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INTRAORGANIZATIONAL ECOLOGY OF STRATEGY MAKING AND ORGANIZATIONAL ADAPTATION: THEORY AND FIELD RESEARCH*

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This paper presents an intraorganizational ecological perspective on strategy making, and examines how internal selection may combine with external selection to explain organizational change and survival. The perspective serves to illuminate data from a field study of the evolution of Intel Corporation's corporate strategy. The data, in turn, are used to refine and deepen the conceptual framework. Relationships between induced and autonomous strategic processes and four modes of organizational adaptation are discussed. Apparent paradoxes associated with structural inertia and strategic reorientation arguments are elucidated and several new propositions derived. The paper proposes that consistently successful organizations are characterized by top managements who spend efforts on building the induced and autonomous strategic processes, as well as concerning themselves with the content of strategy; that such organizations simultaneously exercise induced and autonomous processes; and that successful reorientations in organizations are likely to have been preceded by internal experimentation and selection processes effected through the autonomous process. (ORGANIZATIONAL ECOLOGY; CORPORATE STRATEGY; SELECTION AND ADAPTATION; EVOLUTIONARY MANAGEMENT)

The emergence of an ecological perspective, producing new insights in organizational change and adaptation (e.g., Carroll 1988, Hannan and Freeman 1989), has triggered several debates in organizational science that are important for the field of strategic management. One debate centers around the issue of environmental determinism versus strategic choice (Child 1972, Aldrich 1979, Astley and Van de Ven 1983, Bourgeois 1984, Hrebiniak and Joyce 1985). Another debate concerns the relative importance of selection and adaptation in explaining organizational change and survival (Miles and Cameron 1982, Hannan and Freeman 1984, Singh et al. 1986). These sorts of debates have sometimes been interpreted as reflecting a fundamental opposition between the ideas of ecology and strategy.

The present paper is based on the premise that there need not be a fundamental opposition of ecological and strategic perspectives, and that a fruitful integration of these ideas is possible in some ways. To do so, the paper uses the variation-selection-retention framework of cultural evolutionary theory (Campbell 1969, Aldrich 1979, Weick 1979) which has previously been applied to strategy-making by western (Burgelman 1983a) as well as Japanese (Kagono et al. 1985) scholars. The paper extends earlier work by addressing research questions motivated by the evolutionary perspective. Some of these concern strategy content and process: How does the content of an organization's strategy come about and how does it evolve? How do strategy-making processes take shape over time? Of particular interest for this paper are questions concerning some of the connections between strategy-making processes and different forms of organizational change and adaptation: what, if any, is the link between strategy making and inertia? Which sorts of strategy-making processes lead

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to major strategic change that is survival-enhancing? The paper uses field research at Intel Corporation, a leading semiconductor company, to explore these questions.

The purposes of the paper are twofold. First, the paper proposes the usefulness of an *intraorganizational* ecological perspective on strategy making. An organization is viewed as an ecology of strategic initiatives which emerge in patterned ways, and compete for limited organizational resources so as to increase their relative importance within the organization. Strategy results, in part, from selection and retention operating on internal variation associated with strategic initiatives. Variation in strategic initiatives comes about, in part, as the result of individual strategists seeking expression of their special skills and career advancement through the pursuit of different types of strategic initiatives. Selection works through administrative and cultural mechanisms regulating the allocation of attention and resources to different areas of strategic initiative. Retention takes the form of organizational-level learning and distinctive competence, embodied in various ways–organizational goal definition, domain delineation, and shared views of organizational character. In this perspective, strategic initiatives rather than individuals are the unit of analysis (Cohen and Machalek 1988).

Second, the paper proposes patterned links between the intraorganizational ecological processes and different forms of adaptation that have previously been identified in the literature. More specifically, the paper suggests how opposing ideas concerning expected consequences of major strategic change (Hannan and Freeman 1984, Tushman and Romanelli 1985) can possibly be reconciled. This, in turn, suggests directions for further research.

The next section of the paper discusses a field study carried out at Intel Corporation. The following two sections examine, first, strategic content and process from an evolutionary perspective and, second, relationships between strategy-making processes and modes of organizational adaptation. Throughout these sections, references to and vignettes from the Intel study are provided. The discussion section presents conclusions from the research and several propositions derived from it. The final section presents implications for theory and further research.

A Field Study of INTEL Corporation

To explore the research questions motivated by the evolutionary perspective, a field study of the evolution of Intel Corporation's corporate strategy was carried out. Intel is a leading semiconductor company which has survived for more than 20 years as an independent company in an extremely dynamic industry. The firm grew from one million dollars of sales in 1968 to almost three billion in 1989. Profits rose from a loss of two million dollars in 1969 to $453 million in 1988.

After initial interviews with CEO Andrew S. Grove and his assistant, Dennis Carter, it was decided to focus the first stage of the research on Intel's decision, in 1985, to exit from the Dynamic Random Access Memory (DRAM) business. The second stage of the research focused on the period since 1985 and Intel's current strategy. The study, encompassing archival data collection as well as interviews, was carried out during the period August 1988–October 1989. Company documents describing Intel's history, industry publications and other written materials were analyzed. Some 20 key Intel managers were interviewed, many of them repeatedly. Some top managers who had previously left the company were included as well. The research is embodied in two case studies (Cogan and Burgelman 1989a, b).

The research began with a broad examination of how Intel's strategy as a "memory company" had taken shape in the early years and then focused on the decision to exit DRAM's. In 1985, Intel was faced with a large cyclical downturn in the semiconduc-

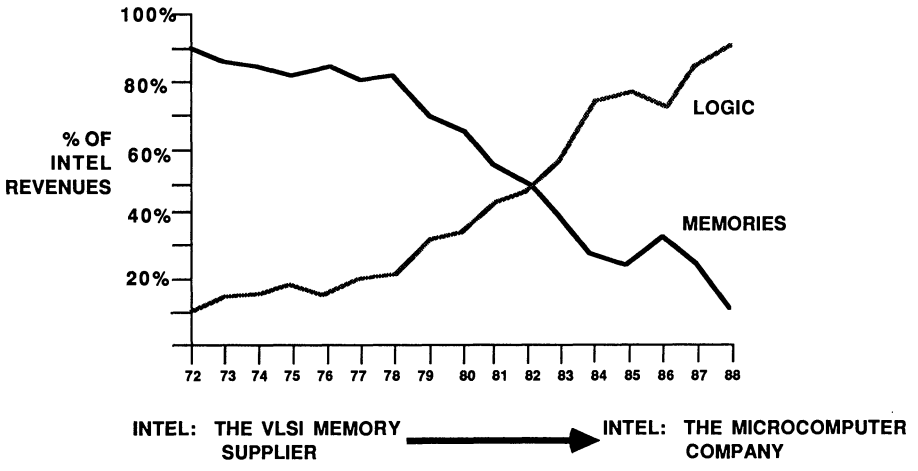

FIGURE 1. Intel's Evolution from Memory Company to Microcomputer Company
Source: *Intel Corporation*.

tor industry, and fierce Japanese price competition in DRAM's. The firm expected a loss of more than 100 million dollars in 1986, yet needed to invest several hundred million dollars in new plant and equipment if it wanted to be competitive for the next generation of DRAM's. Top management decided that exit from DRAM's was the best alternative for Intel. Managers from different levels and different functional and business groups who had been involved in and/or affected by the decision were asked to discuss the causes of Intel's exit and the aftermath of the decision. Looking at numerical archival data, it was a surprise to find that DRAM's had been a relatively small part of Intel's business for several years before the decision to exit was actually made.

Intel's market share in DRAM's was only 3.4%, ranking ninth in the industry, in 1985. Yet, there was a pervasive feeling among the interviewees that getting out of DRAM's had been perhaps the most momentous decision in Intel's history. The research then sought to understand Intel's evolution from a "memory" company in 1968 to a "microcomputer" company in 1985. This evolution is illustrated in Figure 1.

The second stage of the research focused on events since 1985, covering several key strategic areas, including the development of Intel's major Complex Instruction Set Computing (CISC) microprocessor business (the x86 product family); the evolution of the strategic importance of the Erasable Programmable Read Only Memory (EPROM) business; Intel's experience with the Application Specific Integrated Circuits (ASICS) business; the emergence and spinoff of the Electrically Erasable Programmable Read Only Memory (EEPROM) venture; the growing importance of the Systems business; the emergence of Reduced Instruction Set Computing (RISC) processors as part of Intel's strategy; and questions regarding the potential strategic importance of a new form of memory called "FLASH." While most of the research was retrospective, the research period was long enough to observe some strategic decisions in real time, especially the decision to adopt RISC as part of Intel's corporate strategy, and the current uncertainty about FLASH memories.

The field study was guided by an evolutionary framework, derived from earlier research (Burgelman 1983a), which posits the existence of induced and autonomous processes in strategy making. The induced process concerns initiatives that are within the scope of the organization's current strategy and build on existing organizational learning; the autonomous process concerns initiatives that emerge outside of it and provide the potential for new organizational learning. These processes are considered

important determinants of the evolution of the organization's strategy. The field data serve to test, to some extent, the validity of this framework. Campbell (1975) discusses several conditions for making a single case study useful as a probe for theory, two of which can be addressed in relation to the Intel study: (1) keeping track of confirming and disconfirming observations, (2) choosing the theory without knowledge of the confirmatory value of the case study. First, while initially not intended to serve as a test of an evolutionary theory of strategy making, the study does offer confirmatory support for the existence of the strategic processes proposed in the framework. Disconfirming observations were not systematically sought out, but some unexpected findings are presented that suggest the need for some amendment of the theory. Second, the availability of Intel as a research site was a fortuitous event and the researchers did not know whether the Intel case study would show support for the evolutionary framework or not. They were not familiar with the strategic management approaches of Intel. Also, many of the open-ended interviews were done by the research assistant who was not involved in developing the conceptual framework. This limited somewhat the potential for confirmatory bias in the data collection. The research assistant wrote up detailed interview transcriptions which were analyzed together with data collected by the author.

While offering support for the existence of the proposed strategy-making processes, the research also offers the opportunity to refine and deepen some of the ideas underlying the initial conceptual framework. The paper reflects iterations between theory and data, using the data to identify some new aspects of an evolutionary perspective on strategy-making processes. In the context of grounded theorizing (Glaser and Strauss 1967), the paper intends to move from theory building based on research in substantive areas, such as internal corporate venturing (Burgelman 1983b), to a more general theory of strategy-making processes in organizations. The theory concerns corporate strategy rather than business strategy, and substantive strategy-making rather than corporate restructuring (Snow and Hambrick 1980).

The research has several limitations. It concerns a single high-tech organization still run by some of its founders. The firm has grown up in a cyclical but very expansive industry. And it is a successful organization. Clearly it would be useful to study a larger sample also including failing organizations. On the other hand, by concentrating on one organization with 20 years of continuity in leadership, the research could access sources with intimate knowledge of the details of the firm's evolution and could examine in depth how the organization had dealt with partial failure—and the threat of complete failure—at a critical point in its history. Also, the semiconductor industry has previously been studied by organizational ecologists (e.g., Brittain and Freeman 1980, Boeker 1989), but no in-depth study of the strategy making of semiconductor firms is currently available.

Intraorganizational Ecology of Strategy Making

Research on strategy-making processes can be classified in terms of two primary foci (Snow and Hambrick 1980). Some scholars, focusing on strategic change, have documented major epochs (Mintzberg 1978, Mintzberg and Waters 1982), periods of quantum change (Miller and Friesen 1984), and reorientations (Tushman and Romanelli 1985) in strategy making. Others have documented the *ongoing* process of strategy making in organizations (e.g., Quinn 1982). The evolutionary framework encompassing induced and autonomous strategic processes builds on both streams of work. This section discusses the induced and autonomous processes in terms of variation-selection-retention mechanisms, and uses them to elucidate strategy-making at Intel.

Induced Strategic Process

Retention. Consider a newly-founded and successful organization like Intel in the late sixties. Whether initial success is the result of competence or luck, top management's role is to articulate an organizational strategy that will help secure continued survival. Such a strategy is likely to be based, at least in part, on retrospective sense making and attempts to capture top management's learning about the basis for the organization's success. The strategy is embodied in the managers who rose to (or stayed at) the top while pursuing a particular set of strategic initiatives. It is also embodied in oral and written statements regarding the technical/economic as well as cultural factors—such as key values and company traditions—perceived to be associated with past success (Pettigrew 1979, Beyer 1981, Haggerty 1981, Donaldson and Lorsch 1983, March 1981b, Pfeffer 1981, Weick 1987). Organizational strategy, conceived in this fashion, identifies the distinctive competences of the organization, defines its goals, delineates its action domain, and defines its character (Selznick 1957, Andrews 1971, McKelvey and Aldrich 1983). The organizational strategy may be expressed in substantive rules and prescriptions, referring to the technical/economic and cultural factors (March 1981a, Nelson and Winter 1982) which guide organizational-level strategic action and induce strategic initiatives in line with it at lower levels. Through the application of these rules and prescriptions, strategic decisions are joined over time (Freeman and Boeker 1984), distinct patterns of organizational-level strategy are realized (Miles and Snow 1978, Mintzberg 1978, Miller and Friesen 1984), and the organization's character is maintained (Selznick 1957).

The Intel study illustrates this evolutionary perspective on organizational strategy. Les Vadasz, a top-level manager, described how Intel's strategy making had evolved:

> Intel was a successful start-up in the late 60's, and one of the first things I did (when asked to think about strategic planning) was to try to understand what led to Intel's success. The reasons for success were embedded in the combined talents of the group that was in charge. We had a "sense" about the technology and the business which led to a series of correct decisions.

Having a "sense" about the technology meant that Intel's top management understood that silicon rather than metal was the key material for memories and that process technology was the driver of the memory business. In fact, it was manufacturing prowess that made it possible for Intel to succeed with DRAM's where other memory start-ups (such as Advanced Memory Systems) had previously failed. Andy Grove, in charge of engineering and manufacturing in the early days, and other team members solved the technical problems with silicon based memories, and were able to get Intel's production yields to surpass the threshold for viability in the market against core memories. Once the fundamental manufacturing problems had been solved, Intel's technological efforts focused on how to get more transistors on the same amount of silicon real estate. The ability to make smaller and denser devices was the result of Intel's research and was kept proprietary. Top management also believed that initial success was associated with using small business teams, which affected the way Intel tried to implement its strategy as it grew larger. While Intel's success with silicon-based memories set the stage for a fundamental transformation of the computer industry, such transformation was not the founders' purpose: they simply saw the entrepreneurial opportunity of offering replacement parts for mainframe computer memories (Gilder 1989).

Of course, an organizational strategy largely based on retrospective rationality does not preclude prospectively rational efforts on the part of top management. One upper-level manager at Intel expressed this as follows: "Grove has been preaching: 'Make the tough decisions! Don't do something tomorrow because you did it today'."

However, as will be seen later on, Grove himself experienced how difficult it was to actually do this.

Selection. Research suggests that the awareness of a firm's strategy is likely to be concentrated at the top level of the organization (Hambrick 1981), and that there may be less than full agreement on what the firm's distinctive competences are (Stevenson 1976, Snow and Hrebiniak 1980). Also, as an organization grows, strategy making becomes increasingly differentiated over multiple levels of management (Williamson 1970) and the strategy can no longer be directly communicated in substantive detail to all levels of management. Participants differentially situated in the organization are likely to perceive different strategies as having the best potential for their own and the organization's advancement. This provides an important source of internal variation, as individuals who possess data, ideas, motivation, and resources all strive to undertake specialized initiatives. But unless an organization is able to establish internal selection mechanisms to maintain a level of coherence, it seems likely that the strategy eventually will become unrealized (Mintzberg 1978). Top management is expected, therefore, to establish a structural context encompassing administrative (Bower 1970) and cultural (Ouchi 1980) mechanisms. Administrative mechanisms include, among others, strategic planning and control systems, approaches to measuring and rewarding managers, and rules governing resource allocation. Cultural mechanisms include, among others, socialization rituals and behavioral norms (do's and don'ts). Different forms of structural context provide more or less tight coupling between the organizational strategy and strategic initiatives of managers at various levels (e.g., Chandler 1962, Mintzberg 1979, Rumelt 1974, Williamson 1970, Haspeslagh 1983).

The Intel data support the importance of having the induced process driven by top management strategic intent, and also offer insight in the consequences of losing the coupling between strategic initiatives of middle managers and strategic intent. Commenting on the evolution of Intel's Strategic Long Range Planning (SLRP) process, Les Vadasz described the efforts to establish an induced process:

> As the company grew, we tried to replicate the environment that had led to making "correct" decisions by forming relatively small business units and creating a bottoms up strategic planning system. However, that became very unwieldy. The notion of pushing decisions down may have been a good one, but the task-relevant maturity was not great enough. Managers started gaming with the system. One key symptom was that new ideas were often coopted by groups and molded to fit immediate needs rather than developed as originally intended. The system is now more top down. A high-level group sets the corporate strategy, and business units operate within that locus. Business units must focus on a few things and do them right. Neither the old nor the new system is perfect... Some managers complain that their "sandbox" is too well defined.

CEO Grove elaborated on the problems of letting middle level managers drive the induced process in the face of unclear top management strategic intent:

> The SLRP process turned into an embarrassment. Top management didn't really have the guts to call the shots, so we were trying to get middle management to come up with strategies and then taking pot shots at them. It wasn't clear whether middle management had either positional *or* informational power.
>
> In addition to being unpleasant, the system resulted in unrealistically high projections. One year, someone had the idea to put all the previous SLRP forecasts for unit sales on one chart along with the actual growth for the same period. The result was a series of "hockey sticks" which demonstrated the ineffectiveness of the process.

The data also confirm that rules concerning resource allocation are a potent part of structural context (Bower 1970). Intel was the first company able to manufacture and market DRAM's successfully and viewed itself as the "memory company." As one manager put it, "In a way, DRAM's created Intel." However, as new business opportunities in EPROM's and microprocessors were pursued, and competed for resources, DRAM's began to lose out. As a result of adopting a resource allocation rule that shifted resources systematically to products that maximized margin-per-manufacturing activity, DRAM's found it very difficult to continue to obtain capital investment in competition with other products. In fact, the VP of Finance at Intel insisted, at one point, that the DRAM manager sign a symbolic check equal to the margin foregone when high-margin products were bumped by DRAM's. So even though most managers at Intel continued to believe the mythology (the "self-evident truth" as CEO Andrew Grove put it) of Intel as a memory company, the effect of these capital investment decisions was that Intel became a microprocessor company during the early 80's. The mythology was kept alive, in part, because important amounts of resources continued to flow to DRAM R & D (estimated at one third of the total of about $195 million in 1985).

The data suggest that Intel's internal selection processes were consistent with the selection pressures in the external environment. Resources were allocated to the more profitable businesses rather than to DRAM's, even though a major change in organizational-level strategy had not yet been explicitly made. Given the relative size of the capital investments involved (hundreds of millions of dollars), this was extremely important. Eventually, of course, the discrepancy between internal selection and organizational strategy needed to be resolved.

The finding of a significant discrepancy between the internal selection mechanisms and the organizational strategy suggests that the induced strategic process may be driven more by the structural context than by the strategy (Bower 1970): managers may respond more to incentives than to directions. In addition, this finding suggests that the induced process can continue to be effective if the internal selection mechanisms reflect the selective pressures of the environment, even while becoming decoupled from the espoused organizational strategy. In this situation, positive performance provides a time cushion for bringing organizational strategy in line with structural context. One expects that the opposite would not hold. That is, internal selection mechanisms coupled strongly to the organizational strategy but not reflecting the selective pressures of the environment are not likely to be associated with effectiveness of the induced process. The importance of internal selection being linked directly to environmental pressures as well as to organizational strategy provides a refinement of earlier theory concerning strategy and structure.

Variation. The induced strategic process is intended to preserve the coupling of strategic initiatives at operational levels with the organization's strategy through shaping managers' perceptions about which types of initiatives are likely to be supported by the organization. As a consequence, the induced process may have a variation-reduction effect on the set of strategic initiatives that it spawns. In the Intel case, Chairman Gordon Moore addressed this issue in relation to Intel's strategy in 1989:

> We can do variations on present businesses very well, but doing something new is more difficult. Today, the likelihood of someone killing an effort like the one of Dov Frohman (inventor of the EPROM) is very high, because you need a well-defined application to a market from the outset. This is especially so because we are not looking for additional opportunities. There is still a lot of evolution left in the current technology. If you consider the possibilities with reducing line-width, you can see another twelve years of evolution along the same curve.

Gordon Moore's observations also seem to imply that the induced process depends on the growth opportunities remaining in the current domain. To the extent that these growth opportunities are perceived to be high, it is expected that top management will favor initiatives that fit with the current strategy.

Of course, this does not imply that there is no planned variation in the induced process. Clearly, there is room for core technology advances, new product development for existing product families, new approaches to marketing and manufacturing, and so on. Hundreds of examples of such planned variations could be documented at Intel. And these variations are not always small, since new equipment, for instance, may require very large investments. Later in this paper, the adaptive implications of the variation-reduction tendency of the induced process will be further examined.

Autonomous Strategic Process

Variation. Studies of public organizations (e.g., Daft and Becker 1978, Lewis 1980) and private organizations (e.g., Shepard 1967, Kidder 1981, Kanter 1982, Burgelman 1983b, Mintzberg and McHugh 1985) suggest that, at any given time, some individuals or small groups are likely to try to get their organization to engage in activities that are outside of the scope of its current strategy. As the Intel examples provided below may illustrate, such autonomous initiatives are often significantly different from induced ones in terms of technology employed, customer functions served, and/or customer groups targeted. They often derive from new combinations of individual and organizational skills and capabilities (Penrose 1968, Teece 1982) that are not currently recognized as distinctive or centrally important to the firm. While autonomous initiatives are probably quite often triggered by ideas or events external to the organization, they involve more than imitation in order to be of evolutionary importance for the organization's strategy. Imitation usually does not lead to sustainable competitive advantage. Autonomous initiatives are important for the firm's evolution to the extent that they involve the creation of new competences that may combine in unique ways with the resources and competences already available to the organization. While autonomous initiatives often emerge fortuitously and are difficult to predict, they are usually not random because they are rooted in and constrained by the evolving competence set of the organization (McKelvey and Aldrich 1983).

Autonomous initiatives can originate at all levels of management. But they are most likely to emerge at a level where managers are directly in contact with new technological developments and changes in market conditions, and have some budgetary discretion. As the organization grows, they are increasingly likely to emerge at levels below top management, even in the case of a company like Intel where senior executives have strong technical backgrounds.

The Intel study shows that, in spite of Gordon Moore's concerns, the autonomous strategic process is not easily suppressed. This is illustrated by a recent example of how Intel got into the RISC processor business with its i860 processor.[1]

The i860 Story. The story of Intel's entrance into the RISC (Reduced Instruction Set Computing) processor business details the emergence of a new product family which may ultimately challenge Intel's core microprocessor strategy. It illustrates the ability of an astute technologist, Les Kohn, to test the boundaries of the currently articulated corporate strategy and to modify them. Intel's deliberate corporate strategy was *not* to enter the RISC business, but rather to focus on the extremely successful x86 architecture. Kohn had been attempting to get Intel into the RISC processor business since he joined the company in 1982. As he puts it: "RISC was not an existing business and people were not convinced a market was there." In fact, the strength of the organization's aversion to RISC architectures was demonstrated by the corporate argot, YARP, for "Yet Another RISC Processor." While talking in understated terms about his approach, it seemed clear that Kohn had a deliberate strategy which could be viewed as surreptitious from the

[1] i860 is a trademark of the Intel Corporation.

perspective of corporate strategy. He mentioned that there was some realization at levels below top management that "Intel needed to broaden beyond the 386[2] market, but there was no agreement on what to do and how to do it." He also intimated that "There were various contenders at different points." From a technical point of view, Kohn believed that RISC architecture had intrinsic advantages over CISC architecture. However, he had learned from several more straightforward attempts at the product approval process that an approach which supported rather than challenged the status quo would be more likely successful. Also, the investment needed was too large to do the development "under the table." His solution was to disguise his product. Andrew Grove, Intel's CEO, mentioned that Kohn sold the design to top management as a co-processor, rather than a stand-alone processor. Kohn confirmed that "We designed it as a stand-alone processor, but made it very useful as an accessory to the i486[3]." By the time top management realized what their "co-processor" was, Kohn, with the help of two other champions, had already lined up a customer base for the stand-alone processor, a base he suggested was different than the companies who purchase the 486 chips: in Kohn's own words, "a lot of customers who before did not even talk to Intel." Thus Kohn could argue that he was broadening Intel's business rather than cannibalizing it. During 1989 Intel's top management decided to amend the corporate strategy to incorporate the RISC chip business.

Another example, still in a much earlier stage, concerns a new type of memory, called "FLASH." A middle level manager who is currently championing FLASH memories at Intel emphasized that FLASH might ultimately provide a replacement for the microprocessor business. Asked to describe life as a champion at Intel, this manager said:

> You have to be naive, but mature enough to realize that the process takes a long time. You have to be sensitive to political toes. You have to be a religious zealot, but not too religious because then you lose your credibility. Finally, you have to succeed . . . . It is most difficult to champion a product that threatens the company's [current] business.

Selection. At the time it emerges, the importance of an autonomous strategic initiative in relation to the firm's current strategy remains more or less indeterminate. To resolve the indeterminacy, the strategic context for the new initiative must become clear to, and accepted by, top management. Strategic context determination processes (Burgelman 1983b, Haspeslagh 1983) allow autonomous initiatives to be internally evaluated and selected outside the regular structural context, usually through the interactions of various types of "champions" and top management, and may lead to a change in the organization's strategy. Such amendments, in turn, integrate the new business activities with the induced strategic process.

Strategic context determination processes may be among the more elusive, volatile, and precarious decision processes in organizations. They deal with highly equivocal inputs and are therefore expected to involve relatively few rules but many interlocked cycles for their assembly (Daft and Weick 1984, Weick 1979). That is, they require much iterative, substantive interaction between managers from different levels in the organization. In contrast to the structural context, which selects initiatives that are consistent with an ex ante vision, strategic context determination processes select initiatives for which the vision becomes articulated ex post (Burgelman 1983c). They require that viability be established, in both the internal and external environments, at each intermediate stage of their development. As the process unfolds, and more information becomes available, top management is able to evaluate the adaptive potential of the new activities for the organization. From an evolutionary point of view, only after it has become reasonably certain that an autonomous initiative is viable can it legitimately become part of the organizational strategy. In a study of the autonomous strategic process in the area of marketing strategy, Hutt, Reingen, and Ronchetto (1988) operationalize the process in terms of network analysis, communi-

[2]386 is a trademark of the Intel Corporation.
[3]i486 is a trademark of the Intel Corporation.

cation patterns, and coalition building. They conclude: "If the efforts of the product and organizational champions are successful, the autonomous strategic initiative blends into the firm's formal planning routine and concept of strategy." (1988, p. 16)

Commenting on how the strategic context for a potential new business gets defined at Intel, Les Vadasz, who had been responsible for Intel's internal corporate venturing efforts, mentioned that these efforts require alternative avenues for obtaining resources so that the new business has a chance to demonstrate its viability. This is illustrated with Intel's add-on-boards venture.

> *The Add-On Boards Story*. Some middle-level managers had the idea to develop add-on boards for personal computers. The strategic planning process initially rejected the idea since channels of distribution were too different. The idea, however, was able to get support through Intel's internal corporate venturing program and became a separate business. After success of the business became evident, the venture was folded back into Intel's Systems business.

In similar vein, the general manager of the components development group said he keeps the process fluid by "carving out a certain amount of resources for unplanned things. Usually you need no more than a million dollars to get something going." These examples suggest that the availability of "unabsorbed slack" (e.g., Singh 1986) may be an important factor affecting the rate at which autonomous strategic behavior can be supported within the organization.

Retention. Both EPROM's and microprocessors were the result of unplanned initiatives that were outside of the scope of the strategy of the early 70's. These initiatives had been able to obtain resources because top management recognized *some* of their potential *after* they had come into existence. Obtaining resources allowed the new initiatives to demonstrate their viability in the environment. The evolutionary success of microprocessors and the accompanying shift in relative importance in Intel's action domain from memory (low design content) to microprocessor (high design content) had important consequences for the evolution of Intel's distinctive competences. As differences in process technology levelled among competitors in the industry, distinctive competence in circuit design increasingly became the new basis for Intel's competitive advantage. And, as customers had to be taught what the powerful microprocessors could do for them, it also lead Intel to develop new distinctive marketing capabilities (Davidow 1986).

The RISC story, presented earlier, is important because it shows how the autonomous strategic process allows the organization to become more clearly aware of, and prepare itself to cope with, environmental variations that have already come into play and might potentially threaten its competitive position. RISC had been invented at IBM but had remained dormant until it found a major application in work stations. Craig Barrett, a top-level manager, pointed out that RISC is still viewed as relatively less important than CISC in Intel's strategy, but that its availability makes it possible for Intel to be a strong competitor in what may become an important new market:

> Intel's bread and butter is in the x86 product family. There is a 586[4] on the drawing board and a 686 planned to follow that. If there was ever any question of which comes first, it could be answered quickly. But if there are enough people out there who want to buy YARP's, then we call the i860 a YARP killer. It is the highest performance RISC processor on the market.

Kohn's autonomous efforts now make it possible for Intel to be prepared in case RISC would ever pose a threat to CISC.

Autonomous initiatives provide the organization with an internal window on future, potentially major environmental variations in markets and technologies, and with

[4]586 and 686 are trademarks of the Intel Corporation.

strategic options. This may perhaps be the case with FLASH memories. While the implications of FLASH may eventually be less revolutionary than its champion predicts, and the strategic context for FLASH so far remains unclear at Intel, this champion's efforts offer Intel top management the opportunity to anticipate and evaluate a potential environmental variation.

Sometimes, the strategic context for a new business cannot be successfully defined, and the business dies out or spins off. The Intel data reveal that, in some instances, a failed attempt to define the strategic context for an initiative outside the scope of the current strategy may nevertheless lead to a sharper articulation of the firm's strategy. An example (in this case resulting from imitation) is provided with the Application Specific Integrated Circuit (ASIC) venture. Intel had been late moving into ASIC's. Tens of millions of dollars were invested for a fast ramp up, and a separate division was established. However, top management soon realized that ASIC was simply a delivery vehicle for circuit designs. As one middle level manager observed, "In ASIC the customer added all the value. So we realized that we should add the value ourselves." The separate division was eventually folded back into Intel's mainstream as the corporate focus on design as a competitive advantage was adopted by the entire organization. Later on, Intel disengaged from ASIC's in fact because its core design skills were different.

Managing the autonomous strategic process seems difficult. The history of areas such as Silicon Valley indicates that autonomous strategic initiatives in established firms often result in the creation of new firms, rather than in new businesses for the firms where they originated. Many internal entrepreneurs seem to have left reluctantly because of lack of organizational support. In the Intel case, one example, among others, concerns a group involved in EEPROM's, who left after a majority of top management determined that EEPROM's were too small and specialized. The group formed a venture called Xicor. On the other hand, autonomous initiatives can have a dissipating effect on the spawning organization's resources and/or distinctive competence. Resources can be spread thin if too many autonomous initiatives are supported, perhaps at the expense of the mainstream businesses. Distinctive competences can be diluted or lost if an autonomous initiative is not internally supported and important talent decides to leave the firm, with or without the help of venture capital. (It is interesting to note that Intel significantly increased its legal staff during the '80s in order to better be able to protect its intellectual property.) Yet, sometimes it seems quite clear, in retrospect, that an established company lost out severely because it failed to capitalize on autonomous initiatives (this is well illustrated, for instance, in the case of Bendix Corporation and electronic fuel injection (Porter 1981)). Later in this paper, the adaptive implications of the variation-increasing tendency of the autonomous strategic process will be further discussed.

Rationality of Strategy Making as Internal Selection

From the perspective of the organization, the rationality of the induced strategic process seems clear. In this process, intentional strategy may serve the organization to leverage—do as much as possible with—its currently available learning, to fully exploit the opportunities associated with the current action domain. From the perspective of individual managers, operating in the induced process would seem attractive. This is so because the organizational learning, guiding participants operating in the induced process, is likely to have been achieved at significant organizational and individual costs (Langton 1984). For instance, top managers may remember former colleagues who tried to do different things and suffered high costs in terms of their career progress, or they may recall instances where the organization tried something different, say an unrelated diversification move, and it ended up being very costly. Participants at lower levels can be expected to be aware of this and therefore

motivated to pursue initiatives in line with the current strategy. Induced initiatives allow managers to propose projects that take advantage of the available organizational learning, rather than to incur the potentially high costs of new individually-driven learning associated with pursuing projects through the autonomous process. The induced process is part of the organization's regular opportunity structures for career advancement.

But why then are some managers willing to engage in autonomous strategic behavior? March (1988) observes that their motivation may be rooted in (a) an "obligatory logic" or (b) a "consequential logic." Managers operating within an obligatory logic engage in autonomous initiatives because it is congruent with their self-image. Managers operating within a consequential logic may feel that they have capabilities and skills that make autonomous initiatives no riskier than induced ones, or because they want to emulate colleagues who have received unusually high internal rewards for successfully pursuing a highly risky autonomous initiative, or they pursue it because they expect to receive venture capital support if no internal support is forthcoming. From the viewpoint of consequential logic, managers may see the autonomous process as an alternative opportunity structure for career progress if they consider that their access to the opportunity structure as defined by the induced process is limited, e.g., because of previous "bad luck" with performance outcomes, poor prospects of available opportunities in the induced process, or because other strategists have already preempted access to the induced process.

The organization may, within resource constraints, rationally tolerate autonomous strategic initiatives because it offers, as the Intel data suggest, opportunities to explore and extend the boundaries of its capabilities set, to engage new environmental niches in which environmental forces such as competition or institutional pressures (e.g., DiMaggio and Powell 1983) are as yet not as strong (Astley 1985, Burgelman 1983c, Itami 1983), to help the organization enter new niches that have already been opened up by others and which might eventually pose a threat to the current strategy, or to learn about future potential variations in markets and technologies. In the autonomous strategic process, myopically purposeful (McKelvey 1982) initiatives by individuals may help the organization find out what its intentions could be. The possibilities for participants to engage in opportunistic behavior (Bower 1970, Williamson 1970, Rumelt 1987, Cohen and Machalek 1988), however, underscore the importance of the structural and strategic contexts.

Structural and strategic contexts, together, constitute internal selection processes operating on strategic initiatives. The effectiveness of internal selection processes may depend on how closely they correspond to the selection pressures exerted by the current external environment, while simultaneously allowing new environments to be sought out. As seen earlier, at Intel there seemed to exist a close correspondence between key parts of the structural context and the current external environment: resource allocation in the induced process favored business activities that were able to get high returns in the current external environment. At the same time, Intel kept open the possibility to activate processes of strategic context determination through which new, unplanned business activities got a chance to obtain resources to demonstrate their viability.

Strategy Making and Organizational Adaptation

The view of strategy making as an intraorganizational ecological process yields a new theoretical question: how important are internal selection processes for explaining continued organizational survival? This question can be addressed by linking the induced and autonomous processes to different forms of adaptation identified previously in the literature: (1) relative inertia (Hannan and Freeman 1984), (2) adjustment

(Snow and Hambrick 1980), (3) reorientation (Tushman and Romanelli 1985), and a new form proposed here: (4) strategic renewal.

The Adaptation Paradox Revisited

Relative Inertia. Overcoming the liabilities of newness (Stinchcombe 1965) requires organizations to develop a capacity for reliability and accountability in their transactions with the environment (Hannan and Freeman 1984) and to structure themselves so as to be considered legitimate (e.g., DiMaggio and Powell 1983). But doing so may create structural inertia (Hannan and Freeman 1984). Paradoxically, adaptation to existing environmental demands may reduce the organization's capacity to adapt to future changes in the environment or to seek out new environments.

The existence of an induced strategic process seems to be consistent with *relative inertia* arguments. Relative inertia means that the rate of strategic change that the organization can implement will, in the long run, be lower than the rate of change in the environment (Hannan and Freeman 1984). Some ecological research has shown that the inertial consequences of environmental selection are likely to affect the core features of an organization (Scott 1981, Hannan and Freeman 1984, Singh et al. 1986). While the difference between core and peripheral features of organizations has not been definitively established, it seems reasonable to view a firm's strategy as a core feature. Because the strategy is rooted in organizational experience and learning, top managers are likely to be reluctant to make frequent changes in it. As noted earlier, research (e.g., Mintzberg and Waters 1982, Miller and Friesen 1984, Tushman and Romanelli 1985) suggests that an organization's strategy tends to remain in place for extended periods of time. So it seems plausible in many instances to expect the evolution of the strategy to be inert relative to the accumulation of changes in the environment (Snow and Hambrick 1980).

The Intel case provides further insight in this. The articulation of corporate strategy in terms of microprocessor leadership versus memory leadership came almost five years after the company had stopped being a major player in DRAM's. Reflecting on how difficult it had been to get top management to come to grips with this change, Andrew Grove observed:

> Don't ask managers, "What is your strategy?" Look at what they do! Because people will pretend.... The fact is that we had become a non-factor in DRAM's, with 2-3% market share. The DRAM business just passed us by! Yet, in 1985, many people were still holding to the "self-evident truth" that Intel was a memory company. One of the toughest challenges is to make people see that these self-evident truths are no longer true.

Intel's top management took a long time to finalize a decision that had been in the making since the early 80's. Several managers pointed out in the interviews that the decision could and should have been made sooner. The delay was, in part, caused by the fact that some managers sensed that the existing organizational strategy was no longer adequate and that there were competing views about what the new organizational strategy should be. There was still an important group of managers who believed that DRAM's were critically important to Intel. Some of the top technologists saw DRAM's as the technology driver of the corporation. This group was convinced that DRAM's, being the largest volume product, were key to Intel's learning curve. Some of the top sales people also saw the need for offering a complete product line to the customer. Top management as a group, it seems, was watching how the organization sorted out the conflicting views. CEO Grove observed:

> By mid '84, some middle level managers had made the decision to adopt a new process technology which inherently favored logic (microprocessor) rather than the memory advances, thereby limiting

the decision space within which top management could operate. The faction representing the x86 microprocessor business won the debate even though the 386 had not yet become the big revenue generator that it eventually would become.

While clearly demonstrating a degree of relative inertia, Intel's exit decision was not too late. Intel lost a lot of money in DRAM's, but the hemorrhaging was stopped before its viability became threatened. In fact, Intel lost less money than its competitors, including the Japanese. So, why was Intel's relative inertia as low as it was? The data suggest that this was not due, in first instance, to a prescient or exceptionally agile top management, but to the way in which the internal selection processes were allowed to work themselves out.

An atmosphere in which strategic ideas can be freely championed and fully contested by anyone with relevant information or insight may be a key factor in developing internal selection processes that maximize the probability of generating viable organizational strategies. Such processes generate strategic change that is neither too slow nor too fast (Hambrick and D'Aveni 1988, Levitt and March 1988). They take time to develop and have a large tacit component. That is, it is difficult to provide a full explanation of how they actually work. The role of founders, such as Bob Noyce, Gordon Moore and Andy Grove at Intel, seems important in setting the initial tone and maintaining continuity. The data suggest that the influence of top management in strategy making at Intel was undeniably very strong, but that there was also a perception on the part of most managers that, most of the time, knowledge and facts tend to win over positional power at Intel. The possibility for a young engineer like Les Kohn to directly interact with the CEO on substantive technical issues and to be able to prevail on the merits of the argument is a vivid illustration of that. It is also illustrated in CEO Grove's view on his role in decisions to continue to support or not a business activity:

You need to be able to be ambiguous in some circumstances. You dance around it a bit, until a wider and wider group in the company becomes clear about it. That's why continued argument is important. Intel is a very open system. No one is ever told to shut up, but you are asked to come up with better arguments. People are allowed to be persistent.

Once the decision to exit DRAM's was made, top management showed strong intent to implement it. In the face of some lingering opposition, Grove himself took charge and made several organizational and personnel changes. Perhaps most important, from a symbolic point of view, he visited several groups affected by the decision and addressed them with the phrase, "Welcome to the Mainstream Intel," that is, Intel the microprocessor company, thereby ratifying the results of the internal selection processes that had been going on for several years. Top management also reassigned the highly regarded memory R & D group to microprocessors, thereby protecting the firm's distinctive technical competences.

Adjustment. Inherent tendencies toward relative inertia in organizational strategy do not preclude adjustments (Snow and Hambrick 1980) in the strategy. Such adjustments leave the overall strategy in place and operate on more peripheral features. Recent ecological research suggests that some types of peripheral changes may enhance an organization's life chances (Singh et al. 1986). Adjustments are to a large extent deliberate, reflecting strategic choice and managerial discretion (Hambrick and Finkelstein 1987), and are instances of nonrandom adaptation.

The Intel study offers several examples of deliberate adjustments that were made to try to stay viable in the DRAM business. Some of these involved efforts to differentiate Intel's DRAM offering from the commodity business; others involved

efforts to reduce cost and design time. One move involved the introduction of the first 5-volt 16K DRAM in 1980 (differentiation). Another move involved introducing "redundancy" in the 64K DRAM design in order to increase yields (cost reduction). Still another move was to "go CMOS" for the 64K and 256K (differentiation). A final move involved focusing on "thin dielectrics" for the 1 Meg DRAM in order to reduce the minimum feature size to one micron instead of changing the entire cell design (cost reduction). None of these moves, however, was sufficient to make DRAM's viable again as a business for Intel. Eventually, as was noted earlier, the decision to exit became unavoidable.

Relative inertia and adjustment both seem possible outcomes of the induced strategic process. Relative inertia does not preclude adjustment, and adjustments may temporarily result in improved performance. In the long run, however, cumulative environmental selection pressures are expected to overwhelm adjustments effected through the induced strategic process, and it seems likely that the strategy itself will eventually have to change in major ways.

Theory (Hannan and Freeman 1984) and empirical evidence (Singh et al. 1986) suggest that major strategic changes are governed by environmental selection processes. That is, such changes subject the organization to powerful environmental pressures and are likely thereby to reduce the chances of survival. On the other hand, Tushman and Romanelli (1985) suggest that strategic reorientations, which imply major changes in the concept of strategy, are an integral part of a punctuated equilibrium model of firm evolution. Firms that do not reorient when major changes are necessary, or reorient when the need for such changes is not compelling, they argue, will see their life chances reduced. The seeming contradiction between these two positions can be resolved in terms of the role of the autonomous strategic process, as explained below.

Reorientation. Major changes in the strategy seem likely to upset the induced strategic process in fundamental ways. The necessity for a major strategic change suggests that selective pressures from environmental variations have made the organization's capacity for relatively modest adjustments largely irrelevant. At first, threat-rigidity (Staw, Sandelands and Dutton 1981) may lead top management to reaffirm familiar approaches. For instance, Cooper and Schendel (1976) found that established firms, confronted with the threat of radically new technologies, were likely to increase their efforts to improve the existing technology rather than switch to the new technology, even after the latter had passed the threshold of viability. Eventually, however, confronted with chronic low performance, top management is more likely to take major risks (March 1981b, Singh 1986) by making extreme and vacillating changes in the strategy, potentially involving a complete change of domain (Hambrick and D'Aveni 1988). When an organization finds itself in a precarious situation, reorientation may be perceived by top management as necessary to maintain or regain viability (Miles and Cameron 1982), and may be better than doing nothing. However, as March (1981b) has observed, organizations facing bad times, and therefore following riskier and riskier strategies, may simultaneously increase their chances of survival through the present crisis, but also reduce their life expectancy: "for those organizations that do not survive, efforts to survive will have speeded the process of failure." (1981b, p. 567)

Strategic Renewal. Major changes in the strategy effected through the autonomous strategic process, however, need not be completely governed by external selection processes. Autonomous strategic initiatives, as seen in the Intel case, offer opportunities to open new niches or provide early warning of impending radical, external changes. To the extent that strategic context determination processes are effectively

TABLE 1

Intraorganizational Ecology of Strategy Making and Organizational Adaptation

Intraorganizational Ecological Processes

	Variation	Selection	Retention	Ties to Adaptation
Induced	Strategic initiatives seeking resources for projects that correspond to internal selection pressures of structural context, fit with the current organizational strategy, and offer access to regular opportunity structure for career advancement. Originate at operational-level but intended to be driven by top management's ex ante vision. Enhanced by availability of growth opportunities remaining in current action domain.	Initiatives selected through administrative mechanisms (e.g., strategic planning) and/or cultural influencing (e.g., reference to key values). Differential allocation of resources to different areas of strategic initiative. Key is that internal selection reflects current external selection pressures.	1. Organizational learning about bases for past/current survival (variously embodied). 2. Distinctive competences (variously embodied). 3. Organizational goals. 4. Organizational action domain. 5. Organizational character. All of these elements integrated in ex ante vision	1. *Relative inertia*. Organizational survival is due to a good fit of internal selection processes with the environment. Survival motivates conservatism on the part of top management and desire to leverage existing organizational learning through induced process. Reluctance to change organizational strategy. 2. *Adjustment*. Relatively minor changes in strategy to accommodate environmental change.
	Radically new induced initiatives initiated by top management.	Major changes in structural context.	Major changes in the dimensions of organizational strategy.	3. *Reorientation*. Major changes in strategy in response to major environmental change.
Autonomous	Strategic initiatives outside scope of current strategy. Driven by operational-level managers seeking to use their skills in new combinations with organization's distinctive competences and, in some cases, seeking career advancement through alternative opportunity structure. Enhanced by availability of unabsorbed slack	Defining strategic context for new initiatives through: · finding resources outside regular resource allocation process; · demonstrating viability in external environment through entrepreneurial activity; · mobilizing internal support on the part of upper level managers; · developing new competences/skills. · setting stage for an amendment in the organizational strategy.	Changes in organizational learning, distinctive competence, and relative importance of new activities in total domain activity, which, cumulatively, lead top management to recognize that a major change in strategy is necessary and feasible. Lead to new, ex post vision. Once formally ratified, new vision becomes part of the basis for the induced process.	4. *Strategic renewal*. Major change in organizational strategy preceded by internal experimentation and selection offers organization possibilities for anticipatory adaptation to new environmental demands and/or to enter new niches.

activated, the organization may learn new capabilities and skills in anticipation of making major changes in its strategy, but without knowing in advance how it should be changed. Changes of this sort form the basis for "strategic renewal"—major strategic change preceded by internal experimentation and selection. In the Intel case, EPROM's and microprocessors, like the recent i860 (RISC) chip, were unplanned developments, but Intel management was capable of recognizing the importance of these developments after they had occurred, and keeping them inside the firm through shifts in resource allocation.

Reorientations are *not* expected outcomes of the autonomous strategic process. Consistent with the view of organizational ecology (Hannan and Freeman 1984), environmental selection is expected to govern reorientations, because reorientations seem fundamentally incompatible with strategy making as an organizational learning process based on internal experimentation and selection. Reorientations inherently seem to involve "betting the organization" because they eliminate a good deal of its cumulative learning. On the other hand, strategic renewal—major strategic change preceded by internal experimentation and selection—is the critical outcome of the autonomous process through which an organization can indefinitely maintain adaptive.

Table 1 summarizes the analysis of the induced and autonomous strategic processes and their proposed ties to modes of organizational adaptation.

Discussion

Organizations are both creators and prisoners of their environments (Miles and Cameron 1982). Organizational survival depends to a significant extent on the adjustment and renewal capacities of strategy-making processes. Such processes are an emergent property of organizations and may be differentially distributed within a population of organizations. Firms overcome the liabilities of newness by accumulating and leveraging organizational learning, and by deliberately combining distinctive competences in the induced process. Adjustments effected through the induced strategic process serve the organization in its attempts to remain adaptative over some range of environmental variation and over a certain time horizon (Chakravarthy 1982, Burgelman 1983c). The autonomous strategic process, on the other hand, helps organizations develop, appropriate and retain new learning. Strategic renewal through internal experimentation and selection offers an organization the possibility to remain adaptive over a wider range of environmental variation and a longer time horizon (Chakravarthy 1982, Burgelman 1983c).

Selection and adaptation have sometimes been viewed as alternative explanations in organizational research (e.g., Singh et al. 1986). The analysis presented in this paper suggests that they may be viewed, to some extent, as complementary: selection processes at the intraorganizational level, working themselves out through the strategy-making processes, may generate strategies that are adaptive at the organizational level.

Structural and strategic contexts thus emerge as critical process design parameters from this analysis. In the induced strategic process, top management's role is to ensure the pursuit of an intended strategy through administrative and cultural mechanisms that couple operational-level strategic initiatives with the intended strategy. Doing so makes it possible for the organization to build on past success and to exploit the opportunities associated with the current domain. However, the Intel study also suggests that it is important that the structural context reflect the selective pressures of the environment. This provides a reality test for the organizational strategy. In the autonomous strategic process, top management's role is strategic

recognition rather than strategic planning (Burgelman 1983c, Van de Ven 1986). Top management needs to facilitate the activation of strategic context determination processes to find out which of the autonomous initiatives have adaptive value for the organization and deserve to become part of the organization's strategy. The proposed importance of a continued concern with managing strategic processes, as well as with strategy content (or "strategic choice") at any given time, is consistent with a wide range of research findings (e.g., Hedberg, Nystrom and Starbuck 1976; Bower and Doz 1979; Padgett 1980). More formally,

PROPOSITION 1. *Firms that are relatively successful over long periods of time, say ten years or more, will be characterized by top managements that are concerned with building the quality of the organization's induced and autonomous strategic processes as well as with the content of the strategy itself.*

Combining induced and autonomous processes in their strategy making would seem to give organizations a chance to outsmart or outrun the selective pressures associated with environmental variations. The analysis suggests that organizations may have to keep both processes in play at all times, even though this means that the organization never completely maximizes its efforts in the current domain. This implies that strategic intent and internal entrepreneurship, separately, are not sufficient for organizational survival (e.g., Hamel and Prahalad 1989). Both are needed *simultaneously*. The ability to maintain these different concerns simultaneously seemed to be missing in the failing corporations studied by Hambrick and D'Aveni (1988), who found that failing firms tended to operate either in an inactive (no strategic change) or hyperactive (excessive and vacillating change) mode. This also implies that a sequential approach involving, for instance, sequences of reorientation and convergence (Tushman and Romanelli 1985) may not be optimal in the long run. More formally,

PROPOSITION 2. *Firms that are relatively successful over long periods of time, say ten years or more, will be characterized by maintaining top driven strategic intent while simultaneously maintaining bottoms-up driven internal experimentation and selection processes.*

The analysis also suggests that successful reorientations, as defined by Tushman and Romanelli (1985), are likely to be *preceded* by internal experimentation and selection processes effected through the autonomous strategic process. More formally,

PROPOSITION 3. *The population of firms with successful strategic reorientations will contain a significantly higher proportion of firms whose strategic reorientations were preceded by internal experimentation and selection processes than the population of firms with failing strategic reorientations.*

Of course, these propositions do not imply that there is only one way to organize the strategic processes or that managers should get overly absorbed in the details of these processes. Also, there does not seem to be a fixed optimal ratio in terms of emphasis on induced versus autonomous processes. At different times in an organization's development, different emphases on the induced and autonomous strategic processes may be warranted, and there may not be a fixed series of stages in firm evolution as some researchers seem to suggest (e.g., Kimberly and Miles 1980, Miller and Friesen 1984). Old firms may continue to be able to act like young ones, even though young ones may not be equally able to act like old ones. The renewal capacity associated with the autonomous strategic process may enable organizations to negate the inevitability of aging and decline. By the same token, it may expose them again, to some extent, to the liabilities of newness (Hannan and Freeman 1984).

The intraorganizational ecological perspective has offered useful insights into Intel's strategic evolution. Intel may have survived as an independent company, in part, because it was able to recognize important internal variations that were externally viable, and to allocate resources to these through the internal selection mechanisms, almost in spite of the pervasive desire to continue to be a "memory company." The procrastination in finalizing the DRAM-exit decision, and Gordon Moore's current concerns about the inexorable tendency toward narrowing down the technology base of the firm suggest some inertial tendencies in Intel's strategic process. But events like the emergence of the i860 (RISC) chip also suggest that the autonomous strategic process is still alive and well. Although Intel went through a major strategic change—from "memory company" to "microcomputer company"—it did not do so through a dramatic and sudden reorientation. Instead, unplanned, autonomous processes were allowed to run their courses, with many losers and some winners. And as these processes unfolded, the company developed new learning that made the ratification of the strategic change a reasonably safe bet for top management.

Implications and Conclusions

This paper has offered an intraorganizational ecological perspective on strategy making and organizational adaptation. The framework proposes balancing of variation-reduction and variation-increasing mechanisms. It suggests that one process leads to relative inertia and incremental adjustments, while the other expands the firm's domain and renews the organization's distinctive competence base, countering inertia and serving some of the functions of a reorientation. The research reported here provides some confirmation of the existence of these two processes, suggests some amendments to the initial conceptual framework, and offers additional insights into the working of the processes.

The research is a part of emergent efforts to integrate evolutionary views of strategy making and organization. These efforts recognize the importance of some forms of rationality and learning and the need to go beyond biological evolutionary arguments (e.g., Langton 1984, Boyd and Richerson 1985, Gould 1987). They reflect a belief that evolutionary theory may be useful for integrating insights from organizational ecology, rational adaptation, and random transformation perspectives (Hannan and Freeman 1984). Other seeds for such a synthesis already exist. Economic evolutionists (Nelson and Winter 1982, Winter 1990) provide a detailed theoretical picture of some of the mechanisms of inheritance, selection, and survival. Organizational evolutionists have shown that some forms of organizational change are adaptive while others reduce an organization's life chances (e.g., Singh et al. 1986), and that the "imprinting" effects of founding characteristics of organizations affect subsequent rates of organizational change (Tucker et al. 1990, Boeker 1989). This paper sketches the outlines of an intraorganizational perspective on strategy making and proposes this as a fourth level in the hierarchy of ecological systems which currently comprises only organization, population and community levels (Carroll 1984, Astley 1985, Aldrich and Auster 1986). Incorporating this additional level may facilitate the rapprochement between ideas of ecology and strategy, and enhance the prospects of an evolutionary theory of organizations (Burgelman and Singh 1987).

The intraorganizational perspective on strategy making also extends frameworks presented by Mintzberg (1978) and Quinn (1982) in the strategic management literature. It does so by documenting more explicitly some of the sources of emergent strategy, by further elucidating the organizational decision processes through which emergent strategies become part of realized strategies (strategic context determination), by identifying feedback mechanisms between realized and intended strategy,

and by providing some evidence that logical incrementalism is likely to be variation reducing and may need to be augmented with an autonomous strategic process to enhance long-term organizational survival. The perspective presented in the paper adds some additional dynamism to these earlier frameworks and draws more explicit attention to the simultaneity of multiple strategy-making processes in organizations.

Implications for Theory and Future Research

Several specific avenues for further research derive from the propositions discussed earlier. For instance, future research could examine whether consistently successful firms are characterized by top managements' spending efforts on building each organization's strategy-making processes; whether such firms simultaneously exercise induced and autonomous strategic processes; and whether successful reorientations are more likely to be preceded by internal experimentation and selection processes effected through the autonomous strategic process than are the unsuccessful ones.

Effective internal selection seems to depend on top management's capacities to adjust the structural and strategic contexts in the organization. Discovering the determinants of such capacities and how the latter relate to rates of adjustment and strategic renewal remains an important agenda for further research (March 1981b, Hannan and Freeman 1984). Future research could also examine the possibilities that there may be an optimal level of ambiguity in the concept of strategy (March 1978) and an optimal degree of coupling in the structural context (Weick 1976). This would require studying the working of strategy-making processes in different types of organizations, such as generalists versus specialists (Freeman and Hannan 1983) or defenders, prospectors, analyzers and reactors (Miles and Snow 1978), and under different types of environmental conditions (e.g., Freeman and Hannan 1983, Eisenhardt 1989). This, in turn, may raise further questions about the relationships between strategy making and organization form, provide deeper insight into the distinction between core and peripheral features, and elucidate the mechanisms that determine structural features and their transformation—that is, organizational morphology.

For internal selection mechanisms to be useful, organizations must generate internal variation. That is, they must motivate strategic initiatives on the part of their participants. As a result of internal selection, some participants may win big and others may lose big. But the genius of surviving organizations lies in their ability to benefit from both winning and losing individual strategic initiatives through their capacity for learning. This suggests an organizational-level analogy to societal-level processes described by Rosenberg and Birdzell (1986). Rosenberg and Birdzell provide some evidence for how western capitalism has used decentralized entrepreneurialism: it has allowed innovators to bear the losses of failed experiments and to gain the profits of successful ones, and it has benefited from both in terms of growth. This analogy also suggests a link between strategy-making and "foolishness" (March 1981b). Organizations may use individual-level "foolishness" to enhance organizational-level survival in somewhat the same way that organizational-level foolishness may enhance the survival chances of a system of organizations. March views organizational foolishness as a form of altruism, but it might be possible to link such individual-level behavior to the idea that strategy making may be viewed as part of the organization's opportunity structures for career advancement.

This, in turn, motivates interest in further examining how the Barnard-March-Simon theory of inducements and contributions may be realized. It raises, for instance, the issue of how the balance between inducements and contributions may be different in the induced and autonomous strategic processes and how shifting balances may affect organizational adaptation. It also directs attention to the effects that external resource constraints (e.g., remaining growth opportunities in an organization's

current action domain) and internal resource constraints (e.g., "sustainable growth" (Donaldson and Lorsch 1983) and "unabsorbed slack" (e.g., Singh 1986)) may have on the degree to which induced and autonomous strategic initiatives are supported during any given period in the firm's history. These links open new directions for research.

In conclusion, the theory and field research presented in this paper suggest that the opposite views of blind natural selection or prescient and comprehensive strategic planning as the basis for understanding organizational adaptation both are too narrow. The pure environmental-selection view misses the additional insights that can be obtained from considering internal selection. The pure strategic-planning view misses the ecological components altogether. Rich behavioral phenomena are currently being documented in a variety of studies and will have to be accounted for by equally rich theories of organizations. An intraorganizational ecological perspective on strategy making seems likely to provide a useful input to organization theory. It also suggests the need to reconsider important precepts of received strategic management theory.

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