Dynamic Strategic Thinking

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Market analysis and marketing strategies stress understanding the fundamental dynamics of a market, but how deeply do they think about the interplay of such fundamentals and what frameworks do they use in such thinking? How do business schools teach managers to think this way? The premise of this article is that in their strategizing, senior marketing executives, boards of directors, consultants, and financial analysts should see the market and the firm's embeddedness in a market as a moving video rather than a static snapshot. The authors propose that what makes the video move are fundamental feedback effects that create the evolutionary path that a market and a firm may travel. A taxonomy of systemic feedback regulations is presented with applications that demonstrate how the taxonomy and proposed soft mapping techniques can be used to construct dynamic mental models that help managers and consultants improve their dynamic strategic thinking and the strategic forecasts of firms.

Forecasting the way markets will evolve and the way technology will evolve is an ever-increasingly difficult job. History is replete with examples that prove to be wrong. I would like to see more firm roots to our judgments.

—Alvin Greenspan, Chairman of the Federal Reserve, 1998

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Demonstrate how feedback dynamics can be visualized and explained.

We propose a taxonomy of the general types of positive feedback dynamics that drive fundamental long-term change within markets and firms. Feedback effects are often associated with the generation of standards within high-tech markets (Chesbrough and Vanhaverbeke 1995). For them, the classification of feedback effects and how they produce path dependencies has been somewhat casual (see Ansoff 1965). A more precise and comprehensive conceptualization of feedback effects is needed to provide firmer roots for the application of complexity theory to the marketing strategy process. Such an exercise is most timely as the development of a complex system's initial thoughts in strategy formation is at a precontingent stage. It is neither mentioned by Mintzberg and Lampel (1990) in their review of the field nor in The Economist's latest guide to the essentials of business strategy from A to Z, which does not even define basic terms such as systemic dynamics and systems feedback (Kotter 1999). These terms are also seldom to be found in the marketing literature.

This article also addresses the theory of firm capabilities by responding to the observation that as a firm's dynamic capabilities and strategic management are concerned, "darker theoretical work is needed to lighten the framework." (Gomes 1997:250). For example, we lighten this work by elaborating how a firm's most potent positions "shape" competitive advantages. In theorizing a firm, a firm's specific asset position must be and create a firm's evolutionary path. The interface uniqueness of these positioning feedback effects (rather than "the" position itself) generates economic rents. We use the taxonomy to demonstrate that the "dynamic" component of a firm's capabilities may be best understood by studying the types of learning feedback effects that can be classified as dynamic capabilities. Learning feedback effects specify the likely dynamic changes in the firm's capabilities that, in turn, create, destroy, and redefine a firm's asset positions into more competitive and competitively differentiated positions (Senge 1990). Our study describes the most efficient deployment of manufacturing assets as involving two learning processes: learning by doing and learning from experience. Argote (1999) also describes two learning processes, the learning of labor deploying the new and new managers learn to better deploy the capital equipment and technology embedded in the firm's added-value process. Their learning is an aspect of the product design and specification that the class of learning feedback effects we describe are a higher order type of feedback effect within which the other class of feedback effects resulting from the deployment of assets (or more generally capital) operate. The cumulative, often hard to reverse, evolutionary path a firm takes is caused by the interaction between the firm's asset positioning and learning feedback effects and the business environment's positioning and learning feedback effects. According to Thiers et al. (1997), the greatest potential contribution to strategy lies in improving our understanding of such dynamics. Making such a contribution is the first goal of this article.

The concept of sustainable competitive advantage has also been closely connected to learning capabilities (De Gans 1988; DiBona 1992, 1996, 1997) and learning clearly involves feedback. While we might argue that learning can also involve negative feedback (don't do that again), ultimate success will depend on finding at least some positive reinforcing feedback loops (do more of this). The idea that organizations can combine learning capabilities that reinforce the competitive advantage or, in themselves, become competitive advantage can be framed as a positive feedback effect. Learning to learn is an even higher order feedback loop. It is our claim that this higher order feedback effect is a fundamental market dynamic. After all, learning at a slower rate than our competitors almost by definition means that we do the wrong thing or do what would have been the right thing at the wrong time. Thus, understanding what we want but being always one step behind the competition must make the profitability of this firm and the economic rents that it earns.

The second goal of the article is to demonstrate how multiple feedback effects can be visualized and explained. The feedback loop diagrams, the schematic forms, and their relations to the text are easy to grasp. They present two concepts for each narrative feedback loop and market feedback metrics. The better visualization of feedback effects helps shift the focus of managerial attention to feedback flows rather than stocks (see also Senge 1995). Visualisation of the dynamics of a system encourages a paradigmatic shift of focus from stocks to processes (e.g., market share, quick ratio, brand equity) to rates of change of stocks (e.g., rates of change of market share; DiBona 1992, 1996, 1997). The scenario planning frameworks we propose can be used as a foundation for the narratives or actions that describe market and firm scenarios. They also can frequently the reduced frequency of feedback effects.
The basic concept of feedback effects

A market feedback effect is a reciprocal relationship between one changing state of nature in a market and another changing state of nature in a market. It produces an underlying negative or positive trend, pattern, fundamental, systemic dynamic, or serial correlation in relationships between supply and demand essentials within and outside supply and demand. The notion that market dynamics are not all systematic and may have irregularities that can be analyzed and partially understood is an essential premise of modem growth theory, industrial dynamics, and theories of finance. Thus, the concepts of positive and negative feedback effects, as an important class of market dynamics, are core to many contemporary theories of the firm. Negative feedback effects create stability and equilibration in nature, society, and markets. Positive feedback effects create permanent change and growth: the evolution of economic systems and markets (Kerlin 1998). The task of the strategist is to understand the Yin and Yang interplay between these two effects.

Negative feedback mechanisms

The best-known negative feedback effect is the approximate a priori classic price theory, which is taught in all Economics 101 classes and is specified mathematically by the price elasticity formula. When a supplier raises its prices, some consumers react by decreasing their purchases, so the supplier's sales decrease by reducing the rate of consumption and frequency of purchase, postponing consumption or switching to a competitor's product. This reaction tends to be a fall in the sales' rate, which leads the seller to reduce its price, back down again. It is called an equilibrating regularity because it tends to bring the market back toward its previous state of production and consumption. In the context, a negative feedback effect is when an increase in x (any price) leads to a decrease in y (demand) that then tends to undo its increase in x (prices). In mechanics, a negative feedback effect is called a servomechanism because the system has a built-in control mechanism that brings it back to its previous dynamic performance, for example, an engine's revolutions per minute. What is observed in the context of a servomechanism is an equilibrating regularity.

Positive feedback mechanisms

A pattern of positive feedback effects that has been called a speculative bubble has been frequently observed in economic history. Invention is gold, napalm, Florida real estate, or Internet stocks can "feed on itself" and develop a "life of its own." Speculation pays a price for the innovation that has nothing to do with market fundamentals—the current and forecast streams of returns from speculative investments in the market. They pay a price they never would otherwise pay because they conjecture that there will be plenty of buyers (i.e., greater fools), which is why this commodity is called the "greater fool" theory of stock market investment. At an even higher price in the dead: This belief creates an endogenous positive feedback cycle where rising prices, rather than reducing demand, lead to even greater demand as speculators are attracted by the prospect of making arbitrage profits out of rising prices. The result is more speculative demand and buying that further raises prices, generating further arbitrage profits, which further raise demand. Reality confirms beliefs, and beliefs lead to the predicted reality in a self-fulfilling prophecy. Often analysis at this stage of a speculative bubble feedback effect mask the truth by attempting to rationalize the phenomenon as something else, such as a "new economy" or "network effect," without really explaining their explanation. But when reality finally falls to earth against existing expectations, it is inevitably most, a rapid reaction in the positive feedback effect will occur: those selling, induced by the bubble's logic, are forced to sell out of what is now perceived as a bursting speculative bubble. This leads to an explosion of selling that rapidly drives down prices, resulting in further selling. As we shall see, there are many other types of positive feedback effects that are much more common and economically productive than the positive feedback effect underlying speculative bubbles. In fact, speculative bubbles must be categorized as one of the most inefficient positive feedback effects in the capitalist system because of the misallocation of resources they produce.

Positive feedback effects are the opposite of a servomechanism because any change in x leads to further change in x in the same direction. The further change sometimes is even greater than the initial first-order effect, but it is often less, producing an exponentially shaped "plateau" for both x and y, over time. This raises the issue of how to define increasing returns. In evolutionary theories of disequilibrium economics such as developed by Arthur (1994), the term increasing returns is a synonym for positive feedback phenomena. A change in state is a shift that increases returns because increasing-returns feedback effects continue to increase x and y in a particular direction over time.

Increasing returns and feedback effects

This definition of increasing returns should not be confused with meso-agency theories of equilibrium economics, where the term increasing returns describes the phenomenon where the return on an innovation factor increases as innovation increases. It is very important to keep these two interpretations of increasing returns distinct, particularly in any theory that uses both terms. The attempt to do so by using the term positive feedback to describe the dynamic that creates path dependencies and what Arthur and others who reference his work call "increasing returns" is to prefer to use the term increasing returns in the classic way to describe how x and y progress within a feedback relationship, a further increase is then an increasingly large increase in y. In the dynamics of calculus, increasing returns are specified by a positive first and second derivative in the relationship between x and y. This may occur for a period of time with a positive feedback dynamic (during the first turning point of the S curve for x and y).

For increasing returns to be the result of positive feedback, the output of the system (network utility, perhaps) has to be consistently specified to some inputs (not just path specifically in a set of model equations but in the real world that the equation models). Form and Pitcher (2000) have noted that, whereas the Interstate Highway System was the first constructed, the routes from previous taxes were not devastated by the new construction funds. The feedback loop was not completed, therefore, even though the United States enjoyed the increasing returns from an even more connected Interstates Highway System, which increased usage and usage, an important feedback effect was missing. Output was not connected to input to ensure a consistently direct and powerful way. Once the public (or highway users) sat on the network effect, a market for cars, which drove costs connected to the new Interstate Highway System, which increased usage and usage, an important feedback effect was missing. Output was not connected to input to ensure a consistently direct and powerful way. Once the public (or highway users) sat on the network effect, a market for cars, which drove costs connected to the new Interstate Highway System, which increased usage and usage, an important feedback effect was missing. Output was not connected to input to ensure a consistently direct and powerful way. Once the public (or highway users) sat on the network effect, a market for cars, which drove costs connected to the new Interstate Highway System, which increased usage and usage, an important feedback effect was missing. Output was not connected to input to ensure a consistently direct and powerful way.
Instituted that these mechanisms occur within firms and also between firms connecting the actions of firms and their competitors with supply, demand, and consumer. Such feedback loops connect the performance and competitive ness of members of the value chain through changes in some variables (parameters) that stimulate a response in other variables. These responses ultimately "feed back" to the triggers to cause another change in the trigger variables. Examples of x and y variables that are involved in these feedback loops are investment, costs, prices, demand, sales volume, consumer utility, and profits.

According to Arthor (1994), feedback effects are self-reinforcing mechanisms that are variants of or derive from four genetic sources:

- Large set-up or fixed costs (which give the advantage of falling unit costs to increased output)
- Learning effects (which act to reduce costs or increase costs as their prevalence increases) (Arthor 1982; Rosenbloom 1982)
- Coordination effects (which confer advantages to "going along" with other economic agents taking similar actions) and
- Self-reinforcing expectations (where increased prevalence enhances beliefs of further prevalence).

Our categorization of feedback effects into two major classes (see Table 1) are (1) types of most positive feedback advantages involving investments in R&D, marketing, distribution, and brand equity that create feedback dynamics and (2) types of learning dynamics that over time help create most positive advantage effects. We will demonstrate that Arthor's coordination effects are actually either positive feedback advantages that are subject to scale dynamics and/or a special class of network learning dynamics. We also argue that self-reinforcing expectations are a special type of learning dynamic.

**TABLE I**

<table>
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<tr>
<th>Types of Feedback Dynamics</th>
<th>Along the Supply Chain from Raw Material Extraction to Ultimate End User</th>
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<tbody>
<tr>
<td>1. Positive feedback dynamics Research and development increase position of excellence</td>
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<tr>
<td>2. Learning and experience dynamics Learning by doing increases efficiency</td>
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The uses of the market expects on the fixed costs employed in manufacturing and marketing the product. These fixed costs are the financial and human capital that have been invested to date on the project. They reflect the "uses" the company has deployed its market position (since 1999) and include knowledge assets, manufacturing assets, and complementary assets such as distribution assets, and other marketing assets (e.g., a Website). If the firm is attempting to grow the market and gain its market share, then the average cost of goods sold decreases with increased sales, its price will significantly decrease. When sales increase in the next period, demand increases and its sales increase. This feedback effect underlies the following model.

To the leader belong the spoils. Whether you make shoes, semiconductors or cola coloring, it's the same story. Any company that wants to be the biggest market share can expand research costs and advertising costs over a broader base and come out with lower unit costs. (Brown 1996:26)

If price is a linear function of the average cost, then differentiation of this linear function after substituting the right-hand side in equation 1 (for average cost leads to the following equation:

\[ a \times x + b = \text{average cost} \]

\[ x = \frac{a}{b} \]

What equation (2) shows is that the larger the average cost per dollar spent by the company, the greater the contribution margin. If the average cost per dollar spent by the company is increased, the company will increase its contribution margin. Therefore, the obvious way of creating a positive feedback effect is

- To increase market share in the fixed-cost component of manufacturing and create a cost structure with a very large fixed-cost component. The competitive advantage is then the cost-differentially focused manufacturing cost structure position that produces what Chandler (1990) has called the enabling logic of industrial success. In the world when Henry Ford built assembly lines and trained his workforce in specialized assembly line tasks, he vastly increased his sales but lowered his variable costs significantly. The same can be sold, the lower his average cost, which enabled him to lower prices (which increased demand) and reverse his profits in even more capital intensive production. Positive feedback effects are also commonly created around fixed-cost investments in distribution, R&D, brand equity, and customer service. For example, as firms like Toyota move their customer service process to the internet, and not only the cost of servicing each contact drop around internet (-50% to 80% or more), the nature of the cost shifts from mostly variable (about 70% to mostly a fixed cost (in the Internet system), thus ensuring that firms' customer service costs will decline as the firm grows. When a firm is an industry born from an innovator (e.g., xerox 1970) and adopt similar production and distribution processes that involve large fixed-cost components (e.g., the various energy industries), then the industry cost structure and the associated industry-level feedback effects connect average industry costs and prices to demand and supply by creating structural characteristics of the product market.

**Positioning Dynamics**

The investment required in organizational design, R&D, manufacturing, distribution, and brand equity assets required to enter a market and challenge the existing market incumbent constitutes a barrier to entry. But this is too static and defensive a conceptualization of positioning advantage. The more a firm possesses manufacturing capacity, distribution reach, communication reach, and brand equity, the greater its utility to consent potential demand into actual sales. But it is a firm's early positioning and deployment of these investments in a market's evolution that now it a potentially permanent advantage (see Tracey et al. 1997). Its larger and increasing sales base and cost advantage, whether diversified or focused, grows (or is diversified) over time, which continues to increase its sales revenue. The feedback among cost and sales feedback advantage, if successfully managed, remains that vital driving similar processes over time cannot catch up. Competitive forces (Tracey, 1996) found that pioneering innovators do not always achieve "first-mover" advantages, but at the eight-year time, an incremental advantage commits more resources to building distribution or can take advantage of an established distribution system and brand reputation position. This is a form of an investment, fixed-cost feedback effect. The greater the installed base of cooperating distribution and deployable brand equity, the greater are the returns from push and pull marketing. A follower's earlier deployment of distribution and brand equity assets can trump a pioneer's earlier deployment of knowledge and manufacturing assets. What is noteworthy for marketing strategy is that complementary assets such as distribution reach and brand loyalty/loyalty are more malleable and less specific to knowledge and manufacturing assets, which are much more closely tied to a specific product technology. Thus, pioneering firms that have built their positioning advantage around technology-specific knowledge and manufacturing assets are at a strategic position disadvantage compared with firms that possess distribution and brand equity positioning advantages because the latter marketing assets are easier to deploy.

Van den Berg (1997) argues that although Sony was the first to market with its Betamax format VCR, the ultimate emergence of Minolta's video home system (VHS) as the industry standard was a result of a multiplicity of strategic decisions. These include competitive pricing strategy, scale effects, experience effects, strategic alliance effects, and positive network externalities. The VHS marketing alliance that interested new technology out of the market delered an extensive distribution network and vast from brands that gives the industry advantage in sales and that could be readily understood and managed to create a powerful marketing assets position feedback dynamic. The emergence of the digital video disc (DVD) also shows the evolutionary nature of such technologies. The VHS "lock-in" which has so focused some economists, is a temporary phenomenon.

To this point, we have been developing a potential virtuous circle dynamic, where lower average costs and higher sales feedback on themselves, driven by a positioning feedback effect. But such feedback effects can turn vicious where shrinking sales and rising fixed costs feed on themselves. This is the risk that the dotcoms faced in their large start-up fixed cost investments. If sales decline rather than increase, their average cost of sales can increase geometrically and they bleed out and lose business as they fail to raise their prices and risk a further decline in sales and increase in average cost of sales. When prices and market first collapsed in the early 1990s, firms responded to a reduction in sales by calculating that their average cost of sales decreased as their sales fell and their selling fell. This average cost increase most evidence for firms that faced large fixed costs. The application of a cost-plus rule led to firms raising their prices in response to a drop in demand. This action further decreased sales, causing prices to spiral up and demand to spiral down (see Figure 1). This sequence of events could not be explained by traditional economic theory that predicted the basic negative, equilibrium feedback effect described above: as demand falls, prices fell, which increases demand again. In fact, a special conceptual
End-User Investment Dynamics

Consumer investments in technology and training create a similar positive feedback effect that provides a well-established first advantage called "Customer Looping" by Arthur (1990) or "Lock-in" by Shapiro and Varian (1999). The firm with the larger number of video game controllers in homes has a decided position advantage because the consumer faces a high startup fixed cost of switching in buying a rival's game software. This means that its new, improved games are likely to be more successful and produce higher returns than its rival's similar efforts. Similarly, moving consumers to the new digital camcorders will be a slow process, even though these consumers are far along an existing learning curve (and can be sold on the technological improvements) because they have a sunk cost in their existing camcorder and the playback equipment (their VCR). The prediction is that the pace of the supply-side fixed-cost feedback effects will slow down the adoption of digital camcorders but that once the digital TV's and associated digital VCRs are purchased, these new fixed-cost investments will dominate and will accelerate the adoption of digital camcorders. In short, a sound strategy is for distribution channels to use heavily in marketing digital camcorders until about 20 percent of households have high-definition television (HDTV) sets. At that time, a distributor should go for broke, marketing digital camcorders manufactured by firms who have driven down the design, manufacturing, and supply-chain learning curves for digital camcorders.

Utilities of Scale and Network Effects

A pure network utility effect occurs when the utility of joining the network increases as the size of the network increases. As businesses and households acquire and use the television, the utility of using the service is concentrated around the network increased. This network effect has been employed with the telephones and Web-based e-mail. It is also occurring in less-obvious ways such as the growth of the network of English speakers in the global business world and in science. As a language grows as the language of communication, the value of learning the language increases. As other languages shrink as languages used for global communication, the value of learning to speak those languages decreases. The evolution of the VCR standard was subject to such an effect because the purchased or home-recorded game was shared among friends and relatives. As the network of friends and relatives with VHS players expanded, the perceived utility of such tapes increased. The larger the network, the more it is conceptualized as an asset position, the more the individual utility of the network. This is a utility of-scale feedback effect. To the extent that the network's functioning also involves a high degree of fixed-cost component (such as with the World Wide Web), such coordinated networks also exhibit economics-of-scale and utility network effects. Technology standards deliver both types of economies across networks, which explains their influence and advantages in high-technology markets (e.g., a common technology standard in the European strong phone market). In supply chains, the greater the B2B vertical integration between supply-chain partners via electronic data interchange, the greater the communication and coordination advantages, and down the added value chains. The pressure to cooperate and coordinate becomes huge on lagging in the vertical network because the gains to all increase greatly when the whole network is integrated. While the private ownership of interface software that standardizes transactions and trading communication between businesses and computers via the Web can be questioned (cf. the Microsoft antitrust case), the large network advantages of developing such a standard cannot. It will, however, reduce the unique most position advantages of companies such as Campbell Soup, which has spent tens of millions of dollars on dedicated computer networks with its trade customers and suppliers. As we shall see below, there are further feedback effects that occur across networks of social and economic groups that are associated with nodes, motivations, contagions, learning, and organizational transformation and reconfiguration.

LEARNING FEEDBACK DYNAMICS

Understanding the learning dynamics of firms and markets is key to understanding the evolution of firms and markets and long-term competitive and comparative advantage (e.g., Dosi 1988, 1992; Dosi 1995, 1996). There are five general classes of learning dynamics that can create positive feedback effects within and between firms. We categorize them into motivation dynamics, learning-by-doing dynamics, learning-growth dynamics, network effects, and socialization dynamics.

Motivational/Contagion Dynamics

The motivation to compete between and within companies often exhibits short-term and long-term feedback effects. One form occurs in price wars and has been observed to occur in the real world and in experimental studies of decision making. Aggressive competitive is likely to lead to aggressive competitive reactions, which can lead to an all-out price war (Cannaday 1957). Even the "tie-for" pricing rule in game theory can lead to other escalations of cooperation or competition, depending on initial moves (Axtell 1984). It can be accomplished by an emotional contagion in an industry that is often observed in social groups and subcultures (Halliday, Cacioppo, and Rapson 1994). This leads to a more economic bystander effect, where the market leader can, in effect, create the price-cutting movement that will follow by merely initiating the price-cutting movement. In the de-emphasis of social and economic groups that are associated with nodes, motivations, contagions, learning, and organizational transformation and reconfiguration.

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want to travel and attempt to develop the capabilities to make it profitable: with or without the direct or indirect cooperation of competitors.

The Red Queen effect. Over and above short-term price or quality wars, there exist a long-term trend that increasingly increases the motivation to improve performance. The basic dynamics of a market are that individual seller innovations change consumer preferences. Firms learn from the innovator, and generally supply then develops in response to the emerging new attractive segments of demand created by the changes in consumer preferences. This employment creates excess supply capacity targeted at demand that increases the motivation for sellers to experiment and innovate, and benchmark and imitate (Dickenson 1992). This leads to further seller innovations, feeding back to further changes in consumer preferences and rediscipline of the supplier resources. With this cycling around of innovation-initiation and remaining of the market, each round has to increase its motivation and effort to serve the customer through cost reduction and quality improvement. It has been called the Red Queen effect because it is the Red Queen experienced in Alice in Wonderland, that you have to run ever faster just to stay in the same (competitive) position (Carsten and Hizn 1995). It leads to a virtuous accumulation in motivation to learn and improve performance that is a fundamental trend in free markets.

When innovations in supply change demand preferences but do not increase total demand, the motivation to quickly adopt performance improvement innovations can become particularly fierce. For example, consider the introduction of frozen foods that increase dairy cow productivity. When the milk that produced most from this innovation were those that adopted them first before the increase in total supply drove prices down. During the last 100 years, the window of opportunity to appropriate economic rents from this new production innovation has decreased for farmers because they have collectively learned the fundamentals of being either "quick" or "slow." This has been the case for systems or even specific systems to improve and innovate. A similar motivation to improve is occurring in distribution among wholesalers and retailers where total supply measured in terms of annual-farms capacity has outstripped total retail spending. As new innovation in supply chains management and efficient consumer response is introduced, the time that the early adopters of the innovation make a profit is reduced. This competition to appropriate the extra profits from such innovations is less than it is used to be. This is because everyone is more alert to new ideas and motivated to benchmark and innovate the best new practices in B2B distribution logistics.

Risky-motivation dynamics: A motivation to a try-harder feedback effect can occur within firms as well as between firms. Figure 2 presents a service quality–employee morale–positive feedback effect within the firm (Gresnow 1984). A decline in employee benefits and wages is created by an external trigger such as an economic downturn or a merger that leads to senior management belt-tightening. This leads to a reduction in employees morale, which is contagious and leads to a drop in employee service, which leads to a reduction in demand for the firm's offering, which leads to further belt-tightening and a further drop in employee benefits and wages, which combines the vicious circle or spiral downward. The same effect can result in a "virtuous circle" created by a positive pulse in employee benefits and salary that raises morale, employee service, demand, and future employee benefits and wages. Southwest Airlines experienced such an effect throughout the 1990s.

Learning-by-Doing Dynamics

Firms learn by doing (Argote 1996; Arrow 1962; Solow 1987). The more they do, the more they learn. The more they learn, the more they do. The more they do, the more they learn. Consumers learn from using (Roosenburg 1982). The more they use, the more they learn. The more they learn, the better they use. The better they use, the higher the usage utility. The higher the usage utility, the more they use. This basic empirical learning effect applies to all processes within the added-value supply chain and adds an important higher order dynamic to the above positioning dynamics. Experience with assets, such as production machinery or a customer service Web site, triggers a learning dynamic asset utilization that can transform and reconcile scale economics in ways that accelerate. The functional relationship between quantity produced and cost (what is specified as the economies of scale feedback effect associated with assets employed) is still subject to a positive feedback effect. The effects on costs and prices of positioning feedback effects, tested within learning-by-doing feedback effects, can and has been tracked by researchers (Muhamad 1952; Wright 1936; and consultants, becoming known as the "experience" curve or progress curves. Dutton, Thomas, and Butler (1982) in a review of the history of progress functions as a management theory pointed out that a great deal of attention has been paid profitably to direct labor learning and only recent studies have focused on the cognitive learning of managers (cf. Albers 1989).

Two questions that have been beguiled are: What is the psychological and sociological source of learning by doing? And What does "experience" mean unusually? Assets are deployed within or across organizational manufacturing and distribution processes. But they are always redeployed and reconfigured within the context of re- designed added-value processes. These processes are then subject to various levels or degrees of psychological and sociological "learning-by-doing" process improvement. The first level is that the design of the process remains the same, but its execution is improved with experience. In Adam Smith's famous example, the pin maker becomes more productive through trial and error remaining fixed. The second level is that the execution of a specific activity is being within the production process. The task is completed faster with fewer defects. Clearly learning is very localized and the true learning is a specific activity, more specific activity, less specific activity, and finally the activity becomes cognitive learning. The second type of process learning results from an incremental series of small alterations in the design of the standards operating procedures (e.g., of increased for retooling the work proposed) by the individuals undertaking the activity but that have an impact on other activities within the process. This type of learning implies that the labor is thinking about the process as it works and coming up with creative improvements in the process.

The third type of process improvement occurs when the redesign of an activity affects other activities. It leads to a reconfiguration of the work flow process, perhaps even involving the elimination of activities, the replacement of manpower by machines, and the replacement of management by computer control systems. Learning is now even more entrenched in a technological system in which operational plans are automated as part of a process that is no longer a single task. The design of the process is no longer the same. The design of process is no longer repeated and redeployed. The scale processes are re- designed and redeployed as part of a process that is no longer the same. The design of process is no longer repeated and redeployed. The scale processes are re-designed and redeployed as part of a process that is no longer the same. The design of process is no longer repeated and redeployed.
"Exploitation" learning. Exploitation is continuously pursued because the alternative, competency-destroying, asset-shedding "exploration" is seldom ever tried and experienced. This brings us to a more general discussion of learning capability dynamics.

Learning Capability Dynamics

The evolution of a preference for more localized explorative learning over the initial exploratory learning of the firm raises some interesting questions about how the learning ability of dynamic capabilities of an organization increase over time. Cohen and Levinthal (1990) define this cumulative learning ability as absorptive capacity:

- The ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends is critical to its innovative capabilities. We label this capability a firm's absorptive capacity and we suggest that it is largely a function of the firm's level of prior related knowledge. (P. 128)

One computer company has earned billions from appropriating the economic rents from such a feedback dynamic on the demand side of the PC market. Dell was at a cost advantage into the PC market, but its founder recognized that experienced PC shoppers can be taught and sold new features and technology much more easily and faster by phone or by mail catalog. Such consumers are faster learners because of their accumulated learning. This means that Dell can sell its latest models directly to such experienced users more easily and faster than rivals who market through their traditional distribution channels. Dell can also ship its new models faster to the market, thus gaining a sympoistic advantage in the market. This new technology generates higher profit margins because it competes on new features, rather than prices. Dell wins in four ways:

- more effective targeted marketing to a growing segment of experienced PC buyers,
- lower marketing and distribution costs,
- a growing reputation as a leader in delivering new technology, and
- higher margins.

The general conclusion based on this consumer learning dynamic is that a late entrant in a market can use the benefits to out-perform experienced competitors in markets where consumer cumulative learning curves exist. This may be more productive than targeting new customers in the market. It is non-stochastic because the conventional wisdom in that experienced consumers are expected to be brand loyal—and harder to sell to than novices.

But a deeper analysis of the cumulative effect of learning on further learning reveals that knowledge acquisition may be subject to at least three underlying subdynamics. The first dynamic is that the quality of learning increases with learning because a deep and broad knowledge base provides a greater capacity for absorbing new knowledge; that is, the absorptive capacity effect. For example, a passionate engagement of the Deming or Six Sigma quality improvement methods can feed on itself, leading to a deeper knowledge base. The second dynamic is that the more often a firm replicates the assimilation and application of new information, the better it gets at doing such processes. As an example of this second dynamic, observed by Todes et al. (1997), is that the ability to reconfigure and transform itself is a learned-by-doing skill. "The more frequently practiced, the easier accomplished" (p. 521).

"Practice" makes learning and transformation repetitive, both more "perfect" and easier. Extending this insight, the means that accumulated and transformation are observed and benchmarked in other firms (i.e., "learning by watching imitation"), the easier and better they are accomplished.

A firm is no longer locked into the present state of learning technology. As the technology evolves, the basic cost of learning decreases. "The ability to recognize the value of new, external information, assimilate it, and apply it to commercial ends is critical to its innovative capabilities. We label this capability a firm's absorptive capacity and we suggest that it is largely a function of the firm's level of prior related knowledge. (P. 128)"

**FIGURE 3**

A Within-Firm Surveillance Feedback Effect

- Market Intelligence
- Market Intelligence Gathering
- Decision-Making
- Decision-Making Effect
- Market Change
- Competitive Position

**Surveillance Dynamics**

Tedeschi et al. (1997) encountered a parasitic surveillance relationship in the market to identify emerging new technologies and new and different best practices that are used in the internal and external transformation of the organization. It is a way of breaking out of a specific learning trajectory. But this dynamic capability can itself be subject to a feedback dynamic between investment in what we will generally call market intelligence gathering and the gathering and the use of the market intelligence (see Figure 3). Glaser (1995) alludes to such a feedback loop in describing a knowledge-intensive firm's thrust for even more knowledge. The latest system in Figure 3 can be triggered by a sudden unexpected change in the market that causes actual and perceived market turbulence and uncertainty. This increases the perceived benefit of market intelligence gathering and use. Increasing the quality and amount of intelligence gathering and use raises the quality of decision making, which, in turn, increases the perceived benefit of further investments in market intelligence gathering and use. Increasing the perceived value of more market intelligence gathering and use raises the quality of decision making, which in turn, raises the value of the market intelligence, etc. This in turn raises the perceived benefit of even more surveillance. This dynamic, suggested by the elementary principles of cost-benefit analysis applied to the economics of information, might also be triggered by an innovation in decision support software that leads to a greater use of market intelligence and, hence, increases its perceived value.

Commonly, this feedback system can be triggered by some dramatic success in market intelligence gathering and use. This in turn raises the quality of decision making, which, in turn, raises the perceived benefit of further investments in market intelligence gathering and use. Increasing the perceived value of more market intelligence gathering and use raises the quality of decision making, which in turn, raises the value of the market intelligence, etc. This in turn raises the perceived benefit of even more surveillance. This dynamic, suggested by the elementary principles of cost-benefit analysis applied to the economics of information, might also be triggered by an improvement in decision support software that leads to a greater use of market intelligence and, hence, increases its perceived value.

**Network Learning Dynamics**

Within-n-firm learning dynamics. Learning network effects within organizations increase the ability of an
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strategic management is an area of growing interest among business practitioners and academics. The rapid pace of technological change and the increasing globalization of markets have made it crucial for firms to develop effective strategic management practices. This is especially true for firms operating in highly competitive industries, where the ability to adapt quickly to changes in the market can mean the difference between success and failure.

In recent years, there has been a growing body of research on the topic of strategic management. This research has focused on a variety of issues, including the role of management practices, the importance of innovation, and the impact of environmental factors on strategic decision-making. Despite this progress, there is still much to be learned about how firms can effectively manage their strategic decisions in a rapidly changing world.

In this section, we will explore some of the key concepts and frameworks that have emerged in the study of strategic management. We will also examine some of the challenges that firms face in implementing effective strategic management practices, and we will discuss some of the strategies that firms can use to overcome these challenges.

THE USE OF FEEDBACK ANALYSIS IN MARKETING STRATEGY

strategic management and its role as an area of research and practice. A recent study by Schumacher et al. (1998) highlighted the above feedback framework of competitive dynamics with such a view of strategy leads us to the following two fundamental questions: How can a firm appropriate the economic rents generated by market feedback effects? The extent to which a firm can appropriate these rents depends on a number of factors, including the nature of the market, the level of competition, and the firm's strategic capabilities.

To begin our discussion, let's consider the concept of market feedback. Market feedback refers to the information that firms receive about their performance and the performance of their competitors in the market. This information can take a variety of forms, including sales data, market share information, and customer feedback.

Market feedback is an important source of information for firms, as it can help them to identify opportunities and threats in the market. By analyzing market feedback, firms can gain a better understanding of their competitive position and can make more informed strategic decisions. However, the use of market feedback in strategic management is not without its challenges. For example, firms may struggle to interpret market feedback effectively, or they may be unable to act on the information they receive.

To address these challenges, firms need to develop effective feedback analysis strategies. One approach is to use feedback analysis frameworks to guide strategic decision-making. These frameworks can help firms to identify key market trends, to prioritize strategic actions, and to evaluate the effectiveness of their feedback analysis efforts.

One such framework is the feedback framework of competitive dynamics. This framework was developed by Schumacher et al. (1998) and consists of three key elements: feedback, strategy, and strategic management. The feedback framework suggests that firms can use market feedback to inform their strategic decisions and to improve their competitive performance.

To illustrate how the feedback framework can be used in strategic management, let's consider an example. Suppose a firm is operating in a highly competitive market. The firm may use market feedback to identify opportunities and threats in the market, and it may use this information to inform its strategic decisions. For example, the firm may decide to focus on a particular market segment, or it may decide to invest in new technology or marketing efforts.

In summary, the use of feedback analysis in strategic management is a critical component of effective strategic planning. By using feedback analysis frameworks, firms can gain a better understanding of their competitive position and can make more informed strategic decisions. However, the use of feedback analysis in strategic management is not without its challenges. To address these challenges, firms need to develop effective feedback analysis strategies.
TABLE 2
An Illustrative Market Feedback Matrix for Scenario Planning in the Internet Market for Books

<table>
<thead>
<tr>
<th>Type of Positive Feedback</th>
<th>B2C Marketing</th>
<th>Acquisition</th>
<th>Boyer Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital intensity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brand equity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motivation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning-by-doing Ability</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning-into Ability</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experience</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- moderate positive feedback potential
- strong positive feedback potential

employee away of old employee millionaires must also be factored into the dynamics of this capability. Recent layoffs also are likely to have taken a lot of motivation momentum out of the firm. This feedback advantage is also only an important dynamic capability to the extent that employee motivation makes a significant difference to process output and efficiency in this market. One of the "dynamic capabilities" advantages that B&N may possess in e-marketing and distribution operations is in its personnel. Playing the role of market follower and with its extensive network of store managers and contacts in the brick-and-mortar market, it should be more alert to seeding change in the online book market. Our scenario is that B&N is obtaining increasing volumes from each several and is already and will stay ahead of Amazon on this dynamic capability.

Buyer investment positive feedback effects in this market may be deceptive weak. While a buyer's investment in a PC is spoke, i.e., it is not book buying specific. Book-buying learning-by-doing and learning ability feedback effects are also not great compared with, for example, the computer game market. The presence of a buyer (transaction feedback effect is the wild card. If book-buying behavior becomes institutionalized, then Amazon stands to gain a large first-mover advantage. But buyers are not buying the same book at time after time as they do with, for example, laundry detergent. The future deployment by buyers of intelligent agents that search for the lowest delivered price of a desired book would also depress such institutional buying behavior and make distribution-dynamic capabilities paramount.

Some of the above scenarios dynamics are quite speculative. Senior management in both Amazon and B&N would likely be aware (perhaps strong ideas) with several of our conclusions and have empirical evidence to support their claims of competitive advantage. Our point is to discuss our vision of the competitive dynamics but rather to illustrate how Table 2 provides a systematic foundation for surfacing important feedback effects and developing scenarios that can assist managers in emerging competitive dynamics. Further, to demonstrate the versatility and generalizability of the deeper insights revealed by our market feedback matrix framework, we apply it to three alternative extant frameworks for strategizing in conditions of market uncertainty.

A. Courtney et al. (1997) have proposed four types of uncertainty scenarios:

1. Low uncertainty where the dynamics of the market are highly predictable and lead to a clear view of the future.
2. A future where the market could take several different evolutionary paths but the likelihood of the specific path triggers of a specific path can be estimated.
3. A future where a whole range of different paths could be taken.
4. True ambiguity where the evolution of the market is almost impossible to predict (e.g., post-1992 Russia, emerging markets).

From a feedback theory perspective, the ability to specify a market feedback matrix as presented in Table 2 is greatly reduced as one progresses through Courtney et al.’s uncertainty scenarios. But we would argue that even in the "true ambiguity" scenario, a manager should be able to predict the likely power of different feedback effects presented in Table 2 in an emerging multimedia market. Once some trends start to emerge in the market, a system's thinker's ability to forecast the future may be reasonably sound.

- In an initial review of scenario planning, Schonberger (1995) suggested listing each trend in an influence diagram. We propose that the positive feedback effects that are driving such trends in an industry and in individual firm supply-and-demand curves be specified in a market feedback matrix. In his example of scenario planning for an advertising agency, this would include the following:

1. Interpreting globalization in the context of a fixed-anniversary positive feedback effect.
2. Greater investment by agencies in integrated marketing management overloads that create new positive feedback effects.
3. A decline in the use of brand advertising feedback effects, including the brand equity of agencies.
4. Learning ability and learning-by-doing positive feedback effects associated with the new consumer technologies such as the Internet and cable communication channels.
5. Learning network feedback effects between alliances of specialized advertising service firms that take advantage of economies of scale and learning feedback effects.
6. Alliances with information companies that result in new servitized and learning feedback effects.
7. A decline in the specific investment of customers in agency relationships that is reducing switching costs and changing the compensation conventions.
8. Learning networks within and between buyers of advertising services about how to change their relationships and operating procedures with their agencies.

A strategic question that arises from such an analysis, not identified by Schonberger’s scenario analysis, is whether agencies will learn faster than their customers how to manage globally integrated marketing communication using the new technologies. If they do not, the investment positive feedback expected from the global mergers that have
dominate the worldwide niche markets for manufacturing software (Cook 1997). Cisco Systems has used supply- and-demand feedback effects to dominate the market for routers that create networks of private Internets. But this company is vulnerable to Internet-based networks of Internets (Hedemann and Young 1996) and the evolution of Windows NT (Gupta and 1997). This helps explain why Cisco has entered into a strategic alliance with Microsoft to develop NT networking technology—essentially creating a powerful competition (Dijkkamp 1997) of "test-existing" positive feedback advantages.

CONCLUSIONS

Understanding the various feedback effects that dominate market evolution and development can be useful for managers in at least three ways. First, this understanding may help forecast the different directions in which markets are likely to evolve. Second, understanding the complexity of feedback loops helps managers appreciate and illustrate the nature and degree of uncertainty and risk in a particular market's evolution path. The degree of uncertainty, in turn, dictates the appropriate strategic stance and options. When uncertainty is greater, option theory and contingent analyses may be critical. Third, feedback theory and diagrams may reveal "latent" feedback loops that marketing managers can influence and foster. Such analysis and deep strategic thinking may alternatively reveal that the direction of the market and the fence is set and the outcome very difficult to change. Companies in this situation are either on the train or off the track.

The conjecture of management about what is likely to occur in the future is a particular market and the development and sustainability of a firm's competitive advantage requires thinking about the several, often interacting, feedback effects that are currently driving the complex dynamic systems we call "markets." According to Havel (1998), what is needed is a deeper theory of strategy creation so that firms can sometimes explain how their strategy begins with a specific feedback loop that mediates the structure of the market. When companies are in a similar position, they can identify the opportunities in the market for competitive firms to create competitive advantages. The firms in these cases are those that understand the nature and degree of uncertainty and risk and how they can be combined and visualized in practice to explain what the evolution of a market and competitive firms success constitutes a step. Shift (2000) states that "strategic thinking often offers a wonderful heuristic that illuminates the nature of complexity, it offers precious little help in shaping it." We have attempted a modest step in the direction of classifying feedback effects that unify the emergence of order from chaos, for the strategic theorist who cannot predict this task managers should find it a bit easier to understand how to use complex systems theory in their strategic management, strategic planning, and risk analysis when the types of feedback effects that are likely to occur in a market fall into different categories and the reasons why they develop are explained. Their cumulative power also makes these emerging obvious cases where such feedback effects are identified in figures that explain how they amplify each other. It is easy to see through these effects in the history of the VCR and the PC operating system software markets because they are pronounced. However, insightful executives who have worked for some time in any industry sector or product market will be able to identify the pertinent feedback loops that have driven the evolution of there markets. Have there been cost structure effects, learning feedbacks, network effects, and at what stages of the supply chain have these effects occurred? By answering these questions in reconstructing the historic evolution of markets, company strategists will become more skilled at understanding what feedback dynamics are driving the market now and should be included in market feedback matrix analysis.

Firms led by senior management and marketing managers who can introspectively "see" a market's latent potential from the perspective of Table 2 and Figure 4 are inclined with a private information advantage over the market. The basic for their insights, instincts, and intuition is a superior heuristic or frame (Ansoff and Schoemaker 1995). Successful financial analysts possess a similar skill. In a sense, they can see the direction of uncertainty. In a market system where powerful demand-and-supply effects are latent or not sufficiently emerging, an investment in supply can generate huge cumulative returns. Such powerful feedback effects have made Bill Gates, by far, the richest man in the world. Strategic managers and investors with such thinking skills are able to acquire firms whose competitive advantage is not well understood and owners do not see the potential position and learning feedback effects in their new ventures. They also appreciate the interplay between intuition and learning that places limits on their ability to appreciate the returns from a market's "latent" feedback effects (Bresnahan and Hotelling 1989; Dijkkamp 1992; Nelson and Winter 1982). They remember the new product country that integrates the requirements of a changing environment by understanding how supply, demand, and competitive feedback effects are changing the environment. They change technology paths because they understand that feedback effects are changing the market.

The evolution of the PC software and network exists since feedback effects and their magnitudes are always changing. When demand and supply feedback effects have been played out and can be played out. When and only when they have not understood the sink and your special positive and negative feedback effects. Simple maps of feedback effects are visual frameworks that not only adjust beliefs but also shape the effects of feedback
explains the circular cause-and-effect sequence that can then become a theory in use (Gilbert, Leansen, and Kellington 1982) within the mental model of the manager. The development of feedback matrices and circles such as illustrated in this article can contribute to a more consistent understanding of such theories in use. They are what de Geus (1997) calls "soft mapping" techniques to resolve uncertainty about the feedback structure of the market, feedback effects within the firm, and the relationships among the firm's functional areas.

Future Research Directions

Future behavioral decision theory (BDT) research might be productively directed at a fundamental bias in intuitive thinking about feedback effects. It is the "conjunction fallacy" (Scheffler 1995; Tversky and Kahneman 1982) where explaining a sequence of cause-and-effect relationships can reverse the perceived probability of some outcomes and lead to overinclusiveness in a specific feedback effect in strategic planning. A framework such as offered in Table 2 lists a range of types of supply- and demand feedback effects selected from Table A1 that may be active in the market, thus encouraging a more balanced, integrative assessment of the elements and the extent they pose an opportunity/threat to the firm. This reduces misconception with the feedback effects that are easiest to understand and most visible (Tversky and Kahneman 1982). The way in which managers and analysts learn to identify, understand, and to build feedback matrices and maps reveals the depth, breadth, and complexity of their systems thinking (Beer 1990). This topic has a greater power of potential as a stream of research that cognitive scientists and behavior decision theorists in business might pursue (Kahneman and Tversky 1982). Indeed, systems-thinking exercises can be used to identify the managers who most quickly understand the analyses behind the decision processes and the cumulative complexity of systems dynamics. All other things being equal, how quickly a manager or financial analyst learns to understand and to use feedback maps and tables (including suggesting insightful feedback effect) that might contribute to the ability of the manager's understanding of feedback dynamics, constructing capability, and dynamic strategic thinking (DST) attributes.

NOTES

1. This is a composite tracing reflecting different, unidentifiable errors that have been "mechanized.

2. It should receive the concept of cause-action structures and a clear delineation of feedback effects (an aid to strategy).

3. Such statistical coupling feedback effect was the claim of the classic "trust" theme of Tannenbaum and cohesion and was quite congruent to its long-term consequence: "The price of

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