

**Strategic Thinking in Complex Adaptive Systems: A Case Study of the  
Passive Component Industry**

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# **Strategic Thinking in Complex Adaptive System: A Case Study of the Passive Component Industry**

## **Abstract**

In contrast to the existing strategic perspectives: IO theory and RBV, we focus on the complex adaptive system to explore and understand the complex interaction and dynamic evolution among firms in the rapid growing industry. We conducted a longitudinal study on the development process of the passive component firms by grounded theory. Five paradoxical features emerged as follows: (1) increasing diversity and complexity; (2) risk consciousness and self-transcendence; (3) customer orientation and co-evolution; (4) punctuated equilibrium and international cooperation; (5) unpredictability of the future.

We construct an interacting strategic model, which includes three new interdependent elements. First, since startups are real options and long-term development is unpredictable, a portfolio of real options would affect future industrial opportunities. Second, in order to quickly take advantage of emerging market opportunities, short-term guidelines should be created and controlled by time-pacing improvisations. Finally, maintaining innovation and extending core competence are requisites if strategic management is to be coherent.

## **Introduction**

In retrospect to the literatures on constructing competitive advantages, Porter's (1980) enduring contribution has brought the language of industrial organization (IO) economics into the field of strategic management. The main determinant of a firm's performance was described and prescribed in terms of industry structure, strategy group and external competitive dynamics. While Michael Porter was putting the finishing touches to his various opuses on competitive strategies that is based on the classic industrial economics, the resource-based strategy thinkers shifted this 'outside-in' paradigm to an 'inside-out' paradigm.

The resource-based view of the firm can be traced to Penrose's (1959) book, *the theory of the growth of the firm*. The conceptual transfer of this approach into the strategic management literature is generally credited to Wenerfelt (1984). Important theoretical developments have also come from Barney (1991) and Grant (1991) but the mass-market popularization of the core competences of the firm had to wait for Prahalad and Hamel (1990) and Hamel and Prahalad (1994). The resource-based theory maintained the long-term preoccupation with the determinants of competitive advantage but switched the focus from external competitive advantages to the particular combination of internal resources developed by the firms.

During this period, groundbreaking work was taking place at the Santa Fe Institute. In 1984, scholars there began to sketch the outlines of a new science that would transform the way we think about economics, organizations, and ourselves. Building on the work of early pioneers in the fields of chaos, complexity, artificial life, evolutionary biology, and the new economics, teams at Santa Fe Institute argued and modeled their ways to a new understanding of what it means to “do strategy” in complex, living, evolving systems (Wood 1999).

With the rapid growth of Chinese economic development that has occurred over the past two decades, many small and medium passive component firms in Taiwan have grown into regional businesses. Recently, through global strategic alliances, mergers and acquisitions, some of them have even manifested their worldwide influence on the industry. The purpose of this paper is to explore how organizations continuously change and thereby extend thinking beyond the traditional views, to one in which change is frequent, relentless, and even endemic to the firms. In particular, we try to explore the robust strategy in the rapid changing context of multiple-product innovation.

Both unique resources and privileged market positions should be seen as important sources of sustainable competitive advantages. This raises a methodological issue: which disciplinary approaches are better suited to study the complex interaction between unique resources and market competition (Cool et al., 2002)? In contrast to the existing strategic

perspectives--industry organizational theory and resource-base view--we focus on the complex adaptive system (CAS) to explore and understand the complex interaction and dynamic evolution among the firms in the rapid growing passive component industry. To do this, we review such important properties in CAS as schemata, self-organization, co-evolution, emergence and fitness landscape, and then discuss their strategic implications.

## **CAS and Strategic Management**

### **Schemata and Strategic Choices**

According to Dooley (1997), schema defines how a given agent interacts with other agents around it. Actions between agents involve the nonlinear exchange of information and resources, which can undergo multiplier effects based on the nature of interconnectedness in the system. Agent tags help to identify what other agents are capable of transaction with a given agent; tags also facilitate the formation of aggregates, or meta-agents. Meta-agents help to distribute and decentralize functionality, allowing diversity to thrive and specialization to occur. Agents or meta-agents also exist outside the boundaries of the CAS, and schemata also determine the rules of interaction concerning how information and resources flow externally.

Traditional strategic choice theory holds that an organization changes because its top

managers choose new strategic directions. Learning organization theory holds that organizations develop in new ways because top managers identify leverage points in the system from which they can control it. However, CAS theory holds that new directions in an organization emerge from both their choices and the patterns of responses evoke from others in self-organizing way. CAS theory is an approach that reverses orthodox theory. It is important that the new insights suggest a completely different possibility of interpretation. From a radical complexity perspective, managers are agents in the system, not external observers of it. They cannot therefore know the long-term outcome of the choices they are making (Stacey 1999).

### **Self-Organization and The Impetus of Industry**

A central concept in agent-based CAS is self-organization, which involves the emergence and maintenance of order, or complexity, out of a state that is less ordered, or complex. Self-organization is a bottom-up process in which detailed input of the system itself determines what happens (Stacey 1999). In the world of self-organizing structures, everything is open and susceptible to change. But change is neither random nor incoherent. Instead, we get a glimpse of systems that evolve to greater interdependence and resilience because they are free to adapt, and maintain a coherent identity throughout their history. Stasis, balance, and equilibrium---these are temporary states. What endures is process---dynamic, adaptive, and creative (Wheatley 1992).

To increase evolutionary fitness of a business, one must evaluate both one's internal self-organization capability and the external selection status. A business responds, for example, not only to events from the outside, such as new products or services introduced by competitors and changes in customer needs, but also to events from the inside, such as innovations in potential products and services and changes in the skills and expectations of its employees (Kelly and Allison 1998). At the industry level, CAS can also spontaneously self-organize into more complex structure. Levy (1994) argued that corporate decisions to enter or exit the market, or to develop new technologies, alter the very structure of the industry, which in turn influences a firm's future behavior.

### **Co-Evolution and Far From Equilibrium of Industry**

Evolution is the theory that those species survive that is most capable of adapting to the environment as it changes over time. To this familiar notion, complexity adds an emphasis on the continual interaction among complex systems. In a rapid changing global market, for example, the actions of one firm trigger actions and reactions in other firms, whose actions trigger responsive actions in the first. The importance of this simultaneous and continuous change is noted by the addition of prefix “ co-“ to the word “ evolution “ (Kelly and Allison 1998). Co-evolution is the reason that firms today must run as fast as they can just to maintain their current positions. Similarly, Kauffman (1995) argued that all CAS evolve to the edge of chaos, the point where small and large avalanches of

co-evolutionary change cascade according to a power law.

Levinthal (1997) suggested that the landscape on which agents adapt continually shifts, because the payoffs of individual agents depend on the choices that other agents make. Local adaptations lead to the formation of continually evolving niches, so CAS operates far from the equilibrium of globally optimal system performance (Holland and Miller 1991).

### **Emergence and The Innovation of Industry**

The study of CAS systems has revealed that in order to produce creative, innovative, and continually changeable behavior, systems must operate far from equilibrium where they are driven by negative and positive feedback to paradoxical states of stability and instability, predictability and unpredictability. The transformational process is one of internal, spontaneous self-organization amongst the agents of a system, provoked by instability, and potentially leading to emergent order. The evolutionary process is one of competitive selection, which weeds out all systems that are incapable of spontaneous changeability. Santa Fe Institute uses the term “ emergence” to refer to the macro-level patterns arising in CAS systems of interacting agents (Holland 1998; Kauffman 1995).

In organization science, insights into the generation of novelty through recombination have been generated at several different levels of analysis. Technological

innovations recombine elements of previous innovations (Kogut and Zander 1992). Groups, teams, and task forces integrate the ideas and attitudes of their members, and are arenas in which new ideas emerge from the interaction of their members. Joint ventures, mergers, and acquisitions generate novelty by recombining skills and processes inherited from their parents. At the industry level, technological convergence can lead to the formation of new organizational communities that recombine elements that were formerly distinct populations.

### **Fitness Landscape and Ecology of Industry**

The notion of a “ fitness landscape” is an image of evolution moving across a landscape consisting of peaks and valleys (Wright 1931). The higher the peak the more adapt the collection of species. The lower the valley the less the probability of survival. Evolution is then understood as a hill-climbing process--a journey across a heaving landscape. According to Stacey (1996), smooth landscapes represent the order zone of operation, while very rugged landscapes represent the disordered zone of operation. Landscapes with medium ruggedness are optimal for evolution and constitute the edge of chaos.

Kauffman (1992, 1995) argued that the manner in which competitive selection operates on chance variations depends upon the internal dynamic of the evolving

interaction between the entities of which it is composed. We can model the notion of fitness using the concept of a fitness landscape. In each case what makes one fitter simultaneously damages the fitness of the other. The key point is that CAS and their agents are always locked into interactive games, and the success of one strategy always depends upon the strategies of others.

### **Research Methods**

We chose grounded theory building because of our interest in examining a rarely explored phenomenon for which extant theory did not appear useful. In such situations, a grounded theory-building approach is more likely to generate novel and accurate insights into the phenomenon under study than reliance on either past research or office-bounded thought experiments (Strauss and Corbin 1990). We collected data through interviews, observations, and secondary data. In-depth interviews with senior officers of 10 different firms were conducted from September 1998 to July 2001.

We conducted a longitudinal study on the development of the passive component industry, and analyzed the data of in-depth interviews by grounded theory. Five paradoxical features, which constructed the CAS model of the evolving industry, emerged. The next section is followed by necessary background on the historical phase transition of the industry. The heart of the paper is contained in the next two sections, in which the case

study is introduced and analyzed from the dialog between the data and the perspective of the theoretical framework, and then the key implications are suggested for the strategic management. In the final section, some conclusions are drawn on the contribution of the paper.

## **Case Study**

### **Industrial Phase Transition**

Passive components include resistors, capacitors, inductors, transformers, filters, and others. Any electric products, in the fields of information, telecommunication, consumer electronics, and other industries, would need those indispensable passive components. With the emerging development of electronics industry, the development of passive components is divided into four major phases, based on market features, listed as follows. Because every emergent phase is developed dynamically, the periods between phases partly overlap.

- **Traditional Small and Medium Enterprises Phase**

The production of capacitors in Taiwan began in 1957 when Ta Chin Electrics Co. invested in producing plastic film capacitors. For the production of resistors, TY-OHM invested in producing carbon film resistors in 1958. The development of inductors in Taiwan is even earlier beginning as Taiwan recovered from Japanese colonization. By 1987, more than 70% of domestic capacitor and resistor makers were still small and

medium enterprises, with the capital investments less than NT\$10 millions. During this phase, most makers produced traditional plug-in products, which needed neither large amount of capital nor a high degree of technology, and were easy to access to market. Therefore, competitive advantage was based especially on the control of production cost.

- **Clustered Information Industry Phase**

In 1980, the Council for Economic Planning and Development (CEPD) set up a 10-year developing plan for the electronics and information industries and provided subsidies for R&D to aggressively carry out the plan. The infrastructure of electronics industry had settled by then and grew rapidly. Because of the rapid growth of the clustered information industry, the need and development of passive components increased greatly. In order to follow the growth and the relentless price competition in the market, the firms started to invest in automated equipment to meet economies of scale. In addition, as life cycles of information products were comparatively shorter, they need high quality passive components at a low-price, along with real-time services. Therefore, firms started to introduce R&D techniques into both production and quality management. Moreover, they moved the production of low marginal products to Mainland China or Southeastern Asia to reduce costs and to maintain profitability.

During this phase, the technical paradigm of products confronted a significant change.

Chip products became the mainstream in 1987. During the paradigm transition, different managers still had their own strategic choices and entered different market segments. The passive components firms started on vertical or horizontal integrations during this phase. In order to pursue economies of scope, which offered "One-stop-shopping" service to their customers. As the hyper-competitions arose in the market, firms needed to reposition the products externally and continuously develop new products and production techniques, that is, to accumulate and differentiate their capabilities internally.

- **Emergent Telecommunications Industry Phase**

In 1990, cellular phones and network gradually became hot products. In 1999, the handset market suddenly increased, which was an emerging demand unforeseeable by the passive components firms. These products very quickly weeded through the old to bring forth the new, and continue to look for the latest function and the highest speed. Therefore, the firms developed high function, high speed, lightweight, compact, and inexpensive components to meet the demands of customers.

However, due to interactive factors such as customer needs, investment choices, production techniques and competitors the strategic timing for investing was still hard to effectively forecast and control in advance. To face the rapid changes of the global market, firms began to develop global channels through strategic alliances, which formed global

logistics to capture shifting business chances, and to enter the era of network competition.

- **Digital Convergence Phase**

The current dominating market for passive components is in portable products such as cellular phones and PDA. These products tend to be miniaturized, with a high frequency, speed and accuracy. Therefore, there are two market trends for developing high-end products: first, component integration should be multifunctional to take the place of current single independent components. Second, high frequency component applications should be developed as a new core competence that could guarantee long-term development. Nevertheless, the development of the photo-passive component industry would form a complementary or substitute effect with the current passive component remains an uncertainty. In addition, it is even harder to predict what influences digital convergence and nano-technology will bring to passive components in next decade. For this reason, the effect of economies of scale and scope merely become the prerequisite common foundations. At this moment, apart from external position and internal capabilities, the competitive advantages of the firms should be evolved effectively.

### **Evolution of Industry As a CAS**

During the conceptualizing process, we found that both products and technologies continuously shifted to new paradigms, which cannot be interpreted by the established IO

theory and RBV perspectives. In other words, the continuous change of privileged market position cannot be predicted or planned in advance. However, the concept of Complex Adaptive Systems was emerged from such interactive dynamic model. Consequently, there are five paradoxical features of the industrial development interacting with the theoretical perspective of CAS listed as follows.

- **Increasing Diversity and Complexity**

Because of the volatility and quick changes in 3C industries, upstream passive component industry also experienced great variations. In this industry, old functions are continuously replaced with new features, and the new manufacturing procedures are improved upon old ones. With the influxes of resources, techniques and human resources, the diversity and complexity in passive component industry will increase over time. However, different firms have different strategic choice for a growing chance. Some firms believed they could gradually increase profits and maintain market shares within an existing market. In a sense, however, its accumulated learning in old techniques is a “competency trap” (March, 1991). On the contrary, ambitious makers will quickly invest in new products and capture the strategic timing as described below:

**Once the market chance appears, we will find and get the related equipment and material suppliers immediately; execute investment and**

**technical transfer simultaneously; R&D, manufacturing, and sales personnel will form a team to focus on the new product. In this way, we could cut down the unnecessary procedures and documents. Sometimes, when the order is urgent, the manager would be jittery, just like a baseball coach telling a player to steal base.**

Today, the passive component industry is a diversified combination of small and medium, regional and international enterprises, with diversified strategic vision toward future development. Firms built their domestic business networks through vertical and horizontal integrations, and form their international business networks through mergers, acquisitions, and strategic alliances. These actions result in complex, interactive relationship of competition and cooperation among competitors. Kauffman (1995) argues that a universal law appears to generate increased novelty and complexity in a process that increases the fitness in the whole system, makes it become capable of coping with more and more complexity. However, this only applies to the system as a whole, with no guarantee that any single part of the system will become fitter (Stacey 1996). In short, the entire passive component industry would grow steadily along with the economic development. However, to continue growing and developing, individual firms need their own bottom-up self-organized driving forces, one is from internal risk consciousness and the other is diversified customer's demand.

- **Risk Consciousness and Self-Transcendence**

This section discusses the self-organized impetus within the firms. Due to the prices of computers continuously decreasing, passive component industries also encountered the pressure of price declination and overstocking. However, Taiwanese makers could adapt the surrounding changes. With higher cost reducing abilities, they were gradually taking the market shares away from Japanese makers.

When various customer demands spread rapidly, a creative firm always can coordinate information and technology to perform response quickly. Stacey (1996) suggests that the level of contained anxiety is one of the factors that determines whether an organization could possess creativity or not, while it is at the edge of chaos. This case study observes firms to access their affluent transformation impetus through the concepts of “ risk consciousness” , “ self-transcendence” , and “ pursue the first” . One of their ideas is exemplified as follows:

**I personally think that if a firm wishes to be successful, then it has to superior to its competitors. Formerly, I may have expected to transcend my competitors by 10 percent, but now I will expect to transcend them by 15 percent. In addition, I should have achieved this quality level a half-year before my customers ask for it.**

In a CAS, such impetus is called self-organization. Self-organization is a dynamic process by which a system spontaneously gets increasingly more organized through its own dynamics (Morel and Ramanujam 1999). In a dynamic environment, the power of self-organization of those continuous growing firms mainly comes from the bottom-up creativity inside the firms.

Besides the internal bottom-up creativity, rapid market response is another important self-organization impetus of industry development. In Taiwan, initial OEM, equipments manufacturing, process improvement, and then the global channel and rapid customer services, firms develop and accumulate their resources and capabilities to keep pace with the industry development and the environmental changes

**The passive component industry is related to Taiwanese industrial development. In the beginning, we produced components for consumer electronics, and then we transferred to PC and information industry. Now, we develop into the telecommunications industry, which is another driving force of our competence.**

From complexity perspective, creativity is not only an attribute of an individual but a property of a hierarchy of interlocking systems, beginning with an individual mind that is nested in a group, which itself is nested in an organization, which is in turn nested in an

economy and a society, then finally, nested in an international community. Stacey(1996) argues that the interaction between these nested systems is always circular and each level would affect and be affected by the levels above and below. Due to sensitivity to the connections between upstream and downstream industries, passive component industry forms a co-evolved ecosystem.

- **Customer-Orientation and Co-Evolution**

Recently, 3C-fabrication industries suffer from high domestic labor costs and shortage of industrial locations. For this reason, they move to regions with lower labor costs, such as China and Southeastern Asia, to ensure their profitability and survival. In order to access customers quickly, passive component firms also moved overseas to build an effective channel for cooperation and sales. Offering real-time services has become an important niche in the passive component industry. Therefore, firms try to build a logistic center for the market where downstream fabrication cluster together:

**In foreign countries, customer-orientation is used just to chase after customers. Our idea is to set fabricating plants in the regions where customers cluster together. In China some coastal cities are the important areas. Mexico is, too. Mexico has quite a big 3C assembly market.**

Although three major passive components have different functions and applications,

their channels for downstream customers are the same. Therefore, when selling their products, competitors in passive components could cooperate with each other. Most firms would like to provide various passive components at the same time. In other words, they intended to provide customers “ one-stop-shopping” services. Stacey (1995) argues that the result of co-evolution among firms dose not approach the equilibrium of market, but brings the market to “ the edge of chaos” , which has the paradoxical dynamics of certainty and uncertainty, stability and instability. When the information/technology flow among markets and firms, and the connections and the diversifications among firms reach the critical bifurcating point, the market will create a new equilibrium. In “ the edge of chaos” dynamic environment, firms need to adapt and transfer their management styles techniques and experiences. By doing so, they can continue developing and surviving. In addition, this emerging “ punctuated equilibrium” has complex interaction with the global economy, technology, and supply chains, which form a paradoxical business ecosystem.

- **Punctuated Equilibrium and International Coopetition**

In order to maintain current market shares and competitive advantages, firms must continuously develop new products and process technologies, which need to match the upcoming market demands and niches. One natural endogenous feature of such co-evolutionary competition is punctuated equilibrium, which occurs when the product

margins are interrupted by the development of new technologies, new market demands, and the competitor's imitation. However, on the one hand, if firms invest early, they may incur higher cost and run the risk that the new product has no market. On the other hand, if they invest late, they may lose market shares.

**We executed start-up in 1998 and began to make a profit in 2000. In fact, 1999 was the most profitable year for MLCC. Unfortunately until 2000, we still could not supply MLCC. In the opposite situation, the start-up of Walsin Technology in 1996 was much earlier than market demands. In the beginning, they lost a lot; however, in 1999 when the market emerged, the entire production enjoyed good sales.**

On the one hand, competition among firms from Japan, Korea, China and other Asian countries usually affect margins in the market. On the other hand, vertical integration and alliances work to make these firms cooperate in order to create and share the value chain. In other words, there is a complementary cooperative relationship in the international competition. In terms of new products or new techniques, Taiwanese firms still follow American and Japanese progress. As time goes by, formerly, some Japanese makers that have vertical cooperative relationship with Taiwanese firms might now become competitors again in certain segments of products. Consider the following:

**Japanese firms planned not to withdraw from the market. What they did is to reorganize but not to terminate their operations. Originally there were five plants in Japan; after reorganization, two plants were moved to Mainland China. Japan is still in this market.**

Punctuated equilibrium makes it difficult for passive component firms to survive for long periods, as their strategies and skills tend to get finely optimized for the stable periods and then suddenly become obsolete when the inevitable restructuring takes place (Beinhocker, 1997). In addition, firms in international competition are always locked into an interactive game. All in all, whether a strategy could succeed or not in the future depends on others' strategies.

- **Unpredictability of The Future**

The chairman of Team Young proposed a theory to explain the instability of the supply chain in the electronics industry. He assumed the four stages to be final market (such as Wal-Mart), brand marker (Compaq), fabricator (Acer), and passive component maker (Figure 1). The feedback information on the final market, in his point of view, was non-linear, and unexpected boom fluctuation occurred quite frequently. Similarly, Levy (1994) argues that long-term forecasting is almost impossible for chaotic systems, and dramatic change can occur unexpectedly; as a result, flexibility and accommodation are

essential for organizations to survive.

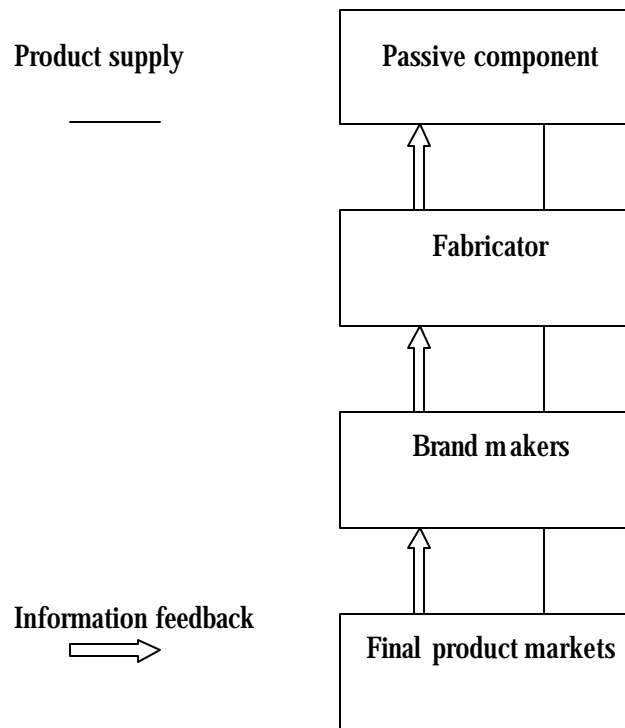


Figure 1: Four-stages supply chains in the electronics industry

For example, in 1998, the Asian economy suffered from depression. Passive components firms were in a catastrophe. However in 1999, the telecommunications industry emerged, all the market supplies of passive components were in shortage. This did not last long, however, in late 2000, market demand declined hastily again. In addition, makers simultaneously excessively expanded their capacities, which incurred supply more than the demand and thus prices kept declining. Therefore, those who ran passive component firms could not precisely forecast the market volatility.

**One problem in the business development is that you cannot always go straight. The way you chose might require you to make a turn later. In the beginning, you might be on the right path. But, halfway there, you might be going the wrong way, and you have to adjust the direction, or you will fail.**

Owing to digital convergence, many traditional consumer electronics firms will have to learn to harmonize what used to be the separate domains of telecommunication, computing, and software. The new high-volume electronics industry is attempting to combine these capabilities seamlessly. Products like cellular phones, palm tops, and Web TV are the results of such integration. The volatility and uncertainty of resultant products lead to unpredictability of the future in components industry. In the past, some firms succeeded and some failed. Successful players regarded their success as “ learning by doing” rather than a result of pure luck.

**We easily go to the wrong direction at the beginning of a start-up. The important point is that I would admit my mistake and correct it. Even if I will lose half of my investment, I would still change to the right path.**

### **Implications and Discussions**

Gummesson (2000) has pointed out that science is a journey, not a destination. Any new data analysis of a case study never destroys existing theories, but expands and

improves upon them. Therefore, in addition to using industry organizational theory and a resource-based view, which still dominate the theory and practice of strategic management today, we propose the nonlinear dynamic model of CAS for evolving competitive advantages, which includes three new interdependent elements (Figure 2). First, since startups are real options and long-term development is unpredictable, a portfolio of real options would affect future industrial opportunities. Second, in order to quickly take advantage of emerging market opportunities, short-term guidelines should be created and controlled by the time-pacing improvisations. Finally, recombination of innovation and extending core competence is requisite if strategic management is to be coherent.

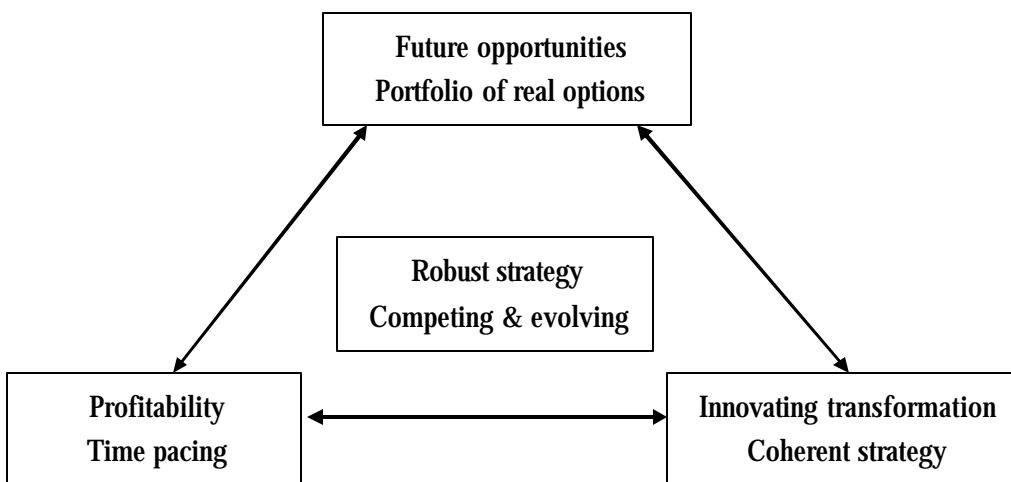


Figure 2: The interacting model of robust strategy in CAS

### **Real Options As Long-Term Strategy**

In general, successful growth companies manage a portfolio of strategic initiative

across three horizons: (1) initiatives are efforts to extend and defend existing business; (2) initiatives seek to build off existing capabilities to create new businesses; (3) initiatives plant the seeds for future businesses that do not yet exist (Beinhocker 1999). A real option is technically defined by an investment decision that is characterized by uncertainty, the provision of future managerial discretion to exercise at the appropriate time, and irreversibility. It is difficult to predict what influences the digital convergence and nano-technology would bring to passive components industry in next decade. For this reason, firms could focus on developing opportunities through investment and start-ups on future technologies. By doing so, the firm's competitive advantages can evolved effectively over time.

### **Time Pacing As Short-Term Guideline**

Brown and Eisenhardt (1998) indicate that time pacing means that change is triggered by the passage of time, rather than by the occurrence of events. In the passive component industry, time pacing means launching a new product or service on short-term schedule, rather than whenever a competitive response is needed, and entering a new market quickly, rather than whenever a promising opportunity appears. While the long-term future is uncertain and unpredictable, the best opportunity and consequence is always embedded in a successful time pacing process. In other words, time pacing is a strategic weapon for creating an internal rhythm that drives the momentum for change. A critical concept, time

ancing is one of the least understood facets of strategy in unpredictable and high volatility industries.

### **Strategic Coherence**

Finally, we will explore the coherent connection between long-term options and short-term guidelines. Tasaka (2000) suggested that a self-organized corporation is one in which (1) employees show a high degree of spontaneity; (2) plans and projects are generated from the bottom up; (3) new goods and services are developed; and (4) marketing activities can be adopted to respond to a rapidly changing market. This kind of company is an open company that actively engages in exchanges of personnel and information with the markets and with other companies. It is also a dynamic company with a corporate culture that is always seeking innovation and change and a coherent company that shares corporate vision, strategy and other valuable information with all employees, thereby creating coherence between one employee and another and expanding the sphere of its activities.

In the passive component industry, firms should be organized around core competencies, which identify themselves as portfolios of skills rather than as portfolios of business units. They can respond quickly to new opportunities because they are not locked into the rigid boundaries of pre-established end products or businesses. Such firms will be

sensitive both to their environment and resilient to it. In deciding on products and markets, they are guided internally by their competencies, not only by the attractiveness or difficulty of a particular market. The presence of a strong competency identity makes the company less vulnerable to environmental fluctuations.

### **Conclusion**

Over the years, strategy scholars have incorporated the theoretical logic of industrial organization economics and resource-based view to address key strategic questions. Now, we are at a crossroads: the key resources that drive value creation gradually become knowledge and expertise, which compel us to develop newer and more powerful lens of strategic thinking. As the traditional models are incapable of dealing with the complex and indeterminate problems in strategic management today, we find that the CAS theory will offer valuable metaphors and methods, which challenge the management research agenda in the new century.

Complexity will bring about nothing less than a shift from old ways of thinking to new ways of thinking in all domains of knowledge. Managers who can make use of the metaphors of complexity see their companies in a different light than those who do not and, in a sense, are competing in a different world (Lakoff and Johnson, 1995). Lissack (1999) points out that the metaphor of CAS influences the way managers see the world and the

way they manage their companies.

Organization theory has historically borrowed from a number of parent disciplines. Because complexity theory has developed along a very interdisciplinary path, it may be that in the end, organization theory contributes as much as it borrows from the development of insight into the behavior of CAS. Anderson (1999) argues that many modern organizations are complex adaptive systems par excellence, and we who study them should eventually lead instead of follow efforts to understand the fundamental nature of non-linear, self-organized structures.

### **References**

Anderson, Philip (1999), " Complexity Theory and Organization Science," ***Organization Science***, Vol.10 (3), 216-232.

Barney, Jay (1991), " Firm Resources and Sustained Competitive Advantage," ***Journal Of Management*** 17 (1), 99-120.

Beinhocker, Eric D. (1997), " Strategy at The Edge of Chaos," ***The Mckinsey Quarterly***, New York, 24-39.

Beinhocker, Eric D. (1999), " Robust Adaptive Strategies," ***Sloan Management Review***, Vol. 4 (3), 95-106.

Brown, Shona L. and Eisenhardt, Kathleen M. (1998), ***Competing on The Edge: Strategy***

***As Structured Chaos***, Harvard Business School Press.

Cool, Karel, Costa, Luis A. and Dierickx, Ingemar (2002), “ Constructing Competitive

Advantage” , Pettigrew, A. Thomas, H. And A. R. Whittington, (2002), ***Handbook***

***of Strategy and Management***, Sage Publication, London, 299-325.

Dooley, Kevin (1997), “ A Complex Adaptive Systems Model of Organization Change,”

***Nonlinear Dynamics, Psychology, & Life Science***, Vol. 1 (1), 69-97.

Grant, Rob M. (1991), “ The Resource-Based Theory of Competitive Advantage:

Implications for Strategy Formulation,” ***California Management Review*** 33(3),

114-135

Gummeson, Evert (2000), ***Qualitative Methods in Management Research***, Sage

Publication, Inc. London, UK.

Hamel, Gray and Prahalad, C. K. (1994), ***Competing for The Future***, Harvard Business

School.

Holland, John H. and Miller, John H. (1991), “ Artificial Adaptive Agents in Economic

Theory,” ***American Economic Review***, 365-370.

Holland, John H. (1998), ***Emergence: From Chaos to Order***, Reading, Ma: Addison-

Wesley.

Kauffman, Stuart A. (1992), ***Origins of Order: Self-Organization and Selection in Evolution***. Oxford: Oxford University Press.

Kauffman, Stuart A. (1995), ***At Home in The Universe***, Oxford, Oxford University Press.

Kelly, Susanne and Allison, Mary A. (1999), ***The Complexity Advantage: How The Science of Complexity Can Help Your Business Achieve Peak Performance***, McGraw-Hill, New York.

Kogut, Bruce and Zander, Udo (1992), “ Knowledge of The Firm, Combinative Capability, and The Replication of Technology,” ***Organization Science*** Vol. 10 (3), 383-397.

Lakoff, George and Johnson, Mark (1995), ***Metaphors We Live By***, Chicago: University Of Chicago Press.

Levy, David (1994), “ Chaos Theory and Strategy: Theory, Application, and Managerial Implications,” ***Strategic Management Journal***, Vol. 15, 167-178.

Levinthal, Daniel A. (1997), “ Adaptation on Rugged Landscapes,” ***Management Science***, 43(8), 934-950.

Lissack, Michael (1999), “ Complexity: The Science, Its Vocabulary, and Its Relation to Organizations” ***Emergence***, Vol. 1, 110-126.

- March, James (1991), “ Exploration and Exploitation in Organizational Learning,”  
***Organization Science*** Vol. 2, 71-87.
- Morel, Benoit and Ramanujam, Rangaraj (1999), “ Through The Looking-Glass of  
Complexity - The Dynamics of Organizations As Adaptive and Evolving Systems,”  
***Organization Science*** Vol. 10(3), 278-293.
- Penrose, Edith T. (1959), ***The Theory Of The Growth Of The Firm***, New York: John  
Wiley.
- Porter, Michael E. (1980), ***Competitive Strategy***, New York: The Free Press.
- Prahalad, C.K. and Hamel, Gray (1990), “ The Core Competence of The Corporation,”  
***Harvard Business Review***, 68(3), May/June, 79-91?
- Stacey, Ralph D. (1995), “ The Science of Complexity: An Alternative Perspective for  
Strategic Change Process,” ***Strategic Management Journal***, Vol. 16 (6), 477-495.
- Stacey, Ralph D. (1996), ***Complexity and Creativity in Organization***, San Francisco,  
Berrett Koehler.
- Stacey, Ralph D. (1999), ***Strategic Management and Organizational Dynamics: The  
Challenge of Complexity***, Trans-Atlantic Publications, Inc.
- Strauss, Anselm And Corbin, Juliet (1990), ***Basics of Qualitative Research—Grounded***

***Theory Procedures and Techniques***, Sage Publications.

Tasaka, Hiroshi (2000), “ Twenty-First-Century Management and The Complexity Paradigm,” ***Emergence***, Vol. 4(1), 115-123.

Wenerfelt, Birger (1984), “ A Resource-Based View of The Firm” , ***Strategic Management Journal***, Vol. 15, 171-180.

Wheatley, Margaret J. (1992), ***Leadership and The New Science: Learning About Organization from An Orderly Universe***, San Francisco, Berrett-Koehler.

Wood, Robin “ The Future of Strategy: The Role of New Science,” Lissack, M. R. and Gunz, H. P. (1999), ***Managing Complexity in Organizations--A View in Many Directions***, Quorum Books, London.

Wright, Sewall (1931), “ Evolution In Mendelian Populations,” ***Genetics***, 16:97-159.