(1): 213-252.

Capra, F. 2009. The new facts of life. *Center for Ecoliteracy.* Retrieved June 29, 2009 from http://www.ecoliteracy.org/article/new-facts-life

Cronin, M., C. Gonzalez, andJ. Sterman. 2009. "Why don't well-educated adults understand accumulation? A challenge to researchers, educators, and citizens".*Organizational Behavior and Human Decision Processes 108*(1): 116–130.

Dutton, J. and E. Ottensmeyer. 1987. "Strategic issue management systems: forms, functions, and contexts". *Academy of ManagementReview 12*(2): 355-365.

Eisenhardt, K. and S. Brown. 1998. "Competing on the edge: strategy as structured chaos".*Long Range Planning 31(*5): 786-789.

ENDS. 2013. Growth duty conflicts with green goals.*ENDS (Environmental Data Services)*.460: 22-24.

Franklin, P. 2003. "Strategy formation in messy conditions". *Strategic Change 12*: 235–237.

Ghoshal, S. and C.A. Bartlett.1990. "The multinational corporation as an interorganizational network". *Academy of Management Review15*(4): 603-626.

Glen, R., C. Suciu, and C. Baughn. 2014. "The need for design thinking in business schools". *Academy of Management Learning &Education 13*: 653-667.

Graham, A.K., J.D. Morecroft, P.M. Senge, P.M., andJ.D. Sterman.1992. "Model-supported case studies for management education". *European Journal of Operational Research 59*(1): 151-166.

Hammer, R.J., J.S. Edwards, andE. Tapings. 2012. "Examining the strategy development process through the lens of complex adaptive systems theory". *The Journal of the Operational Research Society 63*(7): 909-919.

Hirsch, S., P. Burggraf, andC. Daheim.2013. "Scenario planning with integrated quantification – managing uncertainty in corporate strategy building". *Foresight 15*(5): 363.

iSee Systems, Inc. 2016. ithink (version 10) [software]. Available from http://www.iseesystems.com/

Johnson, R.A., F. E. Kast, andJ.E. Rosenzweig. 1964. "Systems theory and management".*Management Science 10*(2): 367-384.

Lyons, M. 2005. "Knowledge and the modelling of complex systems".*Futures*37(7): 711-719.

Meadows, D.2007. "A brief and incomplete history of operational gaming in system dynamics". *System Dynamics Review 23*(2/3): 199-203.

Meadows, D.H.2008. *Thinking in systems: A primer*. White River Junction, VT: Chelsea Green Publishing.

Meyer, A., K. Aten, A. Krause, M. Metzger, andS. Holloway.2011. "Creating a university technology commercialization programme: confronting conflicts between learning, discovery and commercialisation goals". *International Journal of Entrepreneurship & Innovation Management 13*(2): 179-198.

Mintzberg, H. 1990. "The design school: reconsidering the basic premises of strategic management". *Strategic Management Journal* 11: 171-195.

Mockler, R.J..1968. "The Systems Approach to Business Organization and Decision Making". *California Management Review 11*(2): 53-58.

Perrott, B.2011."Strategic issue management as change catalyst".*Strategy &Leadership* 39(5): 20-29.

Porter, M.E. 1981. "The contributions of industrial organization to strategic management".*Academy of Management Review* 6: 609-620.

Porter, M.E. 1996. "What is strategy?".*Harvard Business Review 74*(6): 61-78.

Puche, J., B. Ponte, J. Costas,R. Pino, andD. de la Fuente. 2016. "Systemic approach to supply chain management through the viable system model and the theory of constraints". *Production Planning &Control 27*(5): 421.

Resh, W. andD. Pitts.2012."No Solutions, Only Trade-Offs? Evidence about Goal Conflict in Street-Level Bureaucracies".*Public Administration Review 73*(1): 132–142.

Richmond, B. 1993. "Systems thinking: Critical thinking skills for the 1990s and beyond". *System Dynamics Review 9*(2): 113-133.

Richmond, B. 2004. *An introduction to systems thinking, I think*. Hanover, NH: iSee Systems.

Rumelt, R. 1979. "Evaluation of strategy: Theory and models", in D.E. Schendel and C.W. Hofer (eds). *Strategic Management: A New View of Business Policy and Planning.* Boston: Little, Brown: 196-212.

Rumelt, R. 1980."The Evaluation of Business Strategy".in W.F. Glueck (ed), *Strategic Management and Business Policy*. New York: McGraw-Hill: 359-366.

Rumelt, R. 2011. "Choosing the right strategy". *Director*64(11): 28.

Senge, P. 2006. *The fifth discipline: The art and practice of the learning organization*. (Rev. ed.), New

York: Doubleday. (Original work published 1990).

Senge, P.M. 1993. "Transforming the Practice of Management". *Human Resource Development Quarterly*4(1): 5-32.

Smith, W. andM. Lewis.2011."Toward a theory of paradox: A dymanic equilibrium model of organizing. *Academy of Management Review*.36(2): 381–403.

Snabe, B. andA. Größler. 2006. "System dynamics modelling for strategy implementation—case study and issues". *Systems Research & Behavioral Science*23(4): 467.

Stacey, R. 1995. "The science of complexity: An alternative perspective for strategic change processes". *Strategic Management Journal*16(6): 477-495.

Sterman, J. 2014a. "Interactive web-based simulations for strategy and sustainability: The MIT Sloan LearningEdge management flight simulators, part I.".*System Dynamics Review*30(1/2): 89-121.

Sterman, J. 2014b. "Interactive web-based simulations for strategy and sustainability: The MIT Sloan LearningEdge management flight simulators, part II". *System Dynamics Review*30(3): 206-231.

Sterman, J.D. 1994. "Learning in and about complex systems". *System Dynamics Review*10(2/3): 291-330.

Sterman, J.D. 2000. *Business dynamics: Systems thinking and modeling for a complex world*. Boston: McGraw-Hill.

Sterman, J.D. andG. Dogan. 2015. "I'm not hoarding, I'm just stocking up before the hoarders get here: Behavioral causes of phantom ordering in supply chains". *Journal of Operations Management*39-40(System Dynamics: Emergence, Reinforcement, Adaptation and Traps): 6-22.

Sweeney, L.B. andD. Meadows. 2010. *The systems thinking playbook*. White River Junction, VT: Chelsea Green. (Original work published 1995)

Sweeney, L. andJ. Sterman. 2000. "Bathtub dynamics: initial results of a systems thinking inventory". *System Dynamics Review 16*(4): 249-286.

Waddock, S. andJ.M. Lozano.2013. "Developing more holistic management education: Lessons learned from two programs". *Academy of Management Learning &Education 12(*2): 265-284.

Warren, K. 2005. "Improving strategic management with the fundamental principles of system dynamics". *System Dynamics Review*21(4): 329-350.

Wenger, J., L. O'Toole, andK. Meier. 2008. "Trading Speed for Accuracy? Managing Goal Conflict and Accommodation in the U.S. Unemployment Insurance Program".*Policy Studies Journal 36*(2): 75-198.

Wujec, T. (n.d.). "Draw how to make toast". Retrieved from http://www.drawtoast.com/

Yadav, N., P. Taticchi, and Sushil. 2015. "Dynamics of strategic interventions with firm's performance: Case illustration in Indian context". *International Journal of Productivity and Performance Management 64*(5): 640-656.