

Three Simulations for Teaching Systems Thinking.

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This paper outlines the application of computer simulations in the teaching of systems thinking in two situations: in an academic context in the teaching of Strategic Management in a Graduate Management program at Monash University and in a business context in the management development programs at Carlton and United Brewing, which is part of the Fosters Brewing Group.

Introduction.

In the Department of Business Management at Monash University, the Graduate Diploma and Master of Organizational Systems degrees use System Dynamics and Systems Theory as "informing metaphors" for the teaching of a range of business disciplines. The use of System Thinking in Strategic Management is based on two reasons. First, the concern to build, test and validate models that have the power to illuminate a broad range of cases is common to both Systems Theory and Strategic Management. A second is the focus in both areas on causation and interdependence. The concern of the strategist is to understand the long term effects of a firm's actions and decisions and the impact of the feedback from external systems such as competitors.

To meet these aims the staff involved in teaching strategy decided to have the students design simulations using the modelling package "iThink" and test the range of strategies that management has for dealing with Horn and Hardart's debt problem through divestment. Originally, this process required the successful completion of four learning stages. Firstly, a clear understanding of the strategic options; secondly, the development of sufficient skill in systems dynamics modelling to be able to build relatively complex models; thirdly, building of a model that allows the testing of the strategic options and finally; ensuring that the model had the requisite feedback loops to demonstrate the dynamic relationships the firm was involved in.

Our experience was that building a model of this level of complexity was too difficult for students whose knowledge of modelling was, of necessity, limited. Given that the objective was to develop an understanding of divestment strategies, it was decided to use a teaching model where the focus moves away from the student as model builder to an explorer of a model whose dynamics lead to a greater understanding of the strategic concepts.

In the work done with CUB, the understanding of system thinking has been done in the context of developing a learning organization culture. Here the emphasis is on the establishment of patterns of double loop learning and how systems thinking can provide a the intellectual technology for the examination of previously unchallenged mental models.

1 The Horn and Hardart Model

We used the case on Horn and Hardart [Thompson & Strickland, 1993], a US conglomerate facing severe debt and diversification problems. The objectives were to have students understand the dynamic relationship between debt, current and non-current assets, shareholder equity and cash flow when creating a divestment strategy. The problems facing the management of Horn and Hardart were those of business restructuring, involving decisions on which elements of the business to sell; the profitable ones whose sale provides the greatest debt reduction or the less profitable ones whose sale leaves a strong core business capable of trading out of trouble.

The model that was developed uses financial data from the case to establish capital values for the Horn and Hardart assets. Current financial performance is used to build projections of each asset's performance over the course of the simulation. Class discussion prior to the use of the simulation establishes that Horn and Hardart need to divest assets to arrest their negative cash flow. Students need to plan a strategy that provides the firm and the stock holders with some chance of survival. The first issue for the students is that a non-core business is the most profitable part of the portfolio. Selling it will realize the best return but will leave the firm with subsidiaries that appear to have little chance of being profitable in the medium term. On the other hand, selling businesses that are accumulating losses will realize returns well below the balance sheet value and negatively impact shareholder equity. Thus, students need a clearly defined strategy on "What business do we want to be in?" before they begin the simulation.

During the simulation, students are presented with two offers for each firm in the Horn and Hardart portfolio. They must make a decision on whether to accept the offer or not. Each decision, or non-decision, has an impact on cash flow and shareholder equity. The offers are generated at random to avoid "gaming" and to encourage the formulation of a clear strategy.

The students are required to prepare a causal map of the inter-relationship of the model and a report to the shareholders outlining the strategy for recovery and a realistic appraisal of the shareholders prospects.

2 The Beer Launch Model

This model was developed for a client who is using Systems Thinking as the basis for developing organizational learning. The program is part of the on-going training for the middle and senior management of CUB and in this particular session the aim is to introduce systems thinking concepts in the context of Strategic Management.

- 1 To help participants to understand the dynamics of strategic management and the behaviour over time of advertising, demand, sales, lost sales, production and inventory.
- 2 To introduce participants to causal loop diagramming and computer simulation as tools for organizational learning.

The model simulates the launch of a new beer in which heavy spending on advertising drives customer demand above production capacity allowing the main competitor, who uses a

follower strategy, to gain sales at the clients expense. During the simulation, participants must decide on spending on advertising, wholesale price and production levels.

The participants are told that the simulation is designed to help them understand the dynamic relationships in the market place. However, every group sets out to maximize profit in the first instance. The point that is stressed to them is that understanding the underlying dynamics is an important, long term objective for the learning organization, as it is this understanding that ensures the ability to continue making a profit.

At the conclusion of the session, the groups draw causal loop diagrams that are their best representation of the dynamics of the model. It is during this session that discussion of mental models becomes most valuable as people from different functional areas discuss their mental models of a beer launch. Now discussions revolve around the causal relationships between advertising, sales and inventory levels. It is here that fundamental assumptions about product launches, which CUB has raised to an art form, are challenged.

3 The Beer Delivery Model

This model was developed for the next stage of the management development program at CUB.

The company's objectives are:

- 1 To introduce participants to system thinking and the examination of mental models through the use of causal loop diagramming, system archetypes, and computer simulation.

This model is used as an introduction to the systems archetypes, in particular "Fixes that Fail". After using the simulation, participants work with a series of custom-built case studies that explore the other archetypes.

In this simulation, the manager must decide between the short-term goal of customer service and the longer-term goal of establishing JIT deliveries to the pubs. During the simulation they are given messages from clients worried that their beer deliveries may not be on time. Every response to a nervy customer, worried that deliveries may be late, erodes the capacity to deliver JIT to all customers. As a result, regular deliveries get further behind and the number of nervy clients increases.

Group discussions which involve the "Fixes that Fail" archetype are aimed at exploring the counter-intuitive nature of some policy decisions and the need to think of long term, second order causation.

Conclusion

The experience in using systems thinking and simulations is that participants find concepts such as necessary and sufficient causation, positive and negative feedback loops, first, second and third order effects, the counter-intuitive nature of policy to be tools that help define a common and easily understood vocabulary for the discussion and examination of mental models where those models have, for a long time, constituted significant barriers to the establishment of worthwhile dialogue.

Enquiries

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