

Systems modelling, simulation, and the dynamics of strategy

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Abstract

The paper presents, for consideration, the tools of systems thinking and simulation as a framework for managing the complex and dynamic process of strategy formulation, evaluation, and implementation. It addresses the question of how strategic thinkers can experience the paradigmatic shifts required to survive and prosper in the face of unremitting change, competition, and environmental turbulence. In response to this question, the paper argues that managers need to develop and cultivate a capacity to perceive and analyse relationships between their organisations and the business environment as a complex, adaptive, dynamic system containing nonlinearities, inertia, delays, and networked feedback loops. Principles of, and linkages between, systems and control theory, complexity concepts, business process orientation and simulation are explored, through discourse, within this context. The need to integrate fully operations management within the strategy development process is also emphasised. This leads to the presentation of an illustrative generic model of a marketing, production, and selling causal loop. Influence diagrams and dynamic modelling concepts are then applied to implement this representation and explore its dynamic behaviour using computer-based simulation and experimentalism as a research method. The results demonstrate how, even in a relatively simple case, nonlinearity can produce very different system behaviours depending only on minor changes in operational circumstances. The potentially counterintuitive behaviour of complex managerial systems and the implications for the strategy-making process are thereby highlighted.

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1. Introduction

Managers face an unremitting challenge to their capabilities in both the volume and complexity of factors to be reconciled. Rapid rates of change in the business environment are coupled with unprecedentedly fierce competition and the ‘deification’ of the customer. Additionally, in the search for optimal trade-offs between resource utilisation and customer service fulfilment, conscientious managers are faced with the potentially contradictory task of simultaneously upholding the interests of ‘supply-side’ product and service providers; their colleagues, team members, and employees. This can impose what often appear to be conflicting, if not impossible demands on those who seek to introduce and sustain organisational effectiveness.

In order to address these issues, managers, especially those operating at a strategic level, need appropriate tools to develop the thinking and learning paradigms that

enable attainment of a more holistic and dynamic perspective. The role of organisational learning (OL) (de Geus, 1988; Argyris, 1990; Senge, 1990) and knowledge management (Hall, 1992; Boisot, 1995; Nonaka and Takeuchi, 1995; Davenport and Prusak, 1998) have been quite rightly associated with these requirements. Similarly, the importance of business process as a continuum of seamless, cross-functional activity integration, is now seen as a vital prerequisite of organisational success (Hammer, 1990; Hammer and Champy, 1993; Wolstenholme and Stevenson, 1994; Youssef, 1998). However, in order to assist managers to harness these theories and implement their objectives appropriate models and analytical frameworks are required, which accommodate the full dynamic complexity and uncertainty, which characterise contemporary strategic management.

This paper argues that the theories of ‘systems thinking’ and ‘complexity’ can potentially provide such frameworks. Furthermore, the supporting ‘toolbox’ of continuous system and hybrid (continuous and discrete) simulation potentially provides an excellent medium for

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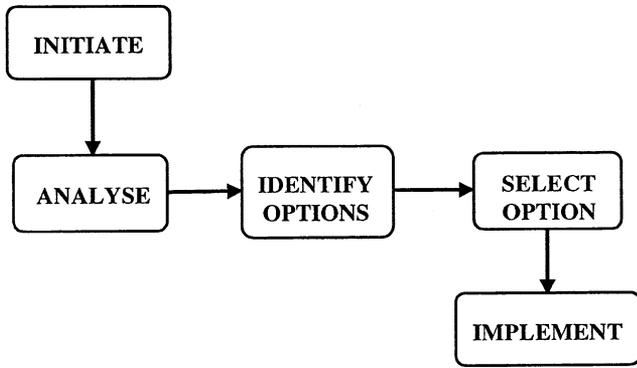


Fig. 1. Linear strategic action sequence.

enacting and exploring the dynamic nature and complex behaviour that characterise the phases of strategic analysis, development, and implementation, respectively.

2. Design vs. emergence

A characteristic of the uncertainty surrounding the concept of strategic management is the absence of agreement on a clear, unambiguous, and reliable model of the strategic process itself. This is epitomised by the running debate between what has come to be known as the ‘design’ or prescriptive school of thought vs. the ‘emergent’ or crafting school (Mintzberg, 1990; Ansoff, 1991; Lynch, 1997).

In its simplest form, the prescriptive model may be seen as a linear, sequential process as identified in Fig. 1. However, most contemporary thinking would probably accept that a more representative view would be inherently more systemic with blurred cause and effect linkages and sequences of action that are iterative, dynamic, and non-linear. Hence, top-down, prescriptive models have been challenged by, for example, Mintzberg (1987) who succinctly notes:

The popular view sees the strategist as a planner or as a visionary; someone sitting on a pedestal dictating brilliant strategies for everyone else to implement. While recognising the importance of thinking ahead and especially of the need for creative vision in this pedantic world, I wish to propose an additional view of the strategist as a pattern recogniser; a learner if you will, who manages a process in which strategies (and visions) can emerge as well as be deliberately conceived.

Hence, according to the crafting school, the full strategy will not be known in advance but will only emerge during actual implementation (Mintzberg and Waters, 1985).

Also central to the philosophy underpinning the emergent approach is the role of OL that seeks to accommodate the true complexity characterising the relationship between the organisation and its environment (de Geus, 1988). This may be seen as an extension of the flexibility concept,

inherent in the crafting perspective, and becomes increasingly important when ‘quantum-leaps’ or large step changes are encountered (usually resulting from changes in the external environment or dramatic internal responses aimed at rectifying long-term strategic drift). Systems thinking, as a viable method for surfacing, analysing, and understanding the dynamics of strategy and organisation, is implicit within the OL paradigm (Senge, 1990; Richardson, 1991; Morecroft and Sterman, 1992; Richmond, 1994).

More recently, additional insights into the complex dynamic processes, which characterise strategic management, have been provided by the complexity theorists (Kauffman, 1993; Stacey, 1996); an issue that is also addressed, in summary, in the following section.

3. Dynamics, control, and complexity in management systems

Strategic planning and control are often envisioned, within the framework of the ‘stable equilibrium’ paradigm (Stacey, 1995). This implies the setting of some target objectives linked to the mission statement, typically following the prescriptive approach outlined above. This is followed by monitoring of actual performance or outcomes for comparative purposes. Combinations of feedback and feed-forward control (Fowler, 1999) are then implemented with the intention of ensuring that the actual system performance tracks the target requirements, over time.

Typical examples of such feedback loops are evident at the ‘macrolevel’ in Fig. 2 that shows, respectively, the stages of discovery (analysis), choice (evaluation and selection), and action (implementation). Control then comprises the linking of the implementation and analysis stages to form, in effect, a closed-loop feedback mechanism comprising performance monitoring, comparison with targets, and subsequent action to ensure convergence. This process may be seen as analogous to single loop learning, as defined by Argyris and Schon (1978).

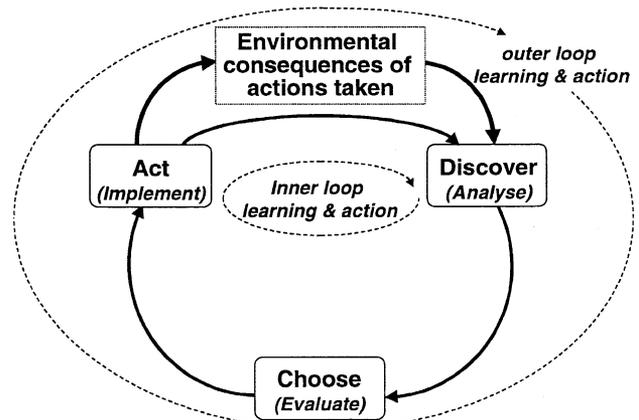


Fig. 2. Looped strategic action sequence.

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