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Strategy Dynamics and Scenarios of Industry Evolution (DRAFT)

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Abstract

The application of System Dynamics to operationalise the resource-based view (RBV) of Strategy makes possible a coherent theory of the dynamics of strategic performance. This framework explains firm-performance over time in terms of the mutual interdependence between its strategic resources, and makes explicit the process of rivalry between firms.

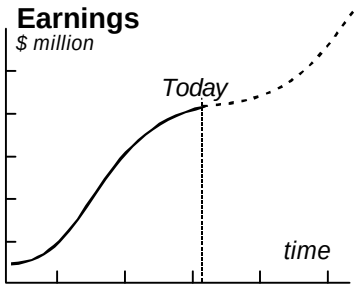
A broader view of this framework, however, shows that a more fundamental process is being captured – the mutual evolution of asset-stocks that determine current market demand and industry-sector supply. The potential profitability offered by a growing market raises firm incentives to invest in functionality, capacity, unit-cost reductions and marketing. Market growth ensues, until the process hits limits to the further accumulation of all demand-side and supply side resources..

When industries compete to serve mutually exclusive market needs, or compete for limited resources, the consequence is a pattern of relative industry growth and decline that reflects the resource-system viability of the respective industries. Variances in excepted rates of resource-development enable quantified time-paths of alternative industry scenarios to be described, and used to advise firm policy, an approach that can be illustrated in the context of the global consumer financial services market.

The Dynamics of Firm Performance

The principal quest of strategic management research is to explain firm performance, usually expressed in financial terms. Since investors value expected future returns, however, instantaneous explanations are insufficient - any useful explanation of strategic performance must also account for the stream of earnings through time (Figure 1).

Figure 1: The time-path of financial performance



The resource-based view (RBV) asserts that performance is a function of firm resources (Wernerfelt, 1984[1]), together with certain exogenous items (e.g. market price), a view that can be expressed formally as *... the performance of*

the firm, Õ, at time T depends on the levels of strategic resources R_1 to R_n, and on exogenous factors at that time, E **(Equation 1).**

$$\textbf{(1)} \qquad \Pi(T) = f\left[R_1(T),..,R_n(T),E(T)\right]$$

Amit and Schoemaker (1993[2], A&S) define resources as '*... stocks of available factors that are owned or controlled by the firm ...***'. However, firms commonly use stocks of items that they do** *not* **own or control, but to which they merely have somewhat reliable access. If 'reliable' means the likelihood that a resource-item available today will still be available in the future, then customers and distributors can be more reliable resources than employees. The definition of 'resources' therefore needs extending to '***... stocks of items that the firm owns or controls, or to which it has somewhat reliable access***'.[1]**

Eq.1, though, leaves unexplained the role of the many resources that clearly affect future performance, but which are not involved in this current calculation of earnings. Such non-P&L resources include, for example, the current range of products, stock of technologies, and intangible factors, such as staff morale and market reputation.

Resources, though, are known to behave as accumulating asset stocks (Dierickx and Cool, 1989)[3]. Thus, the level of a resource stock can *only* **be changed by adding or removing a quantity during a given period of time, so ...** *the current level of resource R at time T is the sum of its initial level and its net rate of accumulation r since time $t=0$* **(Equation 2).**

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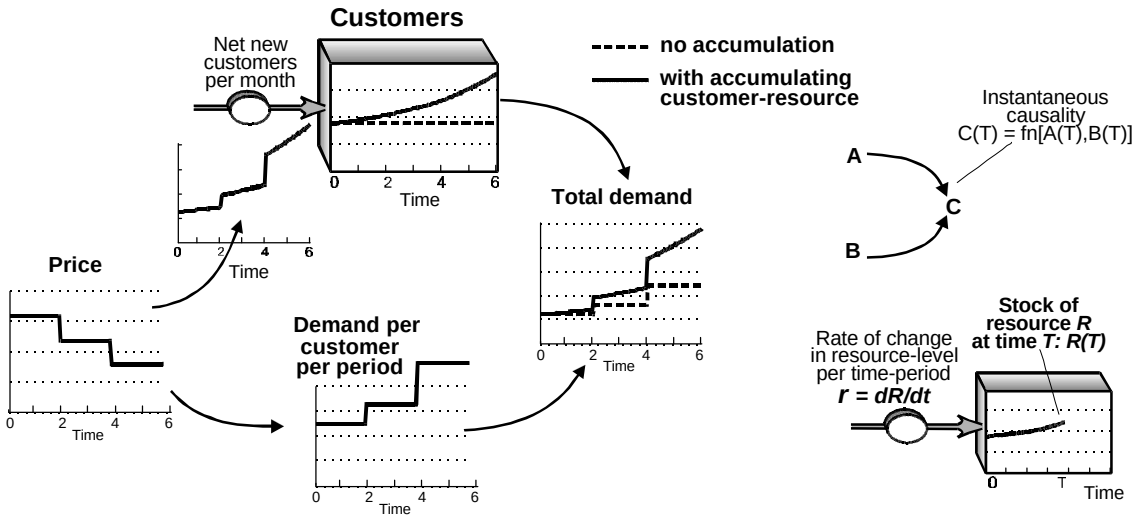
[1] Note that this paper also follows A&S in distinguishing resources from capabilities - both categories are asset stocks, but capabilities capture the firm's capacity to deploy and combine existing resources, in order to enhance the building or sustaining of resources for the future. Capabilities are therefore typically manifest in the procedures, routines and processes of the organisation.

$$\textbf{(2)} \qquad R_i(T) = \int_0^T r_i(t)dt + R_i(0)$$

Figure 2 provides conventions for a graphical representation of the resource accumulation process. In the remainder of this paper, these conventions carry *only* **the precise meanings given here, and do not merely imply some undefined coincidence between variables.**

Figure 2: The accumulation of a strategic resource, and its consequences.



Resource accumulation depends on existing resource-levels.

We now turn to the question of what is required for resource-stocks to accumulate. It appears that no case exists in which resource accumulation can take place without being dependent upon *existing* **resource-levels. This even applies for new enterprises, where cash can be raised, and key staff hired, only if the entrepreneur possesses a stock of experience and credibility. This observation explains how resources that do not feature in (Eq. 1) nevertheless become involved in the organisation's performance – they drive or constrain,**

often strongly, the rates of gain or loss for those tangible resources that *do* **immediately account for performance.**

The current level of that resource itself may also affect its own growth rate, as when existing customers recommend the firm to others. Exogenous factors play a part once more, for example when economic recession causes loss of customers. Thus ... *the current net rate of accumulation* r_i *of resource* i *at time* T *is a function of the current level of all existing resources***,** *including that of resource* i *itself, and on exogenous factors* E **(Equation 3).**

$$\textbf{(3)} \qquad r_i(T) = f_i\left[R_1(T),..,R_n(T),E(T)\right]$$

Dependence of resource-flows on particular levels of existing resources may be either positive or negative. A larger resource-stock of sales people may raise the rate of customer-acquisition, for example, whilst insufficient service staff may cause customer loss-rates through poor service.

Equations 1 to 3 constitute a basic model of the firm as a system of interdependent resources. The system is open, not only because its resource accumulations and depletions are partly determined by exogenous factors, but also because many of the required resources must be developed from outside the firm, and defended against loss. A firm's performance over time therefore depends on its relative progress in developing these potential assets, capturing them from rivals, and retaining them. Note, though, that since the firm need only have somewhat reliable access to resources, ownership is not necessary, and the model is not sensitive to the location of firm-boundaries – performance can be equally captured, for example, whether the firm manufactures in its own facilities, or subcontracts production.

The interdependence between resources implied by Eq. 3 (or 'resource-system') gives rise to feedback structures that may reinforce any tendency for the system to grow or decline. Other feedback structures may cause elements of the resource-system, or the system as a whole, to damp-out any fluctuations, or cause overshoot and correction[4].

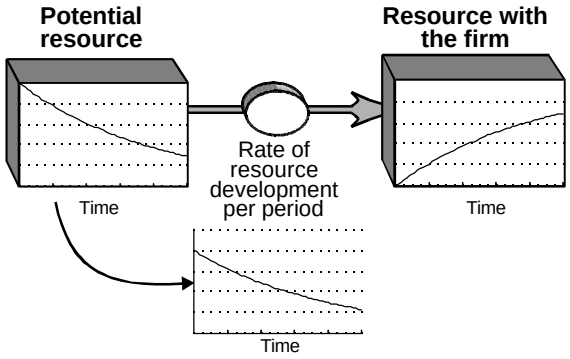
Individual entities within the population of a resource-stock generally differ from each other on one or more attributes that influence firm performance. This influence may be direct – e.g. customers vary in their rate of purchase from the firm, which directly determines revenue and profitability - or operate through affecting other resource-accumulation processes – e.g. sales staff differ in skill and products differ in functionality, both of which affect customer-acquisition rates, and hence future profitability. Such attributes, like the resources that possess them, can only be changed by means of in-flows or out-flows. Staff skills, for example, can be raised by training, or lost through lack of practice. Attribute-stocks also rise or fall, however, as their resource-carrier is won or lost – staff skills are added to by new recruits and lost when individuals leave. This mechanism is known as a coincident flow (Forrester[op.cit.]).

However, although resource attributes differ in character from resources themselves (being intimately tied to a specific resource-carrier) it nevertheless remains true that their accumulation rate depends on the firm's existing resource-levels and exogenous factors. Equation 3, above, therefore applies equally to attributes as to resources themselves.

Potential resources and rivalry.

Since organisations are not closed systems, they must usually accumulate certain resources from 'potential' stocks that lie beyond their direct influence – consumers or firms who might wish to become customers, skilled people who might be hired, and so on. If stocks of these potential resources are plentiful, then the firm's resource-accumulation can be rapid, whereas if the potential stock is empty, then it will not be able to develop the resource at all (Figure 4).

Figure 4: External availability of potential resource constrains a firm's accumulation rate.



Equation 3 therefore needs to be extended, so that ... *the firm's accumulation of resource resource i at time T is dependent also upon the availability of potential resource at that time, $P,(T)$* **(Equation 3b).**

$$\textbf{(3b)} \quad r_i(T) = f_i\left[R_1(T),..,R_n(T),P_1(T),..,P_n(T),E(T)\right]$$

For a particular firm, resource can be won not only from potential sources, but also from rivals. Competitive performance thus depends on the firm's success at persuading customers, skilled staff and other contestable resources to switch to the firm and remain with it into the future. Since each firm's ability to

accumulate and retain any one resource depends upon its existing stock of resources *... the net accumulation rate of any resource i by firm j depends on the firm's existing resource-levels $R_{1\text{-}n,j}$, rivals' resource levels $R_{1\text{-}n,1\text{-}m}$, and levels of potential resources $P_{1\text{-}n}$.* **Firm j is included within the array of firms $(1\text{-}m)$ in the industry, so Equation 3b can be extended to deal with rivalry, as given in Equation 3c.**

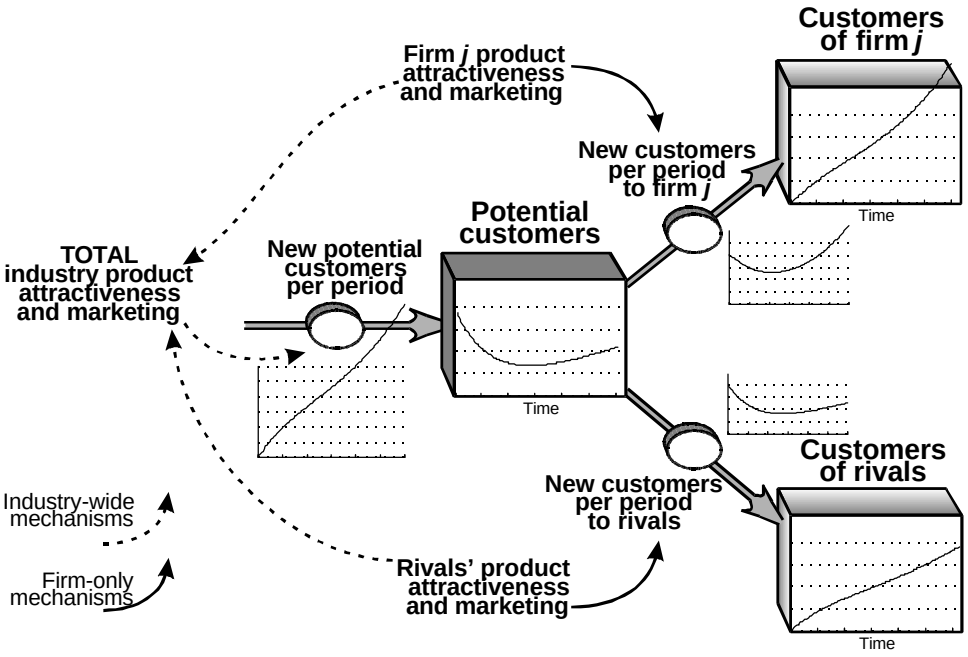
$$\textbf{(3c)} \qquad r_{i,j}(T) = f_i\left[R_{1,1}(T),..,R_{n,m}(T),P_1(T),..,P_n(T),E(T)\right]$$

To complete the formulation of rivalry dynamics, it is necessary to reflect the possibility that any pool of potential resource P may itself accumulate. Increasing functionality, falling price, and firms' marketing efforts stimulate creation of potential customers. Similarly, perceived career opportunities and good salaries stimulate creation of potential staff with skills relevant to the industry, from which pool each firm then seeks to attract individual employees. Thus ... t*he rate, p_i, at which any potential industry resource, P_i, grows at any time T also depends on the existing stock of resources and potential resources in the industry (Equation 4)*

$$\textbf{(4)} \qquad p_{i,j}(T) = f_{2i}\left[R_{1,1}(T),..,R_{n,m}(T),P_1(T),..,P_n(T),E(T)\right]$$

This dynamic interaction between potential resources and resources developed by rivals is portrayed graphically in Figure 4, for the specific resource of customers.

Figure 4: The dynamics of resource-development and rivalry (type 1).



Competition to develop potential resources is conveniently referred to as type-1, and is most evident in emerging industries. However, type-1 rivalry continues to feature in mature and declining industries – new customers, staff and channels may continue to emerge, simultaneously with the demise of established entities. In addition to type-1 rivalry, firms compete to steal resources from one another – type-2 rivalry, whose dynamics are already captured by equation 3c. That function (f_i) must also include the impact of switching costs. Certain resource-items may be shared – customers, suppliers, advertisers and even employees may not be exclusively held by a single rival - in which case a further form of rivalry (type 3) arises as competing firms attempt to win share of access.

Scenario Planning

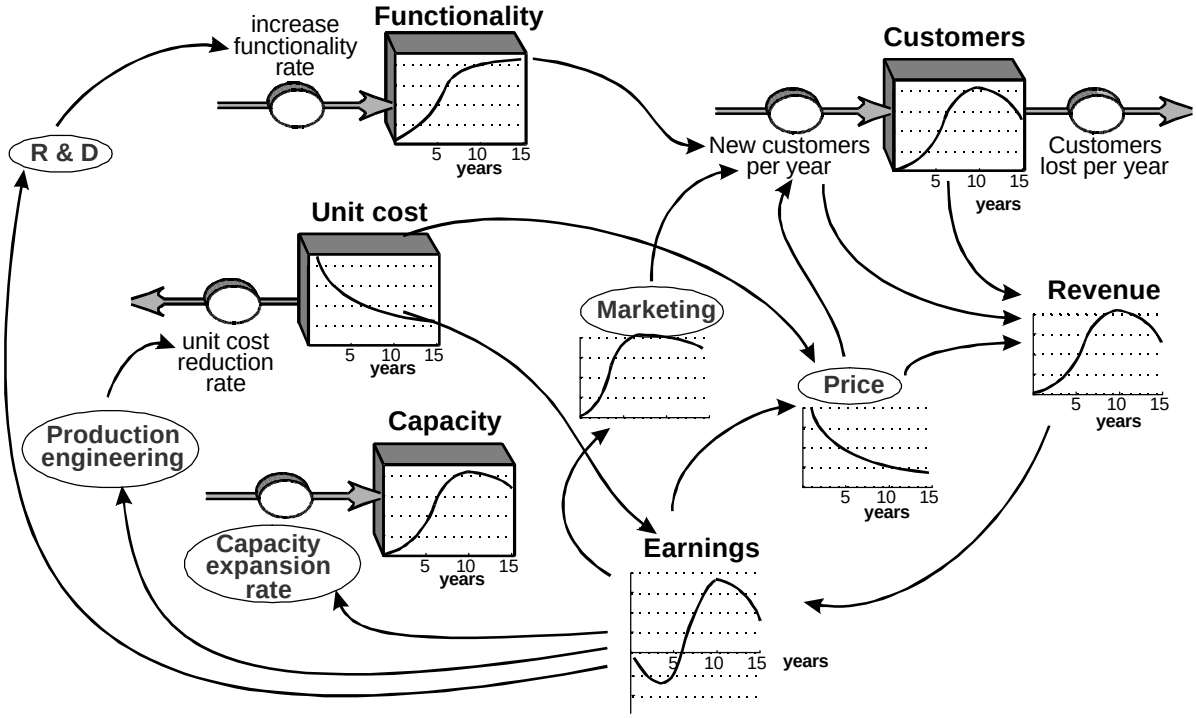
The dependence of firm performance upon exogenous factors has made market and industry forecasting a regular component of organisations' strategic planning processes and consulting firms' methods. Dissatisfaction with forecasting approaches, however, has led many firms to adopt 'scenario planning' approaches – attempts to describe plausible future states of the world, in order to test, at least qualitatively, the potential and robustness of alternative strategies (see for example, de Geus, 1988[5]; van der Heijden, 1996[6]).

There remains, however, an opportunity to improve on this qualitative approach by adding some means for estimating the factors determining the scale and pace-of-change of industry dynamics. This has already been accomplished in certain specific contexts, such as the world oil industry (Morecroft & Marsh, 1997[7]).

The connection between scenario planning and the dynamic resource-system perspective of the firm, outlined above, becomes apparent when it is noted that the firm-system already captures, explicitly, not only the *influence* **of factors outside the direct control of the firm (customers, potential resources and the resources of rivals) but also the** *factors that drive change* **in those exogenous resources. The opportunity to formalise a generic model of evolving industry scenarios therefore arises from the observation that ...** *industry development arises from processes of <u>mutual</u> accumulation and depletion between demand-side stocks and the supply-side resources of all*

firms participating in the industry. **These interdependencies typically play out over the history of the industry sector in a characteristic manner.**

Figure 5: The dynamics of industry-wide resource-development.



In the early phase of an emerging product- or service-market, poor functionality and high unit-cost limit the rate at which potential customers can be won. However, speculative investment by would-be suppliers improves functionality and unit cost, to the point that the product or service becomes acceptable and affordable in comparison with established alternatives, and customers start to be developed (Figure 5, top-right chart).

The potential profitability offered by the growing market raises the incentive for both early entrants and late-coming firms to invest further in functionality, capacity, unit-cost reductions and marketing *(Note that Figure 5 is now representing asset-stocks across all firms, rather than any single firm)***. Market**

growth ensues, until the process hits limits to the further accumulation of all demand-side and supply side resources.

In due course, new product- or service-offerings are developed, and customers may migrate on to a further new industry sector. Would-be suppliers of this new offering then initiate supply-side resource-accumulations, in an effort to accelerate this capture of customers by the new industry. This process is illustrated, for example, by consumers' historic migration through the media sector, from radio to cinema to TV to internet services. When separate industries compete to serve mutually exclusive market needs, or compete for limited resources, the consequence is a pattern of relative industry growth and decline that reflects the resource-system viability of the respective industries – examples include the relative growth and decline in competing modes of transport, and the development of business services offered to firms by consultants and other professional service providers.

Illustrative cases

The principles outlined in the previous section will be demonstrated for the case of consumer financial services. On the demand side, long-term changes in the potential market are being caused by substantial shifts in economic and social conditions. In advanced economies, these changes include demographic shifts and increasing wealth, which together drive in-flows to the potential customer-base for sophisticated, high-value products such as mutual funds. On the supply-side, firms compete to extend the range and functionality of financial products, and technological advances sharply reduce the cost of

delivering these products. These improvements in cost and functionality in turn enhance the appeal of emerging financial services, winning consumers' cash-flows away from traditional savings and lending products, as well as from alternative uses, such as consumption or purchase of real estate.

In emerging economies, population growth and increasing real incomes are driving in-flows to the potential pool of consumers available for basic savings and lending products. This opportunity is attracting suppliers to invest in supply capacity, delivery channels, and marketing and sales efforts, bringing financial products within reach of consumers who become affluent enough to start consuming them. Investigation of the consumer financial services sector will focus on the impact of change in the economic, social and technological driving forces on the emergence of market potential. On the supply-side, attention will focus on the impact of firms' investments in products and channels on the pace of change in appeal and functionality of industry product offerings.

The current study will investigate the range of alternative futures for consumer financial services that arise from plausible variances in the determinants of accumulation and depletion for supply-side and demand-side resources across a number of sectors. The result is expected to provide policy guidance for firms engaged in such sectors on such issues as capacity-expansion, marketing, pricing, and product-improvement.

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[1] *Wernerfelt B (1984) 'A Resource-Based View of the Firm', Strategic Management Journal, 5, 171-180.*

[2] *Amit R and Schoemaker P (1993). Strategic Assets and Organisational Rent. Strategic Management Journal, 14, 38-46.*

[3] *Dierickx, I. and Cool, K, 'Asset stock accumulation and sustainability of competitive advantage', Management Science, 35, 1989, pp.1504-1511*

[4] *Forrester JW (1961) Industrial Dynamics. Productivity Press: Cambridge MA*

[5] *de Geus, A, (1988), 'Planning as Learning', Harvard Business Review, 66(2), pp.70-74.*

[6] *van der Heijden, K,(1996), Scenarios: the Art of Strategic Conversation, Wiley: Chichester.*

[7] *Morecroft, J, and Marsh, B, (1997), 'Exploring Oil Market Dynamics: a system dynamics model and microworld of the oil producers', in Bunn, D, and Larsen, R, (eds), Systems Modelling for Energy Policy, Ch. 10, pp.167-203, Wiley: Chichester.*