Systems Thinking and the Case Method

Ari Ginsberg
Stern School of Business
New York University
44 West 4th Street
New York 10012, USA

John Morecroft
London Business School
Sussex Place, Regent's Park
London NW1 4SA
UK

April 1995

Abstract

To create more effective learning environments for strategic management, system dynamics modelers have recommended the use of computer simulation models as a supplement to conventional case studies. Although custom designed simulation games provide students with the opportunity to investigate the effects of alternative actions, their creation involves considerable development efforts. Moreover, available simulations provide no direction for using case information to discover systems thinking issues and solutions. In this paper we demonstrate how instructors can introduce feedback concepts to students via conventional case discussion. Specifically, we show how feedback processes can be woven into a case discussion involving issues of corporate diversification and restructuring.
Keywords: Management education; case method; systems thinking; feedback systems; system dynamics; diversification; restructuring.

Introduction

The increasing use of systems thinking and simulation to support strategy and policy case teaching requires a better understanding of how these methods add value to the conventional case method approach. Although custom designed simulation games provide students with the opportunity to test hypotheses regarding the effects of alternative actions, their development involves considerable efforts. Moreover, joint usage of case and simulation does not provide instructors with a method for drawing relevant systems thinking issues and solutions from the case discussion.

To address this pedagogical need, we present a method for introducing system thinking to students via conventional case discussion. We begin by reviewing the contributions and limitations of cases and simulation-supported cases. We then describe our method in the context of a case on corporate diversification and restructuring.

Pedagogical Approaches to Strategy Design

Strategy design requires skills in three key areas: (1) ability to use relevant techniques, or frameworks, such as financial statement analysis, Porter's five forces analysis, and portfolio matrix analysis; (2) ability to identify and analyze strategic issues and alternatives; and (3) ability to develop action plans. Effective general managers also develop useful attitudes and "wisdom" that shape three key components of strategy design. These are: (1) investigation,

i.e. asking the right questions to discover the most important issues; (2) framing, i.e. organizing some of the data into a new framework while downplaying other aspects; and (3) transfer, i.e. selecting and applying past experience or an appropriate theoretical framework to help solve the current problem (Graham, Morecroft, Senge and Sterman, 1992).

The Case Method

The case method has been used to develop strategy design skills in a number of ways. Indeed, Dooley and Skinner (1977) have observed that:

> *"The phrase 'case method' embraces such an array of pedagogical practices that the term itself has no precise connotation. There are as many varieties of the case method as there are practitioners. The differences which exist among the varieties are as pronounced as differences between any one variety of the case method and any other "noncase method". The only common denominator in the method is use of a case study. But the purposes to which that case is put, and the actual events that occur in the class, vary almost without limit."*

Dimensions of the Case Method

Despite this range of differences, alternative case method approaches can be differentiated along three broad dimensions encompassing educational objectives, the pedagogic philosophy of the instructor, and varying roles of students and instructor (Dooley & Skinner, 1977).

The case method helps develop strategy design skills by giving students a focussed opportunity for debate regarding a complex, unstructured, and realistic strategic situation (Christensen et al 1987). The class discussion provides a forum in which students can express their opinions and comments. This process enables students to learn from their peers as well as from the instructor. The success of a case-based class on strategy design is typically reflected in the quality of students' analysis of issues, the recommendations they provide, and in their changed awareness and attitudes.

Table 1 summarizes the range of educational objectives that are relevant to the development of strategic thinking skills, along with the concommitant roles of students and instructors. This range of objectives and roles runs parallel to the range of pedagogic philosophies employed, which is bounded on the one hand by the belief that learning is a self-acquired process and on the other hand by the belief that the instructor is the decisive element in the learning process.

Limitations of the Case Method

Despite its contribution to the development of strategy design skills, the case method has an important drawback: it tends to promote thought independent of action, and strategy design as primarily a process of conception rather than as one of learning (Mintzberg, 1990). This is because the conventional case method approach does not provide a means for testing hypotheses provided by participants regarding the effects of alternative actions (Graham et al, 1992). The importance of experimentation lies in the difficulties managers have in evaluating the long-term consequences of decisions taken in complex settings.

TABLE 1. USING THE CASE METHOD IN TEACHING STRATEGY AND POLICY

(Adapted from Dooley & Skinner, 1977)

Educational Objective	Teacher's Role	Student's Role	Teacher's Preparation	Teacher's Skills and Knowledge Required	Problems and Hazards Frequently Encountered	Requirements for Success	Judging Success of Class
Acquire skill in use of technique or framework	Question and probe to develop realism	Work out effective use of technique or framework in business situation	Understand applications and limitations and problems in use of technique	Realistic recognition of problems in use of technique	"It seems too easy; It seems too hard; It seems too universal; It seems too limited"	Realistically demanding case. Teacher can restrain self from resolving problems	Practicality of student recommend-ations
Acquire skill in analysis of strategic issues and alternatives	Probe Clarify Inter-relate	Analyze Determine cause/effect relationships by analysis of facts and Inferences	Case analysis use analytical frameworks to develop issues and alternatives and predict possible student approaches	Questions to open up areas for discussion Careful listening Sense of realism	Teacher domination Teacher "telling" Teacher impatience, Teacher solving	Student willing to work, desires to analyze problem and feels competent	Thoroughness, variety, completeness of analysis in breadth and depth
Acquire skill in synthesis of action plans	Challenge Question Extrapolate Role-play	Establish priorities, plan of action: Develop possible outcomes and implications	Use analytical frameworks to develop understanding of situation and possible approaches	Interpretation of student plan without domination	Teacher temptation to settle it with own ingenious analysis	Student feels he/she had necessary facts and is challenged to develop solution which he/she feels does exist	Creativity & realism of action plans
Develop useful attitudes and awareness	Lift up the problem of executive attitudes	Discuss / debate outcomes Personalize	Consider variety of attitudes, present and possible	Seeing problem from its many sides	Teacher imposition of own attitudes / values	Teacher trusts that attitudes emerge as a long-term by-product of a demanding education	Changes in attitudes, increased confidence, humility, responsibility, and awareness
Develop mature judgment/ wisdom	Give feedback Restate Listen	Discuss / debate Develop alternatives and their implications	Case analysis in all possible dimensions	Self-restraint Perception of student state of progress	Teacher impatience, teacher inability to tolerate student frustration	Teacher can tolerate student frustrations	Waiting & trusting

Research in dynamic decision making and system dynamics shows that decision making environments characterized by multiple feedback processes, side effects, time delays and non-linearity are particularly troublesome (Sterman 1989). The nature of these cognitive limitations significantly decreases the effectiveness of the traditional case method in helping students to acquire skills for analyzing strategic options and for synthesizing action plans.

System dynamics can help overcome misperceptions of feedback that typically constrain management foresight. System dynamics offers a framework for conceptualizing complex strategic situations, tools to identify the feedback structure which generates problematic behaviors, and simulation methods to infer correctly the dynamics of these structures. Thus, a system dynamics model-supported case approach addresses the deficiencies of the traditional case method in a number of ways: (1) it creates an environment in which investigation can occur; (2) it develops skills in the scientific method (developing and testing hypotheses); (3) it produces theory to explain how problems in complex systems arise; (4) it provides a language to describe them; and (5) it furnishes tools to relate system structure to behavior.

Although simulation appears to be critical for achieving the first two objectives, it does not automatically provide the last three contributions mentioned above. Thus, while we do not deny the value of simulation for testing strategic options, we believe that an important intermediate step is a method for using the case discussion itself to develop systems thinking skills and to reveal feedback structures hidden within the case and the simulator. In other words, we propose the development of a model-supported case approach that accomplishes the last three contributions by fostering shared language for system structure and shared theories of dynamic behaviour. This approach is intended to help students discover feedback processes for themselves as a vital prelude to using a management simulator. At present, even the best developed cases-with-simulators such as People Express (Whitestone 1983 and Sterman 1988) leave students in the dark about the feedback structure embodied in the simulator.

To operationalize our approach, we looked for a case in an area of strategy that is currently "underdeveloped" with respect to system dynamics modeling: diversification and restructuring efforts in a mature industry. We then developed a conceptual feedback model that seemed to fit well both the storyline and factual detail of the case. On the basis of this conceptual model we devised a case teaching plan for getting students to frame case issues and recommendations in terms of feedback processes and business dynamics.

Our teaching plan acknowledges the importance of "self-learning" in the case method, but also reflects our belief that it is appropriate for the instructor to impose a subtle discipline on the discussion through the use of an analytical framework. Such frameworks, e.g., Porter's model of five industry forces (Porter, 1985), can help students organize case information and form opinions. Thus in our approach the instructor is the decisive element in the learning process, striving "gently" to help students "discover" solutions and insights. The key challenge we faced was how to use the case method to help students "discover" feedback loops, and to recognize the benefits of system thinking.

Overview of the Case Material

The case material we used to develop our approach is "Goodyear Restructuring" (Harvard Business School, 1988) and "Goodyear Tire and Rubber Company 1988" (Harvard Business School, 1989). The focus of the Goodyear case material is Goodyear's search for new strategic direction against the backdrop of the mature tire market in the 1970s and 1980s, which is the company's core business. The focus of the case is on the long term dynamics of the business portfolio and the consequences of investing in the core tire business versus the non-tire or rubber businesses.

The two cases cover a period of about 20 years in which Goodyear's management team experiment with a number of options to deal with the apparently stagnant, mature, and increasingly competitive tire market. The company's actions can be grouped in three phases:

1977-1982

Actions: Technology-led product innovation, plant and equipment upgrades, strict focus on the tire business.

Performance: Financial returns are low, OEM market share actually declines, replacement share is stagnant, and by 1982 the US Tire industry is in a severe recession.

1982-1986

Actions: Programme of rapid diversification into aerospace, natural gas transmission, and oil and gas exploration aiming for 50% tire, 25% energy, 25% aerospace.

Performance: OEM and replacement share both grow against a backdrop of industry growth. Sir James Goldsmith makes hostile takeover bid.

1986-1988

Actions: Debt to purchase shares and fend-off Sir James, followed by forced sell-off of non-tire business.

Performance: Tight corner for Goodyear; industry heads into cyclical decline.

The 1988 case leaves the reader pondering the options facing a new CEO -- Barrett -- in 1989 in the face of falling earnings, declining stock price, high debt, reduced cash flow, rising raw material prices and increasing industry rivalry.

Using Feedback Loops in Case Discussion - the Process

As preparation for the class students are asked to read (in addition to the cases) Chapter 5 of *The Fifth Discipline,* "A Shift of Mind" (Senge, 1990). As most readers know, this chapter introduces systems thinking as a framework for seeing interrelationships and for dealing with complexity in business and social systems. The chapter explains circle diagrams - the basic mapping tool of systems thinking, and then goes on to cover the building blocks of systems thinking: reinforcing and balancing feedback and time delays. The class is designed to build on these concepts and to apply them specifically to understanding Goodyear and the Tire Industry.

A good starting point for the discussion is to review the actions and performance of Goodyear in the three time phases summarized above, and to pose the question 'what went wrong'. Typically students will try to find someone or something to blame for Goodyear's predicament in 1988. Some blame the management, some blame the corporate raider, others

blame economic conditions, the oil price or exchange rates. This is a good point at which to press the need to understand the structure of the system in which the events unfolded rather than to find a scapegoat.

Discussion then proceeds to four board 'maps' that the instructor creates with the help of students. These maps show the system in which Goodyear's diversification strategy plays out.

Growth and Investment in the Core Tire Business

The first map, shown in figure 1, allows the class to explore growth and investment in the core tire business and to appreciate the difficult investment judgements facing a management team in a mature industry. The instructor creates the map in stages beginning with the parts shown in bold. At the heart of the core tire business is a reinforcing loop connecting investment to assets and competence in the core tire business. This loop will generate growth in assets and competence providing that the performance of the core tire business is sufficient to justify investment at a rate that exceeds obsolescence. With this core structure in place the class can then discuss how managers might gauge performance, how quickly they should adjust investment to changing performance, and how performance itself depends on both previous investment decisions and industry structure. Without being too directive the instructor can lead the class to a picture of the core tire business similar to the one shown in figure 1. The parts shown in normal print deal directly with the feedback consequences of Goodyear's investment decisions. The parts shown in italics deal with the industry. The overall visual impression is one of complexity.

Focussing first on Goodyear, growth in assets and competence lead to an improvement in tire attractiveness, but only after a time delay for product development. Other things being equal, an improvement in tire attractiveness will lead to an increase in market share. Again there is a delay, in this case representing the time it takes customers to recognise a better value tire and to switch brands. Moreover, there are likely to be diminishing returns to tire attractiveness, particularly in a mature market. Market share affects tire sales which then influences performance of the core tire business, so completing the feedback loop connecting investment and performance.

The remainder of the picture shows the industry backdrop to Goodyear's investment decisions. The tire industry displays many characteristics typical of a mature industry. Total tire demand (driven by OEM and replacement demand) is stagnant but strongly cyclical. Cyclical demand coupled with long lags in factory construction lead to volatile capacity and periods of intense rivalry. Rivalry puts downward pressure on industry tire price and on margins in the core tire business.

As the picture unfolds, students begin to appreciate the complex web of factors that underpin performance of the core business. They also begin to see the reasons that may have tempted Goodyear's management to consider diversification. By 1982, after 5 years of investment in the core business, performance was worse than in 1977. Was this due to the industry, to the investment projects, the time lags in product development? It's a matter of managerial judgement, where time delays, feedback and complex causality create the possibility for differing managerial opinions and misperceptions.

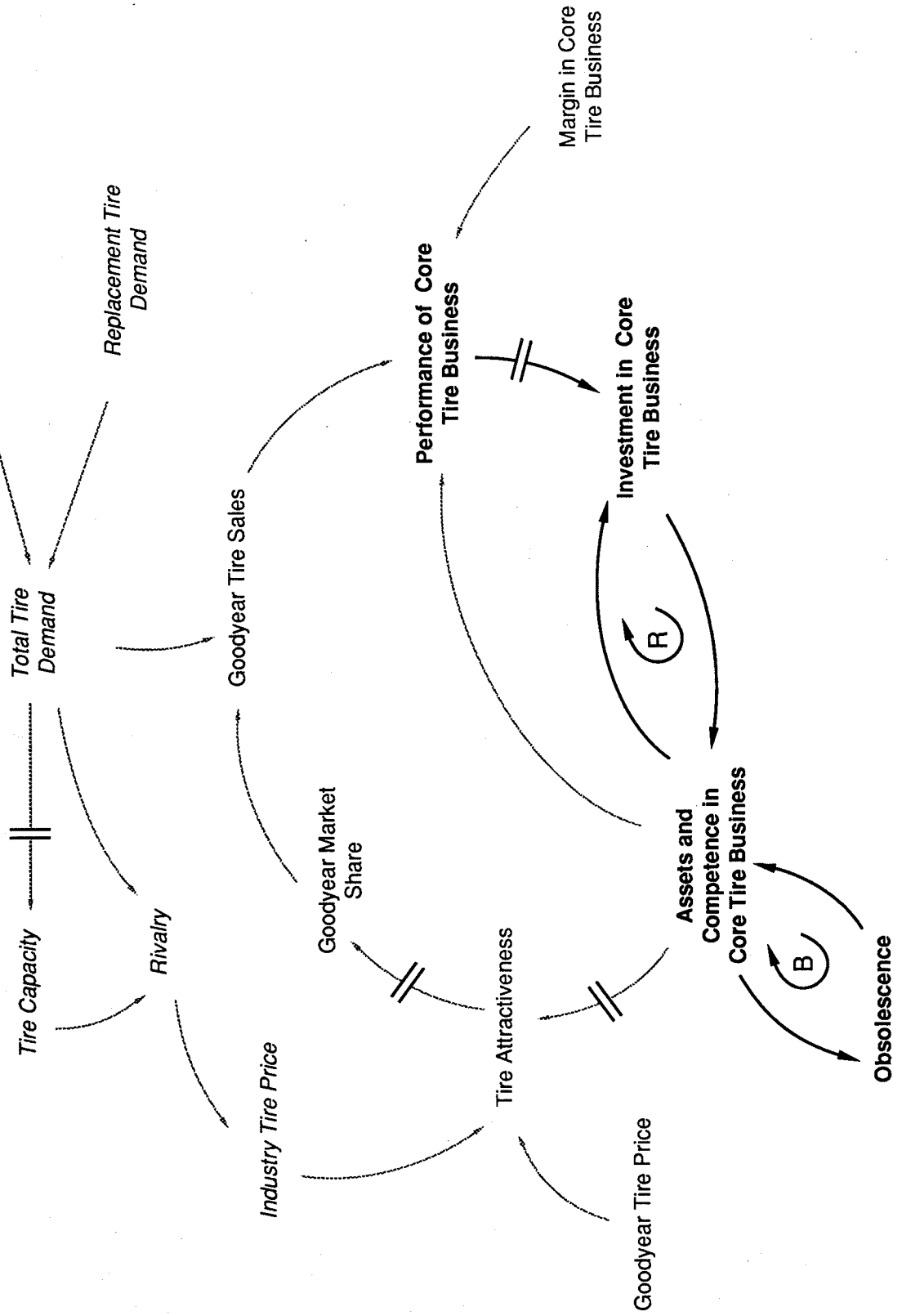

Figure 1: Growth and Investment in the Core Tire Business

Diversification Policy and Growth of the Non Tire Business

Figure 2 shows a map that forms the basis for the discussion of diversification. From a systems view the non tire business can be seen in terms of an investment process quite similar to the core tire business. At the heart of the map is a reinforcing loop connecting investment to assets in the non tire business. Just as before, this loop will generate growth in assets providing that the performance of the non tire business is sufficient to justify investment at a rate that exceeds obsolescence. Once again, with this basic structure in place the class can discuss how managers gauge performance of the non tire business. It is useful to draw the attention of the students to the parallels in feedback structure of the core and non tire businesses, despite the major differences in the details of the business as described in the case.

Investment (and therefore diversification) continues providing that the performance of the non tire business is judged satisfactory. But what is satisfactory performance? Here one can invite comments from the students, building on specific examples taken from the case. Goodyear's diversification program begins with the acquisition of Celeron in the oil and gas business. The class can first discuss the rationale for the Celeron acquisition and then move on consider how management would justify further investment in oil and gas. A key issue is the relative performance of the acquired business. The concept of relative performance raises a host of interesting policy issues for discussion. What is the benchmark for comparison? What were the original assumptions for the performance of the business? What if the true potential performance of the new business differs significantly from assumptions? How quickly should management update their expectations of performance in the light of experience.

A good discussion should yield a map similar to figure 2. Relative performance of the non tire business depends on a judgement that compares benchmark performance with expected performance. An important benchmark is the performance of the core tire business itself. Continued investment in a new business makes little sense if the financial performance of the core business turns out to be superior in the long run. However, the dilemma facing managers is that they don't know for certain how well the new business will perform when it is integrated into the diversified portfolio. Instead they must make do with a judgement of expected performance that blends assumed performance (as originally foreseen at the time of the acquisition) and reported performance. The blend will differ from company to company. Reported performance is a consequence of past investments in the non tire business and closes the feedback loop back to assets and investment.

Rationale of the Raider and Response of the Goodyear Board

While Goodyear's management was busy building and making sense of a diversified portfolio, events began unfolding in the stock market that culminated in the dramatic actions of a corporate raider in the person of Sir James Goldsmith. Many students view the appearance of a raider as a stroke of bad luck or an act of financial opportunism without seeing the system that links the raider to the company before, during and after the attempted hostile takeover.

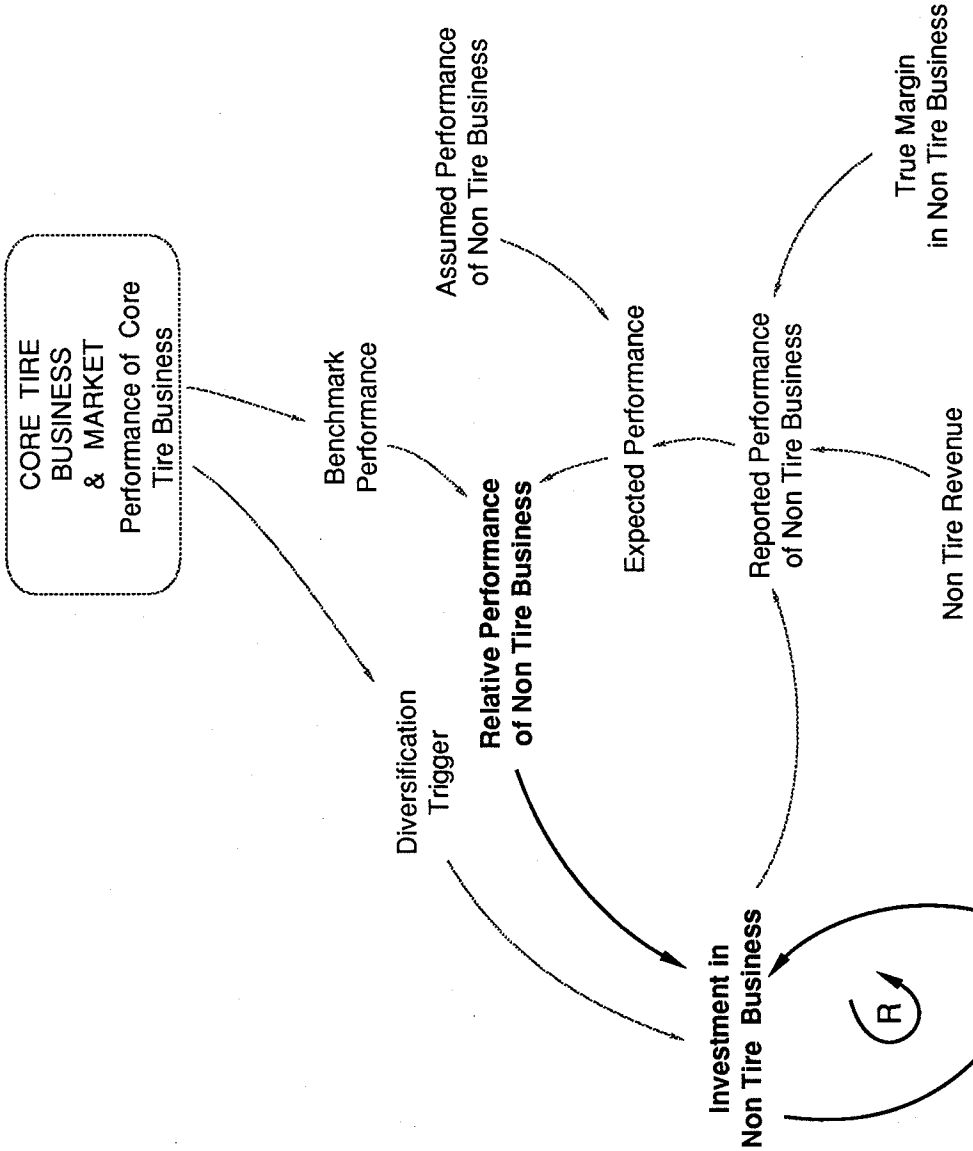

Figure 2: Diversification Policy and Growth of the Non Tire Business

Figure 3 allows the class to explore the rationale of the raider and the response of the Goodyear Board. The instructor begins by sketching the section on the left of the figure shown in bold. This is a balancing loop. The raider gets wind of a company that appears to be a suitable candidate for a hostile takeover. The raider's immediate objective is to acquire a stake in the company as indicated by the raider's share target. The raider proceeds to purchase shares (starting invisibly within the stock market) until the shares in control of the raider approach the target. At this point the class can embark on a interesting discussion of the factors that might influence the share target. The instructor should steer the discussion in the general direction indicated by the figure, though additional factors might easily be added. The key point is to discern potential value in the breakup of a diversified portfolio. In the figure, the raider evaluates perceived business focus which might for example depend on the ratio of assets in the core business to total assets - both core and non tire. If focus is low, yet the core business is performing well (as indicated by market share) in a favourable industry environment (as indicated say by declining rivalry) then the raider sees an opportunity and actively seeks shares.

The instructor then sketches the balancing loop shown in bold on the right of the figure. This loop shows Goodyear's Board purchasing shares in order to reach a share target that will overcome the perceived threat posed by the raider. Class discussion focuses on how the Board becomes aware of the raider and how fast it then acts. How much attention should senior management pay to day-by-day movements in share price? How can managers discern the power of a raider if the raider's dealings are cloaked in the anonymity of the market. When a company is aware of a raider how fast should it/can it act to counter the threat?

All these issues could receive attention in a well structured discussion. In the figure, raider power depends on the ratio of shares in the control of the raider to total shares outstanding. Goodyear's perception of raider power depends on raider power but does not respond immediately. There is a time lag and probably a threshold for visibility of raider power. Once the perception is formed then the ensuing power struggle is played out through the two balancing loops. The figure also shows the unintended debt that arises from forced repurchasing - leading to a debt burden that can constrain essential investment in the core business.

Share Price and the Behavior of the Stock Market

The actions of the raider and Goodyear's Board play themselves out in the context of the stock market. The threat of a hostile bid leads to a brief frenzy of trading that can cause share price to rise significantly. Figure 4 allows students the opportunity to discuss share price and the behavior of the stockmarket and investors during a hostile bid.

The instructor can begin by sketching the portion of the figure shown in bold on the left. The feedback structure here is a balancing loop. Indicated share price represents the new price to which the market is adapting given current transaction pressure. In financial markets the adaption takes place very quickly, so the balancing loop is fast acting. Transaction pressure is an unusual concept that students could not be expected to discover, so it too should be sketched by the instructor: it depends on desired share purchases in relation to the normal trading volume of Goodyear's shares. The instructor can then open up a fruitful discussion (though challenging to facilitate) of the factors affecting desired share

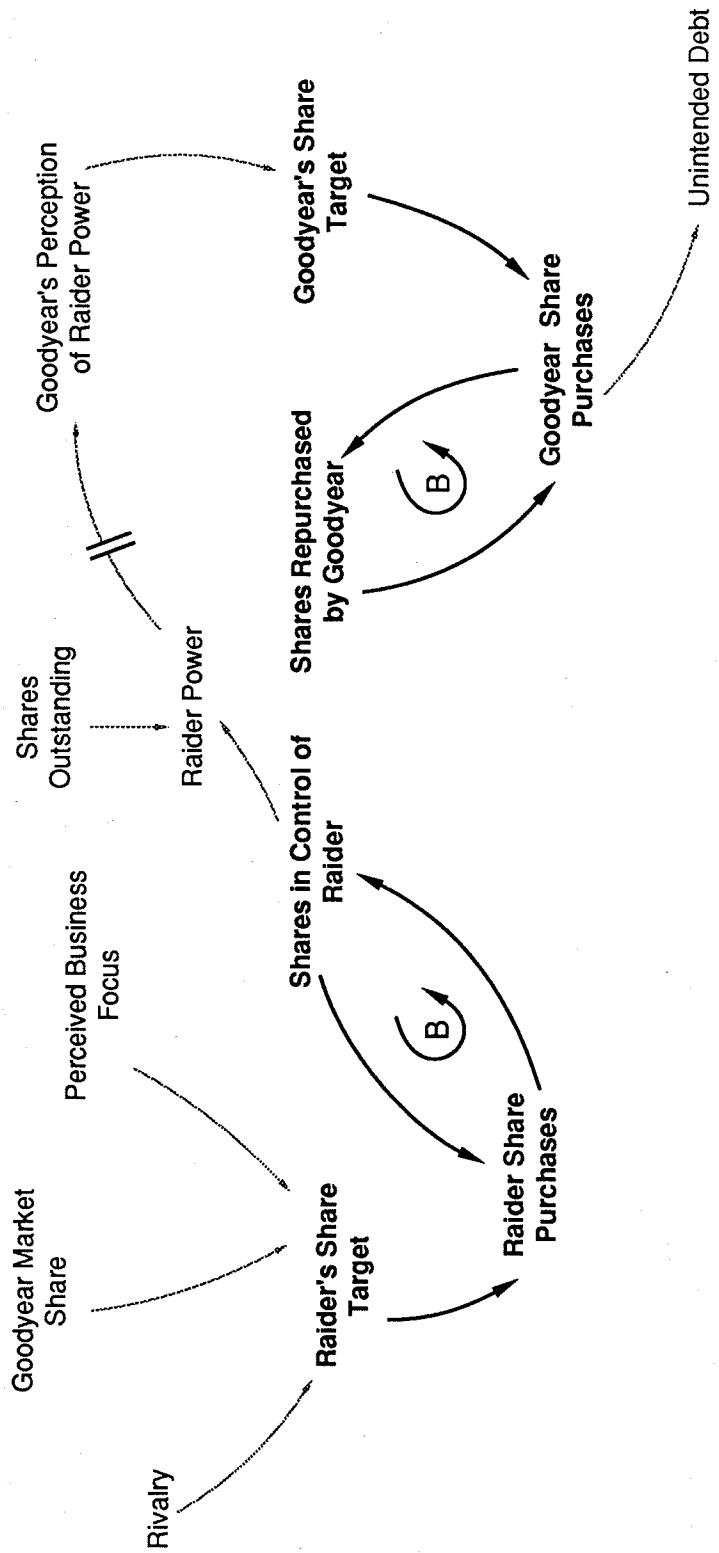

Figure 3: Rationale of Raider and Response of Goodyear Board

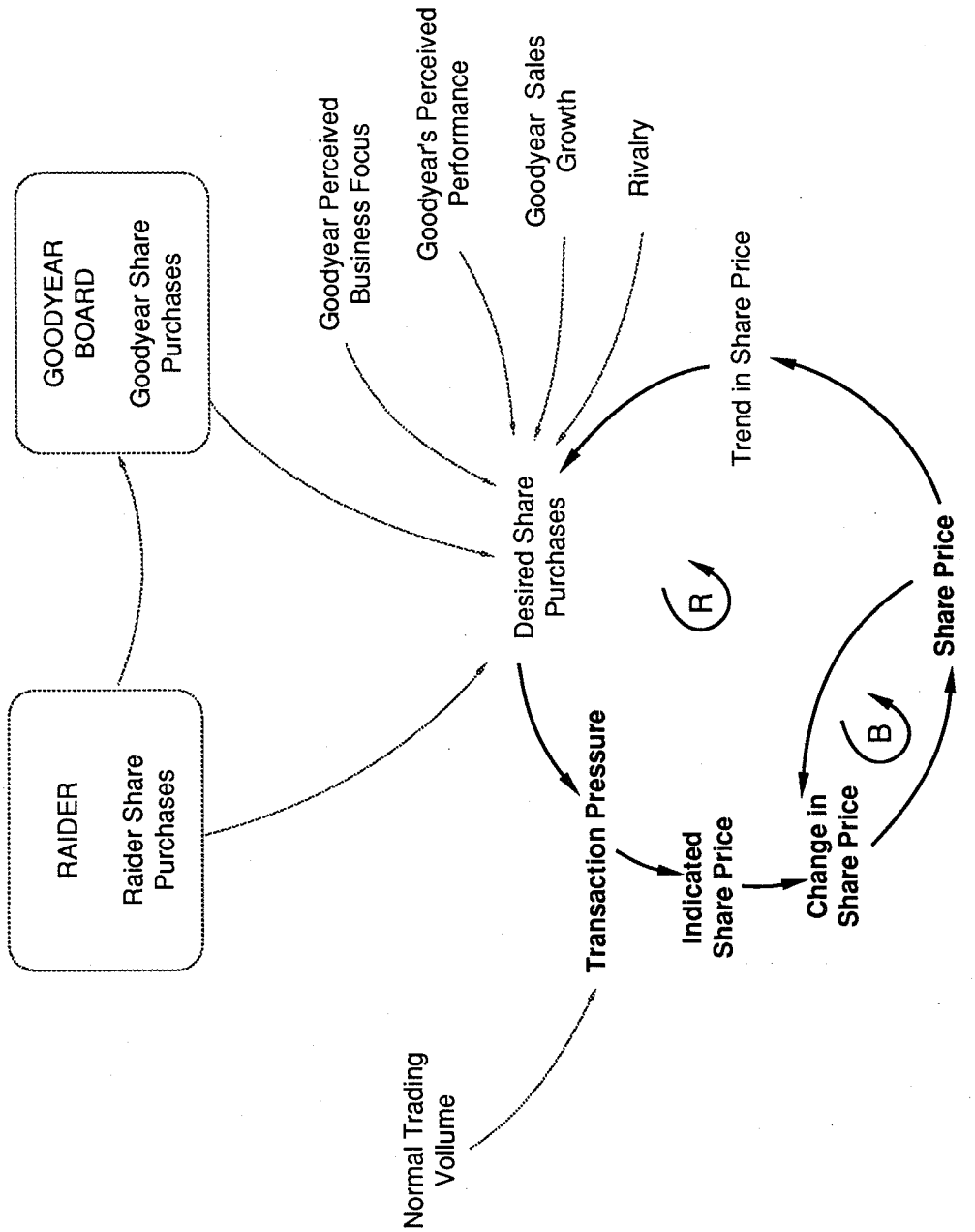

Figure 4: Share Price and the Rationale of the Stock Market

purchases. In the absence of a raider, desired purchases depend on the interpretation placed by analysts and investors on Goodyear's diversification strategy. Students will point to many factors that could legitimately influence this interpretation, which the instructor can add to the map. However, there are two key points on which the class should dwell: (1) that analysts are receiving and processing publicly available information from the firm and the industry as they make their judgments; and (2) that both the information sources and criteria used by analysts differ from those of management. The figure shows a variety of information sources such as business focus, financial performance, sales growth, and industry rivalry. The activities of the raider and the Goodyear Board superimpose on normal trading patterns to augment desired share purchases. The figure also shows a speculative influence on desired share purchases coming from the trend in share price. The full speculative mechanism is shown as a reinforcing loop in which the trend in share price feeds back through transaction pressure to affect share price itself.

Trial Run

We conducted a trial run of the case discussion along the lines described above. The trial group comprised 70 newly arrived MBA students in the third week of their programme, taking an introductory 'general management' course. On average they had seven years business experience before joining the program They had no prior exposure to systems thinking or system dynamics, and many were quite new to the case method. In the previous week they had discussed the competitive structure of the global tire industry as a prelude to thinking about Goodyear.

We found that the market map (top of figure 1) coupled effectively to discussions from the previous week about industry structure. It allowed students to see graphically the drivers of rivalry in a mature industry. The map of the core tire business (the rest of figure 1) raised questions about managers' assessment of business performance - the importance they attach to purely financial measures of performance versus subtle judgements about industry structure and competitive position.

The map of diversification (figure 2) proved to be cast at a high level of aggregation and abstraction that many students found uncomfortable. Typically students think about diversification in terms of individual corporate acquisition decisions: the choice of target company and the resulting balance of the portfolio. The map however is looking at diversification policy - the process for establishing performance benchmarks and for gauging the relative performance of acquired companies in the portfolio. Individual diversification decisions are embedded within this overall policy. The distinction between broad guiding policy and individual decisions is vital in systems thinking as it enables one to step back from detail complexity to the vantage point where feedback processes become visible. Nevertheless this step of abstraction is difficult and presents a conceptual barrier to dialogue in the case method. We dealt with abstraction by first discussing the rationale of the Celeron acquisition before moving the discussion to the broad level of diversification policy.

The map of the raider (figure 3) revealed wide differences in students' understanding of both the mechanics and logic of hostile takeovers. Questions and debate arose over the motives of the raider, how the raider assesses value, how analysts recognise a given company as a takeover target, how the board of a target company finds out about its vulnerability to takeover? Conflict of opinion is fuel for lively case discussion, but here the

instructor faces the difficult challenge of managing the discussion and steering it constructively in the direction of the raider map.

The map of the stock market (figure 4) deals with investors in the aggregate - once again a level of abstraction typical for systems thinking, but not necessarily a good fit with students' prior mental models. There were many different opinions on what really drives demand for shares. The map does not separate institutional investors from individuals and analysts, and the price-setting rationale of traders is a black box (even for those who have visited a trading floor). Nevertheless, the process of constructing the map did provoke useful dialogue even though some students found it difficult to identify with the sparse and aggregate concepts in the final picture.

The trial run identified some areas for improvement. Given the complexity of the case and the novelty of feedback concepts, we would suggest using the case plan later in the MBA program, maybe midway rather than right at the start. We would also recommend a short formal introduction to feedback loops and circle diagrams before the case discussion.

Future Steps

The feedback view of business and social systems has the potential to make important contributions to both research and teaching in strategic management (Morecroft, 1988). Indeed, the success of *The Fifth Discipline* and increasing use of management simulators based on information feedback system principles show that this potential is already being realised. This paper explores a natural further development - the integration of systems thinking into the heart of the case method and classroom dialogue.

The premise of this paper is that the visual building blocks of feedback systems - balancing and reinforcing feedback processes - can form the basis of informed and insightful case discussion. In other words, feedback processes can not only represent (or model) strategic business situations, but can also "contain" (or form the framework for) a conventional case discussion. We have illustrated this premise in the context of the Goodyear case and diversification policy.

The immediate next step in this work is to refine and test the case plan to show that it does indeed reliably support high quality case teaching that challenges students to think, argue and listen while leading them gently to the "discovery" of feedback processes and systems insights.

Beyond the case plan lies a full-fledged business simulator and microworld that allows students to experiment with alternative policies and approaches for managing diversification. We are already working on the development of a prototype simulator in the belief that a simulation model tied to a case (even loosely as an add-on exercise) amplifies the learning experience. However, we will realize a more significant contribution if our case plan proves robust. Then we will have demonstrated the viability of case teaching that makes full use of the combined power of systems thinking (to discover feedback processes) and simulation (to explore the dynamics that arise from feedback systems).

References

Christensen, C.R., K.R. Andrews, J.L. Bower, R.G. 1987. Hammermesh and M.E. Porter. *Business Policy: Text and Cases*, Sixth edition, Irwin: Homewood, IL.

Dooley, A.R. & Skinner, W. 1977. Casing case methods. *Academy of Management Review*, 2(2), 277-289.

Goodyear Tire and Rubber Company 1988, 1989. Harvard Business School Case Services, 9-290-016.

Goodyear Restructuring, 1988. Harvard Business School Case Services, 9-288-046.

Graham, A.K., Morecroft, J.D.W., Senge, P.M. & Sterman, J.D. 1992. Model-supported case studies for management education, *European Journal of Operational Research, 59*, 151-166.

Mintzberg, H. The design school: Reconsidering the basic premises of strategic management. *Strategic Management Journal, 11*, 171-19, 1990.

Morecroft, J.D.W. 1988. System dynamics and microworlds for policymakers, *European Journal of Operational Research,* 35, 3, 301-320.

Porter, M.E. 1985. *Competitive Advantage,* New York: Free Press.

Senge, P.M. 1990. *The Fifth Discipline,* New York: Doubleday.

Sterman, J.D. 1988. *People Express Management Flight Simulator,* MIT Sloan School, Cambridge MA.

Sterman, J.D. 1989. Misperceptions of feedback in dynamic decision making, *Organizational Behavior and Human Decision Processes,* 43, 3, 301-335.

Whitestone, D. 1983. *People Express (A),* Harvard Business School Case Services, 9-483-103.