J Manag Gov (2011) 15:515–532
DOI 10.1007/s10997-009-9125-6

The dynamic nature of strategy: reflections on Kim Warren's strategic management dynamics

John Wiley & Sons Ltd., England, 2008

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Published online: 10 January 2010

1 Introduction

Before reviewing the book, a few words are dedicated to the cultural terrain and the theoretical debate that constitutes the background and the basic domain from which the Strategy Dynamics approach arises. Correctly understanding sources of sustained competitive advantage is a major concern and a fundamental task for both academics and managers, active in the field of strategic management. In this regard, the traditional concept of strategy is phrased in terms of the resource position (strengths and weaknesses) of the firm (Wernerfelt 1984: 171), and many studies in the field of strategic management (e.g. Ansoff 1965; Andrews 1971; Porter 1985) tend to demonstrate that firms obtain sustained competitive advantage by developing and implementing strategies able to exploit their internal strengths (through responding to environmental opportunities), while simultaneously facing external threats and avoiding internal conflicts.

However, this industrial organisation economics (IOE) framework reveals some weaknesses (Ford and Mahieu 1998: 1) directly related to the following two simplifying basic assumptions (Barney 1991: 100):

1. firms within an industry are identical in terms of the strategically relevant resources they control and the strategies they pursue;
2. due to their intrinsic high mobility characteristics, resource heterogeneity leading to sustainable advantage will be short lived because the resources that firms use to implement their strategies are highly mobile.

Starting from these two assumptions and building on the concept of *resources* (used in the strategic management field since the 1959 seminal work by Penrose,

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which focused on firms seen as broader sets of resources), recently the so-called Resource Based View (RBV) of the firm has substituted the previous two assumptions with the following alternatives (Barney 1991: 101):

a. firms within an industry may be heterogeneous with respect to the strategic resources they control;
b. these resources may not be perfectly mobile across firms, and thus heterogeneity can be long lasting.

These considerations raise three fundamental questions: (a) which key resources can be relied on in order to build sustainable competitive advantage? (b) how can these resources be correctly identified and their behaviour understood over time? (c) how can an underlying theory be developed and utilized for the management of a "dynamic strategic architecture" over time?

These questions have been recently addressed in the field of Strategy Dynamics, which builds on a fruitful integration of System Dynamics-based simulation modelling principles and the Resource Based View of the firm.

2 Computer simulation and business dynamics

2.1 Using computer simulation to analyze economic and social systems

Computer simulation methods and techniques have been continually developing since the early 1960s and have become reliable, analytical tools of management science. The first applications were often oriented towards specific industrial problems (such as inventory management) but more recently computer models and simulation software have been commonly used in a variety of fields, from manufacturing to healthcare, from business process re-engineering to defence, from environmental and natural sciences to strategic management.

In this regard, computer models and virtual worlds (i.e. formal models, simulations or microworlds in which decision-makers can develop essential skills, conduct experiments and play) are powerful tools for analysing systems with significant dynamic complexity and have several virtues (Sterman 2000: 35–38) since: "they provide low-cost laboratories for learning. The virtual world allows time and space to be compressed or dilated. Actions can be repeated under the same or different conditions. (…) Virtual worlds provide high-quality feedback. (…) Formalizing qualitative models and testing them via simulation often leads to radical changes in the way we understand reality. (…) Most important, when experimentation in real systems is infeasible, simulation becomes the main, and perhaps the only, way you can discover for yourself how complex systems work".

The basic principles and steps in the development of computer simulation are quite simple; as Vennix (1990: 15–16) explains, some stages are usually required: "in the first stage a model of the reference system is constructed. This is done by selecting from the reference system the relevant variables to be included in the model (abstraction). In the second stage the model is analyzed and this reveals

certain conclusions (deduction). In the third stage these conclusions are implemented in the reference system (realization and implementation)".

These steps support decision-makers in building a mathematical model that constitutes a simplified representation of the real system under analysis and is used to explore an entire range of feasible options in a decision problem. Therefore, as Pidd (2004: 10–11) clearly states, "computer simulation methods allow experimentation on a computer-based model of some system. The model is built by carefully describing the ways in which the system changes state and the rules that govern its dynamic behaviour. (…) Once built, the model is used for experimentation, either interactive or classical or both". In this regard, in relationship to management science, it is our opinion that simulation models can play a fundamental role; whereas over the last few decades, modelling and simulation have been primarily seen as technical tools to be used for solving structured problems of prediction, optimization and financial planning, recently they have reached higher levels, now being seen as instruments that support the implementation of strategic thinking, collaborative group discussion and learning in teams.

This allows not only policy analysis and scenario planning but also the development of mental models and strategic thinking skills within the organization (Senge 1990; Vennix 1996). As Morecroft (2004: 104) underlines "the significance of viewing formal models as transitional objects is the emphasis placed on aiding understanding rather than replicating reality. The idea there is a singular and objective world out there to be modelled is replaced with the softer notion that a formal model can help to improve mental models. It is through mental models that we interpret and make sense of the world around us. And in business and social systems mental models shape decisions and actions".

In particular, System Dynamics—"a discipline that includes a repertoire of modelling principles and simulation techniques to analyse the behaviour of complex social systems" (Mollona 2008: 213)—has demonstrated its validity for decades, supplying models and tools particularly well suited in providing the basis for meaningful learning experiences about the relationships between the structure and the dynamics of complex systems.

2.2 System dynamics

As originally theorised by Forrester (1961) in his seminal book entitled *Industrial Dynamics*, System Dynamics models have proved their validity over more than four decades of application in a variety of different fields. Based on the concept of feedback and on information-feedback control theory (Forrester 1961), System Dynamics (Forrester 1961, 1968; Richardson and Pugh 1981; Sterman 2000) can be considered as "a perspective and a set of conceptual tools that enable us to understand the structure and dynamics of complex systems. System Dynamics is also a rigorous modeling method that enables us to build formal computer simulations of complex systems and use them to design more effective policies and organizations. Together, these tools allow us to create management flight simulators—microworlds where space and time can be compressed and slowed so we can experience the long-term side effects of decisions, speed learning, develop

our understanding of complex systems, and design structures and strategies for greater success" (Sterman 2000: vii).

To attain these goals and support decision-making processes, System Dynamics uses a number of different tools, both *qualitative* (such as diagramming tools, "causal loop diagrams", "stock and flow maps", etc.) and *quantitative* ones (formal models based on a rigorous mathematical language) in order to identify, portray and analyse the critical feedbacks determining the dynamics of the systems under analysis. In particular, computer models, formally combining both maps and knowledge, as well as theory and practice, are key elements of System Dynamics methodology.

During the first stage of building the maps and the model, the modeller filters and organises knowledge from mental models and from real data, while in the second stage, using the computer model, it is possible to learn about complex dynamics and to further develop our understanding and skills.

Some further considerations need to be provided. It is particularly relevant to highlight that the role of a System Dynamics model and, even more importantly, of the whole modelling process is to gain insight into a complex problem, while at the same time influencing thought and actions in management teams. In this regard, we have to stress that System Dynamics is to be preferred to other planning and control/simulation techniques especially when facing dynamic and complex issues. *Complexity* arises because social and economic systems are dynamic, tightly coupled, governed by feedback, nonlinear, history-dependent, self-organizing, adaptive, counterintuitive, policy resistant and characterized by trade-offs. Thus, it is a natural consequence of management that the intended aims of actions carried out could not be reached or could provoke unanticipated effects (Forrester 1971). In particular, this frequently happens because real system are characterised by the presence of feedback loops and unfortunately human beings not only have bounded rationality but they are also largely ineffective in analysing and taking into account complex feedback structures (Morecroft 1983).

In this regard, System Dynamics represents a powerful methodology. As Richardson and Pugh (1981: 15) state, "the System Dynamics approach to complex problems focuses on feedback processes. It takes the philosophical position that feedback structures are responsible for the changes we experience over time. The premise is that *dynamic behaviour is a consequence of system structure*". Davidsen (2000: 172) provides more insights underlining that "the relationship between structure and behaviour is at the very heart of system dynamics. That relationship can be portrayed as follows: behavior is created by the structure that characterizes the system. This behavior, on the other hand, can influence the structure of the system and cause the relative significance of the various component structures of the system to change. Typically, these substructures constitute feedback loops, and we talk of shifts in feedback loop dominance. Note that these structural modifications take place endogenously as a consequence of the internal behavior of the system originating from the structure of the system itself".

In brief, at the basis of the structure of any real system we can identify two main components: a structure of cause and effect links, and a range of variables, divided

into three fundamental typologies, i.e. stock variables, flow variables and auxiliary variables.

Furthermore, as Vennix (1990: 20) clarifies, "at the core of system dynamics are four ideas. First, systems are considered as a whole. (…) Second, emphasis is placed on the internal structure of the system as the cause of its dynamic behaviour. Central notion is the concept of feedback. (…) Third, rather than considering relationships in a model as linear (for the sake of simplicity) emphasis is placed on the non-linear character of many relationships. Fourth, delays (e.g. delays in information) in processes in social systems are considered important".

In this regard, System Dynamics directs management attention towards the performance of organizations over time, allowing the identification of key resources (stock variables) that are believed to contribute to performance, analyse the causes leading to an increase or decrease in such stocks (i.e. the factors influencing inflows and outflows to stocks) and exploring the effects of the policies meant to regulate such flows.

This complex group of principles has been used within the field of System Dynamics to analyze a wide range of applications and situations, such as corporate planning and policy design, public management and policy, energy and the environment, theory development in the natural and social sciences, etc. More recently, several applications have been developed regarding business dynamics and economic environments and particular relevance has been given to corporate business dynamics, scenario planning and strategy formulation.

This situation has led to a significant change in the use of System Dynamics and modelling techniques, which have developed over the past few years. Over the last few decades, modelling and simulation have been generally seen as technical tools used for solving and gaining a better understanding about structured problems of prediction, optimisation and financial planning. In contrast, more recently, models have reached a different consideration: they are seen as instruments to support strategic thinking, group discussion and learning in management teams (Morecroft and Sterman 1994). This situation is particularly relevant when decision-makers have to deal with complex and persistent issues, the effects of which will be experienced over the long-term.

3 The resource-based view of the firm and the strategy dynamics approach

3.1 The resource-based view of the firm

The so-called Resource-Based View (RBV) of the firm is based on the assumption that firms within an industry control heterogeneous strategic resources.

As stated by Barney (1991: 101) *resources* are "all assets, capabilities, organisational processes, firm attributes, information, knowledge, etc. controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness". Furthermore Wernerfelt (1984: 172) states that "by a resource is meant anything which could be thought of as a strength or weakness of a given firm. More formally, a firm's resources at a given time could be

defined as those (tangible and intangible) assets which are tied semipermanently to the firm".

Stated differently, resources are the strengths that enable firms to implement their strategy and to gain sustained competitive advantage.

A firm has a sustained *competitive advantage* "when it is implementing a value creating strategy not simultaneously being implemented by any current or potential competitors *and* when these other firms are unable to duplicate the benefits of this strategy. (…) A competitive advantage is sustained only if it continues to exist after efforts to duplicate that advantage have ceased" (Barney 1991: 102).

Key elements for reaching this position of sustained competitive advantage are all the resources at the disposal of the firm. Moreover, in order to understand sources of sustained competitive advantage, a basic assumption is that a firm's resource may be heterogeneous and immobile. However, to contribute to sustained competitive advantage a firm's resource must have four main features:

a. it must be *valuable*, so to exploit opportunities and/or neutralize threats in the firm's environment;
b. it must be *rare*;
c. it must be *imperfectly imitable*;
d. there cannot be strategically equivalent substitutes for the resources that are valuable but neither rare or imperfectly imitable.

Basically, when a firm does not own those strategic resources a simple solution would be to acquire them. If this solution is not realizable, since assets are not tradeable, the firm has to imitate them by accumulating similar asset stocks of their own or may try to substitute them with other assets. In any case, the firm is constrained to "build" these assets (Dierickx and Cool 1989: 1506–07).

It is necessary to stress that this *building process* requires time and effort since "strategic asset stocks are accumulated by choosing appropriate time paths of flows over a period of time. (…) A crucial point (…) is that while flows can be adjusted instantaneously, stocks cannot. It takes a consistent pattern of resource flows to accumulate a desired change in strategic asset stocks. (…) In other words, appropriate time paths of relevant flow variables must be chosen to build required asset stocks" (Dierickx and Cool 1989: 1506–07).

The dynamic behavior of strategic resources is obvious, as well as the interconnectedness among them and the complexity of the process required to develop such resources over time.

In sum, as Dierickx and Cool (1989: 1510) state "asset stocks are strategic to the extent that they are nontradeable, non-imitable and nonsubstitutable. Within the framework presented in this paper, a firm's current strategy involves choosing optimal time paths of flows, whereas its competitive position and hence its potential profitability is determined by the level of its stocks".

3.2 Operationalising the RBV of the firm: the strategy dynamics approach

From the previous considerations, it is straightforward to see the dynamic nature of resource accumulation and depletion over time. It is also clear that combining

System Dynamics and RBV into a single approach to strategic management would allow managers and scholars to explore the dynamics of strategy, represent resources and capabilities, understand their evolving patterns over time, and have at disposal tools and methodological principles for developing and implementing long-term strategies.

As Ford and Mahieu (1998: 1–2) suggests, "a Resource-based view strategy cannot provide competitive advantage without being operationalised. Operationalisation means a formalisation of the theory's ideas and concepts into applicable models which facilitate all stages of strategy formulation and decision-making. The RBV theory needs to be operationalised because of its inherent high level of abstraction. This makes it difficult for practitioners to recognise which resource-based strategy will lead to sustainable advantage. Consequently, operationalisation is a unique opportunity for managers to benefit from the powerful strategy support that this theory can bring (Peteraf 1993). The operationalisation of RBV theory is fundamental because it directs managers in their resource-based strategy implementation".

Although many instruments and tools could be mentioned, it is our opinion that the RBV would benefit from a "contamination" with a more extensive and powerful approach, particularly oriented in providing the methodological principles able to interpret and represent RBV concepts, and the analytical tools useful for exploring the dynamic nature of resource management over time.

This goal has been pursued by the authors who have contributed to the development of the Strategy Dynamics approach.

3.3 Strategy dynamics

Strategy Dynamics is a quite recent field of study whose main contributors are scholars such as Kim Warren and John Morecroft; in particular, it is from the mid 90s that Morecroft and Warren have been working on the dynamics of strategy.

The dynamic nature of strategy came to their attention through the consultation of widely cited articles in academic management literature (e.g. Dierickx and Cool 1989). These works focused on the idea that a firm might achieve competitive advantage by building-up a distinctive set of asset stocks that rivals and competitors would find difficult to imitate, and that sustainability of competitive advantage would be strictly related to the time required to accumulate or reconfigure such assets. In their opinion, such dynamic view of firm performance could have been better explored and further developed by formally linking System Dynamics (SD) with the resource based view (RBV) of the firm.

Consequently, in the past 15 years Morecroft and Warren have been steadily working in order to bridge the System Dynamics and strategic management fields, by exploring the lines of work combining System Dynamics and organizational behaviour (Cyert and March 1963), using simulation models to support strategy making (Morecroft 1984) and more recently, explicitly building on the combination of SD and RBV (Morecroft 1999, 2000, 2002, 2007; Morecroft et al. 2002; Warren 1999, 2000, 2002).

As demonstrated in Warren's book, the Strategy Dynamics approach builds on key considerations of SD and RBV, combining their principles and orienting the analysis in the following directions: first, the Strategy Dynamics approach considers both tangible and intangible resources, making them explicit and quantified; second, the Strategy Dynamics approach expands the analysis beyond the resources that are owned and controlled by the organisation, considering internal and external assets; third, the Strategy Dynamics approach makes explicit the nature of "*complementarity*" amongst resources, and explores through simulation-based experiments the dynamic nature of such resources, aiming at explaining why performance through time progresses as it does.

Therefore, in order to realize a strategy dynamics study at least three phases are recommended.

The first step of a dynamic-based analysis is to classify resources into two groups: tangible or hard resources (inventory, staff, machinery) and intangible or soft resources (customer satisfaction, morale, reputation), further distinguishing between managed or unmanaged resources. Both distinctions are vital to strategic management, since their identification and management deeply impact on performance over time and on future strategy implementation plans.

The second step is to identify and study the dominant logic (Prahalad 2004), i.e. the managerial rationale for the firm's continuing resource accumulation and development strategy.

The third step of a dynamic resource-based analysis leads to the simulation phase of the study. It is thanks to computer-based simulation that it is now possible to analyse the dynamic behaviour of tangible and intangible resources and to develop sound policies and strategies. In this regard, the links between Strategy Dynamics and System Dynamics are evident, since at the heart of the latter crucially lies the consideration of the time-based behaviour of accumulating resources and other asset-stocks.

Therefore, based on the previous principles and assumptions, the Strategy Dynamics approach aims at demonstrating not only *which* are the key resources, but also *why* they are won and lost and therefore *how* they can be managed *over time*. That is to say, it is fundamental to identify tangible and intangible resources and properly manage their flow rates. In this regard, it is well known that rates of change in resources strictly reflect the effects of management decisions and external factors (e.g. competitors' efforts or limited availability or those resources) and are strongly dependent on the quantities already existing.

In summary, it is crucial to analyse and represent the "strategic architecture" that is in place, giving relevance to interdependence relationships, made of cause and effect links and closed feedback loops. Such topics are well introduced and described in Kim Warren's book. Further details are provided below.

4 Book's structure and main contents

The book is organized in ten main chapters which are based on the same pattern. First, each chapter begins with a concise summary of the key issues presented.

Second, each chapter is organised in several paragraphs followed by a brief summary; subsequently suggested questions and exercises are provided, in conjunction with worksheets and notes. Simulation-based models are presented throughout the book, referring to a variety of strategic issues and applications, ranging from marketing to product development and being applicable both in private and public sectors.

Finally, numerous references in the literature provide useful indications for further reading, while extensive online materials support students and lecturers in their independent study or in the preparation of degree classes and executive education programs.

Coming to the ten chapters in which the book is structured, at a first glance it is possible to divide the first four chapters from those that follow.

In particular, chapters 1–4 of the book present and discuss the main theories and explanations underlying the analysis of the performance of real organisations over time. The primary objective is to explain how to link resources to performance over time and subsequently to introduce frameworks and tools suitable for strategy formulation and representation. Chapters 5–10, furthermore, are clearly focused on the specific topics and strategic issues described below.

Chapter 1 ("Performance through time") focuses on the concept of performance and is meant to explain why improving performance over time is the fundamental imperative for managers. This aim is nonetheless vital both for private and public organisations as well as for non profit and voluntary institutions. In order to do this, the chapter clarifies what is normally meant for performance, discussing traditional performance measures (e.g. economic profit and economic value added–EVA) and parameters/ratios (e.g. market share and percentage growth rates), and suggesting to combine financial and non financial performance measures in order to pursue multiple and conflicting objectives. These topics are specifically addressed in order to demonstrate that managers ought to manage resources in such a way to build performance *into the future*. Subsequently and in more detail, the chapter raises three fundamental questions: a) why has performance followed the path that it has up to today? b) where will performance likely go in the future? c) how can management act to improve that trajectory sustainably?

Chapter 2 ("Resources drive performance") is a key chapter of Warren's book since it is meant to answer the three previous questions, developing a theory around the identification of the underlying causes for performance, i.e. a theoretical explanation of "what causes what, and how". Such explanation should prove to be general, useful and true. In other words, the chapter aims at developing rigorous causal explanations for performance, linking causes to effects, identifying causal mechanisms and exposing the fundamental relationships between resources and demand, revenues, costs and profits.

These concepts are discussed in reference both to the private and the public sector as well as to non profit and voluntary organisations. In all these contexts the above-mentioned relationships and a resource-driven perspective may efficiently be adopted to develop causal analysis of performance and to estimate future performance. To reach this aim, the author argues that it is fundamental to properly identify, specify, manage and measure resources. Therefore, key principles of the

so-called "resource-based view" of strategy are introduced and discussed, even though such topics are analysed in greater depth in Chapter 5.

In sum, the author underlines the role and the influence that a firm's characteristics and choices have on performance, and the impact that the forces from industry and competitive environment have on the firm's results. In particular, examining the concept of *resource*, the author cites Barney 2002 in order to highlight (p 89) that resources are "all assets, capabilities, competencies, organisational processes, firm attributes, information, knowledge, and so forth that are controlled by a firm and that enable the firm to conceive of and implement strategies designed to improve its efficiency and effectiveness". Moreover, such resources can be grouped into financial, physical, human and organisational categories. In any case, even though it is evident that resources are important to performance, the use of the RBV approach clarifies the role that must be given to such facilities. Basically, as Warren underlines (p 90), the RBV "asserts that any resource can *only* contribute to sustained advantage if it is valuable, rare, hard to imitate, and supported by other organisational procedures—the so-called «VRIO criteria»". This is the reason why the RBV approach has traditionally given relevance to subtle and complex factors, such as intangible resources, capabilities and competences, knowledge and processes, in order to understand the way in which an advantage can be gained by a firm over its competitors.

Key questions that are consequently discussed throughout the chapter include the following: How durable is the resource? How mobile or tradeable is the resource? How replicable is the resource? Can the resource be substituted?

Such questions also raise a concern on the applicability of RBV: although resources, capabilities and knowledge are vital elements of a strongly performing organisation, applying the RBV approach in practice is not easy.

It is on this theoretical basis that the author introduces the Strategy Dynamics approach, later discussed in this book. Furthermore, the Strategy Dynamics approach explicitly builds on RBV key considerations, expanding the analysis in three principal ways.

a. The Strategy Dynamics approach considers both tangible and intangible resources. First, it analyses tangible resources, making them explicit, quantified and connected to the organisation's performance outcomes. Second, it includes intangible factors, capabilities and knowledge, capturing their influence on the organisation's outcomes through the impact they have on developing and retaining the tangible factors that directly drive performance.
b. The Strategy Dynamics approach expands the analysis beyond the resources that are owned and controlled by the organisation.
c. The Strategy Dynamics approach makes explicit the nature of "*complementarity*" amongst resources, aiming to discuss how effectively tangible and intangible resources work and interact together, and trying to quantify the impact they have on organisational performance and development. Actually, it is such complementarity that explains why performance through time progresses as it does.

The final part of *Chapter 2* is mainly centered on the consideration and analysis of tangible resources, focusing on their identification, specification and measurement: as Warren explains (p 111), "while related to the resource-based view of strategy, Strategy Dynamics pays more attention to simple tangible factors—customers, staff, capacity, products—to defining and measuring these items, and to tracking how they change over time. Intangible factors and capabilities can only impact on performance outcomes by influencing the development of these tangible resources".

Chapter 3 ("Resource Accumulation") builds on the considerations provided by the previous two chapters focusing on the processes of accumulation and depletion that are fundamental in order to correctly understand why organisations' performance changes over time. In particular, the author describes the "stock and flow" structure of economic systems, demonstrating that such structure numerically captures the behaviour of accumulating resources: it is through resource flow rates that resource levels are determined and can be managed and controlled. This also allows the discovery of explanations for what causes the rate at which resources are won and lost, that is to say to face and at least partially solve the so-called (p 151) problem of "causal ambiguity" (i.e. it is difficult to understand causes and how accumulating resources devalue correlation analysis). Thus, it is through flows that management can control resources and influence the organisation's performance over time. In greater detail, throughout the chapter the author aims at demonstrating that the above-mentioned mechanism operates in the same ways in different contexts, providing some insightful examples related to marketing, human resources and product development. Moreover, the author clearly highlights that three main items determine the rate at which any resource changes at any point of time: management decisions; external factors; existing levels of one or more resources.

Building on the information provided in the first three chapters, *Chapter 4* ("The Strategic Architecture") aims at demonstrating how it is possible to develop an integrated core business system (i.e. a "strategic architecture" that can be formalized through a specific quantified diagram of performance) for any kind of organisation. In order to pursue this aim, any organisation should correctly understand that performance depends on resources, that such resources accumulate and deplete over time, and that resource-building depends on existing resources. Thus, performance over time strictly depends both on having resources and on building new resources. The strategic architecture that is subsequently discussed in chapter 4, based on a stock and flow structure, may be fruitfully used both to analyse and to anticipate organisations' performance.

Additionally, in this chapter the author explains several concepts of fundamental relevance in order to correctly design and understand any system: interdependencies among flows and stocks create more complex structures, referred to as feedback mechanisms. Note that there are just two typologies of feedbacks, usually named reinforcing and balancing feedbacks. Moreover, these feedbacks generate common patterns of performance dynamics, such as escalation, exponential growth, goal-seeking, collapse and limits-to-growth. Thus, modelling seeks to reveal enduring feedback structures (both reinforcing and balancing) which are real characteristics of human activities. Models can be consequently used as instruments for

investigation, clarification, discovery and learning, and can be used to sustain and support strategy definition and strategy implementation (Graham et al.1992).

Therefore, the author demonstrates that identifying key stocks and flows, investigating whether some feedbacks are operating and understanding their dynamics, allow managers to design a more efficient strategic architecture, develop their strategies and identify and exploit tipping points of performance, where growth or decline can suddenly accelerate.

In order to reach these aims, many tools could be valuable and useful, including mapping tools such as causal loop diagrams or stock and flow diagrams (Richardson 1997 and Sterman 2000), computer models and management flight simulators (Sterman 2000)—also referred to as microworlds (Papert 1980) and virtual worlds (Schön 1983), balanced scorecard cockpits (Kaplan and Norton 1992), strategy maps (Kaplan and Norton 2004), issue-tree analysis and value driver analysis (Martin and Petty 2000).

After the first four chapters, which provided the underlying theoretical framework, the book focuses more specifically on intangible factors and capabilities.

Chapter 5 ("Resource Attributes") is aimed at demonstrating that any resource is different from the others due to specific qualities, usually referred to as "attributes". Examples are provided in reference to customer quality, staff skill levels, equipment reliability, fund-raising for a voluntary organisation and, more in depth, for a low-fare airline. From a strategic management point of view, the chapter highlights that these attributes are fundamental because of their contribution to performance, in order to develop and sustain other resources, turn round the performance of a troubled business, or undermine a competitor's strategy.

Even more relevant, the chapter shows that the actual level of any attribute may be improved by three principal mechanisms: adding resources of higher quality, reducing those of lower quality, directly improving the quality of already in place resources.

Starting from these considerations, in *Chapter 6* ("Resource Development") the author aims at demonstrating that resources usually develop over time and through different stages. At any stage and period of time, any resource contributes in a different way to performance. It is consequently fundamental to understand in which stage/state each resource might be at any point in time, trying to manage the subsequent developmental process and properly quantify the impact that various factors (such as managerial choices) may have on that process. In any case, external influences can combine with internal processes of product improvement and cost reduction to significantly alter the pace of business development. Moreover, organisations that face the challenge of building and retaining resources over time are not alone in this effort, having to also battle rivals and competitors.

Subsequently, *Chapter 7* ("The dynamics of rivalry") is primarily intended to explore and discuss the three fundamental mechanisms by which all competitive interactions between firms happen.

The so-called Type-1 mechanisms shows how rivalry works when firms try to capture new customers, especially in reference to growing and mature markets.

Type-2 rivalry explains how it is possible to steal customers from competitors. This mechanism enables an organisation to capture customers from rivals especially when considering firms operating in mature markets. In this regard, the author shows how to create barriers to prevent customers leaving the organisation (e.g. using switching costs).

Type-3 rivalry is related to how rivals fight for share of sales to customers who buy from more than one firm. This situation where an organisation has to attract non-exclusive customers is not significant in any market and must be properly identified when possible.

The chapter subsequently shows that these three mechanisms often operate simultaneously, thus requiring different and conscious decision-making choices in order to make competitive efforts oriented towards each typology of customer: in this regard, new customers are won, existing customers are tempted to switch, disloyal customers' business is fought for.

However, Warren underlines that real-world competition is always characterised by a high degree of complexity and usually involves many competitors. These two features complicate both the display and analysis of competitive dynamics and make the three typologies of rivalry difficult to discern in practice.

Consequently, the author suggests that cluster analysis could be very helpful and that phenomena such as path dependency, delays and bounded rationality ought to be always taken into consideration when carrying out activities related to the analysis of competitive dynamics.

This makes strategic decision-making a complex and dynamic process that requires—at different stages—activities of design, implementation and control.

Chapter 8 ("Goals and controls") deals with these issues trying to systematize their analysis in a chronological order.

First of all, the chapter analyses the business idea, that is to say *whether to take part*.

Second, the chapter analyses how to choose a strategy, showing that this choice involves critical decisions about *where* to compete, *how* to compete and *with what* resources.

Third, the chapter discusses how to design a *likely path to success*, that would enable the business idea to succeed, the firm to grow and the organisation to fulfil its mission and realize its vision.

Fourth, the chapter teaches how to *steer the chosen strategy* over time.

Fifth, the author aims at giving some hints and suggestions on how to *extend or revise the strategy*, in a sort of a continuous ongoing process.

These five stages basically entail that an organisation must be able to identify and evaluate strategic opportunities, subsequently develop and implement a strategy coherent with a likely path to success and improved performance, steer and fine-tune the strategy, and eventually revise or change that strategy.

The chapter consequently presents some hints and rules of thumb on how to create a generic structure for decision-making policy. Based on the control of the gap between goals and actual values, such policy should be sound enough to address complex managerial issues, such as bounded rationality and conflicting objectives.

Chapter 9 ("Intangible Resources") provides some further details on the role of intangible resources within an organisation and on their impact on performance.

The author states (p 576) that "it is widely accepted that intangible or soft factors have a substantial impact on organizational performance (…) But there is a considerable challenge in making practical use of this general understanding to steer strategy, because of terminology that is overly wide-ranging, ambiguous and inconsistent". Thus (p 618) "it is important to adopt a well specified terminology for intangible resources, distinguishing them in particular from tangible factors, attributes, capabilities, routines and processes".

In this regard, the chapter discusses three main classes of "truly" intangible resources affecting the tangible nucleus of any strategic architecture: (a) psychological factors; (b) information-based resources; (c) quality related items.

The first class deals with the state of mind of key groups, such as customers and staff as well as investors and other stakeholders. The second group mainly consists of data, technology and knowledge. The third class is related to quality factors often made explicit and quantified by measures such as reject rate, purity, reported faults, etc.

Finally, the chapter shows that all these intangibles are fundamental and have become increasingly relevant not only to operational effectiveness and efficiency, but also to strategic management. Subsequently, they should be monitored, measured and managed.

Chapter 10 ("Capabilities") is related to another fundamental strategic issue—*capabilities*. As the author underlines (p 666) "capabilities (or competences) are activities that groups and organizations are good at doing, as distinct from the resources, both tangible and intangible, to which organizations have access". Moreover (p 667) capabilities consist of "the people associated with the activity, the sum of their individual and shared skills, the business processes they follow to get the activity done, and the information systems and data available to help them".

To succeed and to properly work with capabilities, three main elements are identified and discussed: getting things done quickly, with high-quality and low-cost. This implies that capabilities need to be identified, built over time, managed and measured.

In this regard, the chapter shows that each capability can be represented as a composite asset-stock, usually being measured as the ratio between how well an activity is actually done compared with the best possible performance. Moreover, the chapter shows that capabilities are not independent from themselves and the results achieved over time; on the contrary (p 667), "capabilities grow as a result of feedback from the activity they support—the more we do, the more we discover how to do it well—and this self-reinforcing process is the principal mechanism that drives learning".

Therefore, applying the capability framework, any organisation can find a way to grow and to design a path to success; as the author states (p 628) "firms with few resources are not necessarily doomed to weak, low growth, competitive positions in their industries. If they do not possess or have access to important resources, they can develop those they need. For this purpose, they need the capability to build and sustain resources". Generally, the chapter shows that the capability framework is

directly applicable to many sectors, providing examples for the public sector and voluntary organisations.

However, it should also be noted that capabilities, like resources, may be lost or become obsolete.

5 Intended audience

The book is not "academic" in the usual, strict sense of the word.

The book is primarily intended as a textbook for courses in strategy but its relevance for practitioners as well as for scholars experienced in strategic management and System Dynamics cannot be ignored. Further comments in this regard would be helpful.

First of all, as a textbook, Warren's work can be used in introductory courses in strategic management, in MBAs and similar programs, and in management and strategy courses designed within specialist Masters and professional courses in subjects such as finance, marketing, entrepreneurship, etc. Moreover, the book is also well suited for independent study. In order to facilitate the use of the book both in class contexts and in individual study, each chapter provides some supporting learning materials, such as small computer-based models, business simulation games, worksheets and many online class presentations.

Second, the book is of interest for professionals and practitioners (such as consultants, analysts, managers and members of strategy teams), aiming at keeping their skills up to date and who are looking for a more holistic and powerful approach able to complement their knowledge and competences in strategy management. In this regard, the book is useful for any scholar aiming at refreshing, updating and expanding his/her own strategy management knowledge and skills. As Warren argues (p xvii) "the book will be useful for anyone wishing to develop their understanding of business and strategy, both newcomers to strategy and those wishing to update their prior knowledge. (…) For those who have previously studied strategic management, the book extends many of the concepts and frameworks in the field in ways that make them more precise, reliable and usable. (…) The book's own underlying principles and frameworks are powerful and reliable in their own right, as well as supporting existing strategy frameworks".

Last, as previously mentioned, the book can be used in independent study, partly due to its richness of examples and simulation-based business games.

6 Final remarks

In addition to the information we provided, we have to highlight at least one further feature, being that the book is strongly supported by a rich variety of learning materials. For instance, throughout the book the author provides a wide range of simulation-based examples and exercises and a complete and detailed example familiar to all audiences—a low-fare airline—integrated into and commented on from chapter to chapter.

These features should effectively and efficiently support teachers in organising and supplementing their existing courses, and should simultaneously allow managers and individual learners to have a "friendly" and more efficient approach to strategy dynamics issues and principles. Furthermore, it is our opinion that the provision of many real-world based cases and related simulation examples plus computer-based business games can ease the process of learning for readers interested in strategic and dynamic issues. As Warren states (p xiii) "since examination and analysis of performance over time is both unfamiliar and intuitively challenging, simulation-based learning is essential to its appreciation".

In this regard, Kim Warren's book, focusing on the Strategy Dynamics approach, demonstrates that is possible to realise a complementarity among different strategic management tools, techniques and methodologies, such as scenario planning, system dynamics, balanced scorecard and RBV. In great detail, the book fruitfully associates the focus on business strategy and performance with modelling principles and techniques which are very common in System Dynamics literature.

In particular, as a positive outcome of this association, Warren provides his readers with both tools to understand and manage performance over time and with tools to cope with complex and dynamic issues. Moreover, this unique approach is not only able to simultaneously consider hard (tangible) and soft (intangible) factors, but also to successfully bridge the problematic gap between strategy formulation and strategy implementation.

Finally, since the Strategy Dynamics approach is characterised by a high degree of multidisciplinarity, it makes it feasible for scholars and professionals to learn or expand their modelling and problem-solving skills, regardless of being experienced in a specific field, such as strategy, marketing, entrepreneurship or general management.

In summary, a fundamental merit of Warren's book is that it is undoubtedly useful for anyone wishing to develop their understanding, competences and modelling skills related to business and strategy, in relation to both the private and the public sector, providing a good mix of methodological principles, modelling tools and analytical instruments in order to manage tangible and intangible resources, to understand and measure performance over time and to gain and sustain a competitive advantage.

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