The Dynamic Theory of the Firm: Theorizing the Firm Dynamics based on Social Physics and Sociobiology*

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This paper attempts to build a dynamic theory of the firm that deals with firm dynamics for wealth creation in an integrated, holistic and dynamic way based on an analogical approach that applies the laws and formulas of motion in physics to firm dynamics, and also the developmental biology to the interaction between industry and firm, recognizing that the ongoing shift from the Newtonian paradigm to the Complexity paradigm requires a quite different theoretical framework for wealth creation. Firstly, new concepts that construct the dynamic model of firm performance are developed and defined. And then some propositions relating to the constructs and firm performance were derived from the laws of interaction among the constructs of the model. Finally, contingency views on strategic behavior variables were provided as normative guidelines for strategic change mode. In the theory, firm performance can be recognized as an aggregate result of industry power (industry effect), firm power (firm effect), and strategic change modes to adapt to or to create the drivers of industry with strategic behavior variables of firm (interaction effect). This paper points out that in what situation, where, and what type of innovation should be sought for firm success, while Schumpeter (1934) raised the importance of innovation in economic growth. This paper also suggests that in explaining firm performance in the age of mass customization, 'The Dynamic Business Paradigm Fit Approach' based on customer-oriented perspective in the dynamic management would be more recommendable than 'The Competitive Advantage Approach' based on competition-oriented perspective in the strategic management or 'The Efficiency-oriented Approach' in the (static) management. However, the usefulness of this theory should be empirically verified hereafter.

I. Introduction

Despite the rapid progress as seen in ⟨Table 1⟩ in strategic management field during last two decades, most of the theory about wealth creation except a few recent ones s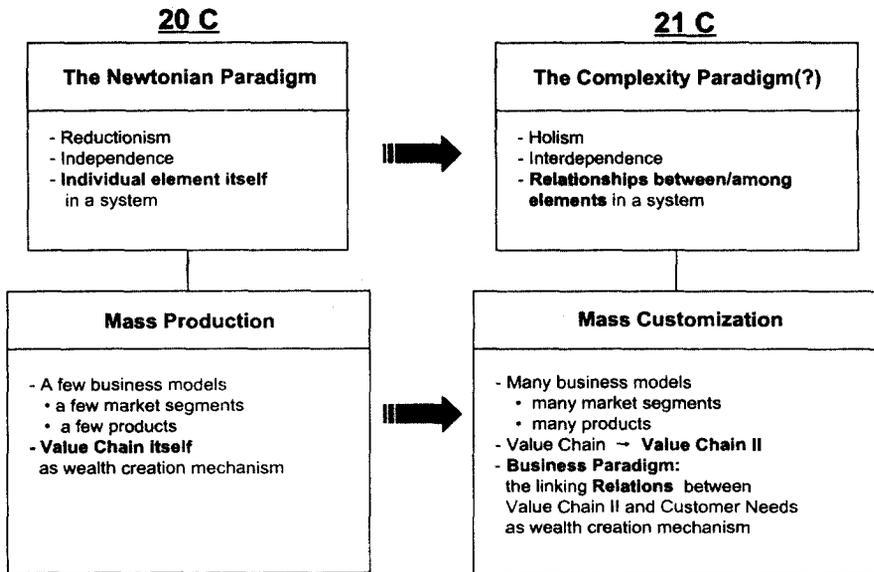how some limitations due mainly to the standpoint of reductionism, the static view, and/or lack of the integrated framework for wealth creation. Under the mass-production regime dealing with a few business models based on the Newtonian paradigm characterized by reductionism, which recognizes the summation of the part as the whole and considers each individual

<Table 1> The major effects on wealth Creation

Determinants of wealth creation	Major proponents /Key words	Level of analysis	Nature of theory/view	Considering integration of firm and industry /Holistic approach
Industry effect	· Industrial organization economics Bain(1972) Caver(1980) Porter(1980)	Industry	Structure-oriented/static	No integration/not holistic (reductionistic)
	· Schumpeterian and Chicago school	Industry	Structure-oriented/static	No integration/notholistic (reductionistic)
Firm effect	· Selznick(1957)	Firm	Structure-oriented/static	No integration/not holistic (reductionistic)
	· Penrose(1959), The theory of the growth of the firm	Firm	Structure-oriented/static	No integration/not holistic (reductionistic)
	· Lippman and Rumelt(1982)	Firm		
	· Wernerfelt(1984)	Firm	Structure-oriented/static	No integration/not holistic (reductionistic)
	· Prahalad & Hamel(1990)	Firm	Structure-oriented/dynamic	No integration/not holistic (reductionistic)
	· Barney(1991), Grant(1991), Rumelt(1991) · Mahoney & Pandian(1992) · Czrrol, Peteraf(1993)	Firm		No integration/not holistic (reductionistic)
	· Teece, Pisano & Shuen(1997)	Firm	Structure-oriented/dynamic	No integration/not holistic (reductionistic)
Industry effect + Firm effect	· PPM(1970s)	Industry and firm	Structure-oriented/static	Yes/holistic
	· Evolutionary economics Nelson and Winter(1982)	Industry and firm (primarily industry)	Process-oriented/dynamic	Yes/not holistic
	· Barney(1986)	Environment and firm		
	· Montgomery(1991, 1995) · Montgomery & Hariharan(1991)	Industry and firm		Yes/not holistic
	· Amit & Schoemaker(1993)	Industry and firm	Structure-oriented/static	Yes/not holistic
	· Kim(1997)	Industry and firm	Structure & process-oriented/dynamic	Yes/holistic
	· Mauri & Michael(1998) · Makadok(1999)	Industry and firm		Yes/not holistic
Interaction effect	· Zajac, Kraatz & Bresser(2000)	Environment and firm	Process-oriented/dynamic	No/holistic implicitly
	· Meeus & Oerlemans(2000)	Environment and firm	Process-oriented/dynamic	No/holistic implicitly
	· Kim & Han(2000)	Industry and firm	Structure & process-oriented/dynamic	Yes/holistic explicitly
Industry effect+ Firm effect+ Interaction effect	· Kim(1999)	Industry and firm	Structure & process-oriented/dynamic	Yes/holistic explicitly

Source: Author

〈Figure 1〉 Why a New Framework for Wealth Creation?

An Integrated, Holistic, and Dynamic Framework for Wealth Creati on is to be required

element itself in a system as an important one, the value chain of Porter itself can be thought as the wealth creating mechanism. However, under the mass-customization regime dealing with many business models based on the complexity paradigm characterized by interdependence (relations) rather than independence, the business paradigm as the linking relations between the value chain (supply side) and the customers' needs (demand side) to be met by that value chain will become much more important than the value chain itself. And not only the entrepreneurial activities to make decisions about the business domain but also the resources on which the activities can be done need to be

added to the Porter's value chain by the form of value chain II. In other words, as the paradigm shifts from the Newtonian one characterized by reductionism and independence to the complexity one by holism and interdependence, a quite brand-new theoretical framework is to be required to explain the firm dynamics for wealth creation in a dynamic environment (Figure 1), even though there will probably be the problems of incommensurability that often prevents effective dialog between competing paradigms (Kuhn, 1962).

Then, how can we explain the firm dynamics in the complexity paradigm?

In this paper, I attempt to build a dynamic

theory of the firm to explain the firm dynamics in the age of mass-customization based on social physics that applies the laws and formulas in physics to the firm dynamics and on sociobiology that adopts analogically the developmental biology to the processes of interaction between industry driving forces (external vectors) and strategic behavior variables(internal vectors). Firstly, a dynamic model of firm performance named The Firm Power Theory is introduced as a theoretical model in which the industry power (industry effect), the firm power (firm effect), and the strategic change modes (interaction effect)-the way for a firm to deal the drivers of industry with those of firm-can be recognized as the determinants of wealth creation.

And then, some descriptive and normative propositions about the firm power, industry power, strategic change modes, and firm performance are subjectively derived from the laws of interaction among the constructs of the model without testing them empirically. Finally, I will provide some normative guidelines for the strategic change modes with the premises that the firm competence (supply side) has directly to be related with customer needs as the source of wealth (demand side) in order to explain wealth creation especially in the age of mass-customization as mentioned before, and the firm should behave in a dynamic environment as a good explorer (Exploration strategy) for the new business(es) by developing the dynamic business paradigm fit as well as the good enabler (Exploitation strategy) for the existing business(es) by obtaining the dynamic business paradigm fit.

II. DYNAMIC MODEL OF THE FIRM PERFORMANCE

This paper deals with firm dynamics of wealth creation in an integrated, holistic, and dynamic way with a stronger rationale. Here the terms, "integrated"means that firm and industry have to be considered simultaneously in a model. "holistic" points that the industry and the firm should be taken as a whole respectively. "dynamic" represents that structures (stock) and processes (flow) must be taken at the same time including time variables, and "a stronger rationale" implies that either an analogical or a deductive method can be better than an intuitive or inductive method because there might be a possibility in an analogical or a deductive approach to overcome the subjectivity of intuition, and/or the limits of induction that there might be a possibility for the proposition derived from the process of induction to be rejected by even an extraordinary event or fact different from what used in induction. This

<Figure 2> A dynamic framework for firm performance

* BPF: Business Paradigm Fit   SF: Static Fit *
  DBPF: Dynamic Business Paradigm Fit   VC II: Value Chain II

can be done by taking the firm as a corporate system and the industry as an industrial system from the holistic and integrated view simultaneously, and also by treating the structures (stock) and the processes (flow) of wealth creation in a dynamic framework with time variables based on social physics. A dynamic framework of firm performance in this paper can be represented as below <Figure 2>.

As seen in <Figure 2>, dynamic model takes the industry competence (IC) and firm competence (FC) at the starting point of time t (the same as the finishing point of time t-1) as the initial conditions, and deals with how a firm (let's assume here the firm as a single-business firm) adapt

to or to create industry driving forces with strategic behavior variables over time t. In the dynamic model, the wealth created by a firm over time t can be thought of as the function of the market size (MS) as industry profit potentials, the industry power (industry effect), the firm power (firm effect), and the strategic change modes (SCM) (interaction effect). That is,

The focal concern in the dynamic model is to obtain the dynamic fit between the customer needs as the potential source of wealth and the firm competence in selecting, producing, and providing the products to the customers in the processes of evolution of industry and/or co-evolution between the market and the technology. In order to obtain

[Firm Performance]t = f [(MS)t,   (IP)t,   (FP)t, ε]

= f [(MS)t, (IC)t-1 · (IDF)t, (FC)t-1 · (SBV)t, (SCM)t, ε]
(profit potentials)   (industry effect)   (firm effect)   (interaction effect)

It also can be expressed by the relative magnitude of power that the firm can attain against the power of an industry where the firm belongs. That is,

[Firm Performance]t = f [(MS)t, (IP)t, (RFP)t , ε]
= f [(MS)t, (IP)t, (RFP)t-1 · (SCM)t, ε]

Where,

Market Size (MS): the market size as industry profit potentials, reflecting the size of the customer group unsatisfied in a marketplace as physical market and/or an e-marketplace as virtual market

Firm Competence (FC): the aggregate of capabilities to create wealth a firm as a corporate system has

Firm Power (FP): the dynamic competence a firm has which conceptually represents the competence having the directions and magnitudes.
Dynamically, (FC)t-1 · (SBV)t = (FP)t. Statically, (FP)t-1 = (FC)t-1

Industry Competence (IC): the aggregate of capabilities to create wealth all the firms in an industrial system collectively have

Industry Power (IP): the dynamic competence all the firms in an industrial system collectively have. Dynamically, (IC)t-1 · (IDF)t = (IP)t. Statically, (IP)t-1 = (IC)t-1

Industry Driving Forces (IDF): all kinds of the environmental changes that affect the industrial system, working on the corporate system as the external vectors

Strategic Behavior Variables (SBV): the variables for firm to adapt to or to create the industry driving forces with the strategic will, working as the internal vectors of the corporate system.

Strategic Change Modes (SCM): the modes that represent the ways of strategic change to adapt to or to create IDF with SBV over time, through which dynamic fit between firm competence (supply-side) and market needs (demand-side) can be obtained

Relative Firm Power (RFP): the firm power expressed relatively by the comparison of a firm's firm power to its major competitor's one.
Dynamically, (RFP)t = (RFP)t-1 · (SCM)t, which means that (RFP)t is the outcome of (SCM) working on (RFP)t-1 over time t

ε : Random variables

the dynamic fit, an insight is needed to understand the overall big picture of the firm competence and industry competence at the starting time (it requires a cross-sectional approach). Also, a foresight to perceive the industry driving forces (IDF) and an imagination to prepare strategic change modes for adapting to IDF with the strategic behavior variables (SBV) over time (it requires a longitudinal approach) are required as well.

2.1 Social Physics as the Rationale of the Firm Dynamics

Which rationale could explain the firm dynamics to create wealth? Before dealing this issue, let's first define what the firm dynamics are. While a corporate system as a holistic expression of firm creates value through the incessant activities in a dynamic environment to which it belongs, the firm as a dynamical system takes its

own dynamic behavior patterns and/or trajectories that can reflect the firm's manner and modes to create wealth. Therefore, the firm dynamics can be conceptually defined as a firm's time- varying (dynamical) behavior to create wealth in a dynamic environment. As far as dynamics are concerned, there are general laws of mass and motion in physics. According to the laws and formulas of mass and motion in physics, power is a product of force (F) and velocity (vel), where force is a product of mass (m) and acceleration (a), and also mass is a product of volume (v) and density (d).

Mathematically,

$$
\begin{aligned}
\text{power} &= F \times \text{vel} \\
&= m \times a \times \text{vel} \\
&= v \times d \times a \times \text{vel}
\end{aligned}
$$

Among the equations above, $m \times a = F$ certainly is the most familiar equation in physics as the Newton's 2nd law of motion $m = v \times d$ is also a well-known formula. Now we can apply these relationships analogically to firm dynamics of wealth creation from the standpoint of social physics. Namely, applying this to firm dynamics, a firm has competence as a mass, and multiplying the acceleration to competence, we can calculate the force of the firm. Again, multiplying force by the velocity, we can determine the dynamic competence, which is the firm power to create wealth. The

rise and fall of a firm depend upon how the firm adapts itself to the industry driving forces in the evolution of industry and/or co-evolution between firm and industry. This is the basic idea in the dynamic model of firm performance named the Firm Power theory. The "Firm Power" and "Industry Power" are two basic conceptual pivoting points of the theory. The dynamic competence to create wealth by a corporate system is defined here "Firm Power". The components of the industry power can also be determined analogically based on social physics.

III. FIRM POWER

Based on social physics, firm power can be presented as an analogy by substituting the volume to firm size (FS), the density to the corporate system density, the mass to the firm competence (FC), the acceleration to the innovation (INN), and the velocity to the growth vector (GV). First what is a corporate system density? A corporate system as a value creating mechanism can be represented in the form of value chain. Therefore, a corporate system density can be understood as the degree of congruence between the market needs and the value chain with which the market needs can be

met. In other words, corporate system density shows how fit a value chain is to meet customer needs in the market. When the linkage between the value chain and customers needs in the market is defined as business paradigm, a corporate system density may be expressed as business paradigm fit (BPF). Now the firm competence can be expressed by the firm size having a specific business paradigm fit (mathematically, $FC = FS \times BPF$). Second, when is the logical situation to apply acceleration to innovation and velocity to growth vector? According to physics, when acceleration, the rate of change in velocity, works on mass, it results in an increase in force. When velocity as vector having the direction and magnitude/speed, works on force, it results in increase/decrease in power. Firm should basically continue to grow in order to survive and prosper by enhancing and/or destroying the existing competencies, and by building the new ones. Growth vector can be applied to velocity as a firms direction of growth and its speed, and innovation can be applied to acceleration as the source of driving force for a firm to grow. The firm power is the effect of the product of the firm competence at the starting point in time t (or the finishing time t-1) (initial conditions) and the strategic behavior variables (causes) as the combination of innovation and growth vector over time t.

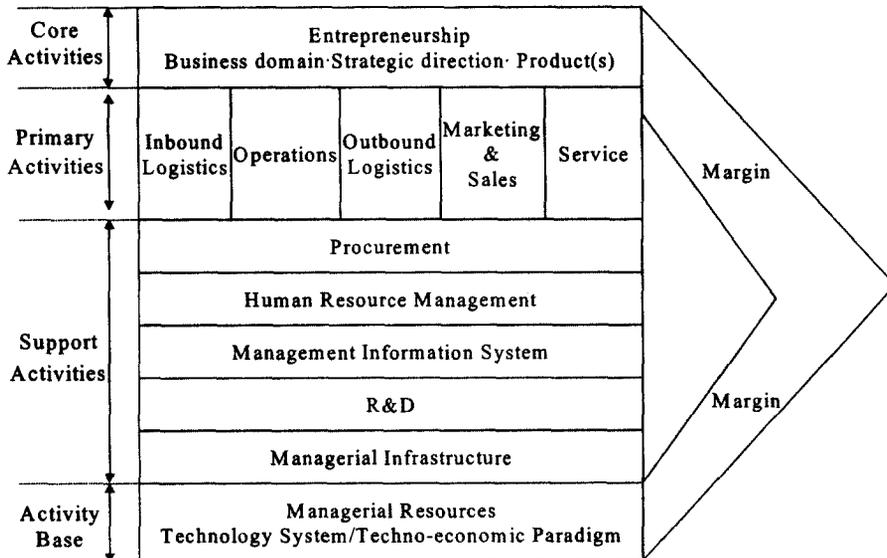Mathematically, the dynamic relationship among the components of firm power can be expressed as follows.

$$FC_{t-1} \cdot (SBV)_t = FP_t$$
$$(FS \cdot BPF)_{t-1} \cdot (Inn \cdot GV)_t = FP_t$$

(Initial Conditions)   (Causes)   (Effects)

$$(FS \cdot BPF)_t = FP_t$$

3.1 Value Chain II

In a dynamic environment, the value chain II is thought to be more meaningful than the conventional value chain. The more turbulent the dynamic environment becomes, the more important for the entrepreneurship to make choices of business domain and scope, the more chances to enhance or to disrupt the existing resources or competencies in accelerated waves of technological change, the more crucial the selection of technology becomes. Therefore, value chain proposed by Porter (1985) can be extended to value chain II (Figure 3) in order to include the entrepreneurship as core activity and the managerial resources deployed on the specific technological systems/ techno-economic paradigm as activity bases in addition to the Porter's value chain.

The necessity of the inclusion of the

⟨Figure 3⟩ Value Chain II

Core Activities	Entrepreneurship Business domain·Strategic direction· Product(s)					
Primary Activities	Inbound Logistics	Operations	Outbound Logistics	Marketing & Sales	Service	Margin
Support Activities	Procurement					
	Human Resource Management					
	Management Information System					
	R&D					
	Managerial Infrastructure					Margin
Activity Base	Managerial Resources Technology System/Techno-economic Paradigm					

managerial resources and technological system (s) / techno-economic paradigm in the value chain might be found by the resource- based management view (Wernerfelt, 1984; Barney, 1991; Prahalad & Hamel, 1990), the evolutionary economics (Nelson & Winter, 1982), and the techno-management literature (Freeman, 1988). In practice, core competence can be obtained through the core, primary, and support activities based on the available managerial resources allocated in specific technological systems, which constitute the activity bases. It implies that the outcomes resulting from even the same activities may vary depending on the activity bases. By activities working on activity bases, the managerial resources can be transformed into core competencies, and also they can be embodied in the parts/components and finally in the tangible and/or intangible product(s) (here product includes goods and services) already similarly presented by Prahalad and Hamel (1990) with which the firm links directly to the customers in a target market segment (Figure 4).

In fact, the value chain II is thought to be more meaningful under the mass-customization regime in a dynamic environment than the conventional value chain.

3.2 Business Paradigm

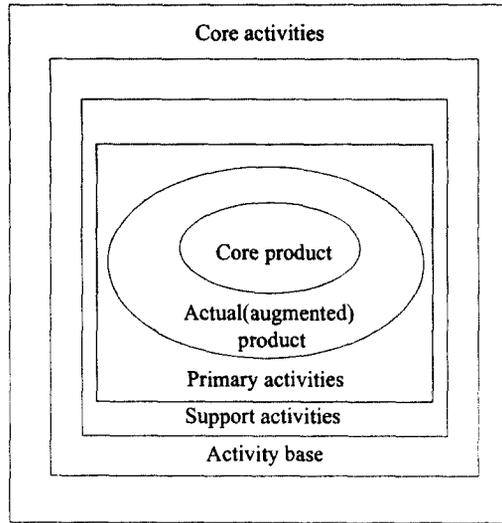In order to explain the wealth creation, business should be introduced as a basic

⟨Figure 4⟩ Relationship between technology, resources, activities, core competence,
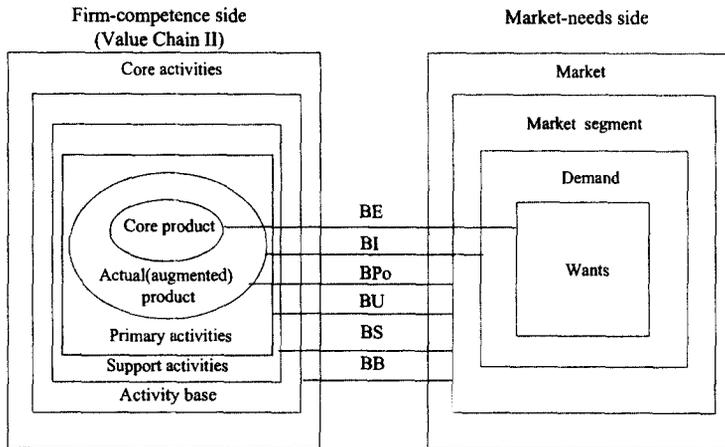product, target segment market, and business

unit of analysis. In defining the business, there have been two powerful models such as Ansoff's 2-dimension uni-level model (1965) that implicitly connects product with market and Abell's 3-dimension uni-level model (1980) made up with customer group, customer function, and technology, but the construct of product/market is still prevailing without any concrete definitions. Recently, supply chain concept that embraces supply side and demand side was introduced since Internet Revolution but it focuses on the synchronous flows of logistics from vendors through manufacturers and distributors to the customers. Kim's 2-dimension multi-level model (Kim, 1999) to connect the firm competence with the customer needs as raison d'etre of firm was introduced to explain wealth creation with the expectation of reflecting the customer satisfaction. From the product point of view, the product is selected by the core activities and produced and provided to the customers through the primary activities with the help of the support activities based on the activity bases. In the sense that the activities in the

〈Figure 5〉 Levels of value chain II

〈Figure 6〉 Levels of Business Paradigm

BE: Business Entity   BU: Business Unit
BI : Business Identity   BS: Business System
BPo : Business Position   BB : Business Base

value chain II contribute differently to the material flows from the suppliers to the customers and that the product has such levels as core product, actual product, and augmented product (Kotler & Armstrong, 1993), a value chain II is thought to have

multi-level as shown in ⟨Figure 5⟩.

And market needs has also multi-level in term of the intrinsic relationship that means that which one among wants, demand, market segment, and market, best represents the attributes of customers' needs more intrinsically than others. In other words, wants is more intrinsic than demand, demand than market segment, and market segment than market. When the levels of the value chain II and market needs are corresponding with each other, they constitute 2-dimension multi-level model of business that is termed here Business Paradigm. It has some levels: business entity; business identity; business position; business unit; business system; business basis (Figure 6); business portfolio as the combination of business unit or business system.

The business entity refers to the linkage between Wants and Core product, the business identity between Demand and Actual (or Augmented) product, the business position between Target market segment and Actual (or Augmented) product, the business unit between Target market segment and business position with the Primary activities, the business system between Target market segment and business unit with the Support activities, and the business basis between Target market segment and the activity basis. Why then do we have to pay much attention to the business paradigm in

the age of mass-customization? It is because that even just the same value chain II can give rise to quite different firm performance according to which market's customer needs a firm intends to meet with its firm competence including core competence. In other words, the firm performance depends upon the relationship between the customer needs (demand side) and the firm competence (supply side), not the firm competence itself.

3.3 Business Paradigm Fit

Now from the concept of business paradigm, the business paradigm fit (BPF) that represents the congruence between the market needs and the value chain II can be derived, and the concept of the business paradigm advantage (BPA) can also be obtained by comparing the firm's BPF with that of the major competitor(s). The business paradigm fit has just the same levels as the business paradigm does.

Thus far there have been so many attempts to deal with the concept of 'fit' in the strategic management field. That is, strategy has been heavily dominated by the concept of a 'fit' between the internal characteristics of the organization and the external environment. The constructs of the 'fit' dealt with so far in the strategic management field can be classified into such

〈Table 2〉 The Characteristics of the Fit typology and their Strategic Applicability

Types of fit	Fit between/among	Proponents	Analytical approach and standpoint	Concern about		Focus of the fit
				time	interaction effect	
Static fit	Environmant-Strategy	Bain(1956), Chandler(1962), Hofer(1975), Bourgeois(1980), Christensen & Montgomery(1981), Porter(1980)	· cross-sectional · reductionistic	No	No	passive fit
	Strategy-Structure	Chandler(1962), Channon(1971), Rumelt(1974), Galbraith & Nathanson(1978), Grinyer & Yasai-Ardekani(1981), Stonich(1982), Szilagyi & Schweiger(1984)	· cross-sectional · reductionistic	No	No	passive fit
	Environment-Strategy-Structure	Chandler(1962), Andrews(1971), Caver(1980), Miles & Snow(1980), Grinyer, Yasai-Ardekani & Al-Bazzaz(1980), White & Hammermesh(1981)	· cross-sectional · reductionistic	No	No	passive fit
Strategic fit	Environment-Organization	Pfeffer & Salancik(1978), Aldrich(1979), Khandwalla(1981), Pennings(1981), Ansoff(1982), Fombrun & Astley(1983)	· longitudinal · reductionistic	No	yes	active fit
	Internal element-Internal element within organization	Child(1972), Montanari(1978)	· longitudinal · reductionistic	No	yes	active fit
	Environment-Internal elements within organization	Thompson(1967), Thorelli(1977), Vande Ven(1979), Lawrence & Dyer(1980), Hebiniak(1981), Jauch & Osborn(1981), Chakravarthy(1982)	· longitudinal · reductionistic	No	yes	active fit
Dynamic fit	Industry-Firm	Miles & Snow(1994), Zajac, Kraatz & Bresser(2000), Meeus & Oerlemans(2000), Kim & Han(2000)	· longitudinal · reductionistic	No	yes	leverage fit
Dominant fit	Buyer-Seller	Weitz & Bradford(1999), Bradely & Lolan(1999)	· longitudinal · holistic	No	yes	leverage fit
	Customers' needs-Firm competence	Kim(1999)	· longitudinal · holistic	yes	yes	leverage fit

categories as the static fit, the strategic fit, the dynamic fit, and the dominant fit in terms of whether considering the time variable and/or interaction effect in wealth creation or not. The static fit represents the one at a given time in a given system state with the so-called tradition SWOT approach without considering any interaction effect on wealth creation based on cross-sectional approach, the strategic fit is the one at the ending time in a given system state with considering only interaction effect without
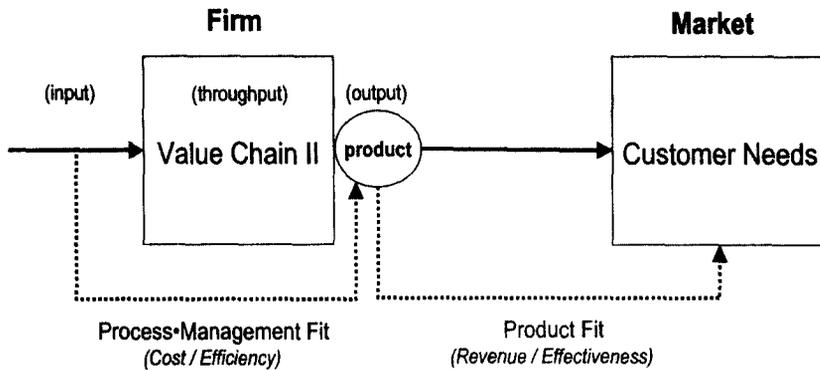
Consideration of the wealth creation mechanism and/or process	Strategic applicabilities		
	Strategic implications	Usefulness	Limitations
nothing	recognizing the importance of industry analysis	providing the logic of tradition SWOT	too inclusive and intuitive
nothing	recognizing the importance of strategy and resource allocation	obtaining the competitive advantage through accumulation and deployment of the inimitable resources	lack of framework for creating the sustainable competitive advantage and little consideration of the environmental forces
nothing	integrating the strategy formulation and implementation	harmonizing the external fit between environment and strategy, and the internal fit between strategy and structure	equality view on various fits
insufficient	recognizing the importance of the flexible structure coping with the environmental change	presenting the ways to manage the diversified businesses for superior firm performance	not considering the corporate and business strategy level
insufficient	recognizing the importance of dynamic management for firm-specific resources	high firm performance through internal fit among organizational factors	lack of mechanism to connect the environment to organization due to the internal resource view
insufficient	emphasizing the multilateral interaction, not bilateral interaction between environment and organization	presenting a basis for dynamic and integrated mechanism among environment and internal elements within organization	vague and subjective to find out the industry's characteristics and firm's distinctive competence
insufficient	an integrated approach to handle industry evolution with firm's innovative efforts simultaneously	an integrated and dynamic approach to firm heterogeneity with holistic view	lack of mechanism to connect industry and firm dynamically
sufficient	considering customer needs side and firm side	attempt to connect the functions of production and marketing in a firm	connection with 2 dimension uni-level
complete	focusing on the fit for very wealth creation in terms of 2 dimension multi-level	consider intensively customer needs environment rather than industry environment	additional empirical verification to be required

source: 1) White Planis(1998), 2) Jonathan P. Doh(2000), 3) Miles & Snow(1994); Zajac, Kraatz & Bresser(2000), Meeus & Oerlemans(2000), 4) Author, 5) Venkatraman and Prescott (1990), 6) Itami(1993)

time variables based on longitudinal approach, the dynamic fit stands for the one during a given period of time in a given system state or in a different system state dealing with the external vectors and internal vectors with considering the interaction effect and time variables as well

based on longitudinal approach, and the dominant fit is the one in a given system state or in a different system state that focuses directly and intensively on the wealth creation structures and/or processes with considering both the interaction effect and time variables together based on

〈Figure 7〉 Product Fit and Process/Management Fit

longitudinal and cross-sectional approach. Each one has its own characteristics and strategic applicabilities. However, all except the dominant fit don't seem to have worked well for explaining the wealth creation because they merely emphasize the alignment among the environment, strategy, and structure (Drazin and Van de Ven, 1985; Venkatraman and Camillus, 1984) without focusing intensively on the relations between the firm side and the market side (Table 2). It does mean that all the relations between the environmental factors and the firm are not equally important, but the one between the customer needs (market) and the firm competence (firm) is the most important. In this respect, the business paradigm fit (or advantage) as a dominant fit can be used as a powerful tool to identify and evaluate the strengths and weaknesses of a firm in more detail at any given time. Just as a medicine doctor diagnoses patients with the under-

standing about the structure of human body, a manager is able to examine a firm's health conditions as a firm doctor by analyzing the business paradigm fit (or advantage).

The business paradigm fit can be divided into two parts; the product fit (including the level of business entity fit, business identity fit, and business position fit) that represents the effectiveness to reflect the revenue and the process/management fit that stands for the efficiency to reflect the cost (Figure 7).

3.4 Strategic Behavior Variables (SBV)

In the dynamical relations of the firm power, FPt is the outcomes of $(SBV)_t$ over time t, working on FC_{t-1} that is path-dependent. While FC_{t-1} as the initial conditions represents the structures (stock) at time t-1, $(SBV)_t$ as combination of innovation and growth vector reflects a firms strategic

will to change over time t dealing with the processes (flow).

□ Innovation as a strategic behavior
   variable

Innovation $(Inn)_t$ is the driving force for reaching $(FP)_t$ in the long-run direction of $(GV)_t$, given the initial conditions $(FC)_{t-1}$. Through innovation, the existing competencies can be enhanced in resolving the bottlenecks a firm has and also the new competencies can be formed. In case of enhancing the existing competencies, the business paradigm fit at the starting point provides a picture of which areas require innovation and in what form and how such innovation should be incorporated. Innovation is closely related to the technology, which forms the activity basis for a firms value chain II. If a technological change (innovation) occurs, the subsequent change in firm power has an effect on some or all the competitors including the potential ones, or possibly the entire industrial structure. In short, innovation is a strategic behavior variable as the driver of firm to grow as indicated already by Schumpeter (1934). According to the impacts of innovation on the economic system, it can be divided into two categories: Metabolic (incremental) Innovation (Mb); Metamorphic (radical or breakthrough) innovation (Mm). Metamorphic Innovation can also be subdivided

into three types according to its impacts on corporate and/or industrial system: Sub-system change (SSC); Technological system change (TSC); and Techno-economic paradigm shift (TEPS).

□ Growth Vector as a Strategic Behavior
   Variable

In order to adapt to or to create the change in a dynamic environment (industry), the firm must first select intended directions and the speed of its growth just as what the concept of the growth vector (Ansoff, 1965) implies. Growth vector as vector that has direction and magnitude, deals first with strategic options of the business domain as strategic path (direction) by considering "what businesses are we in? What businesses we are not in but should be in?" And what businesses are we in but we should not be in? Once the direction of growth is fixed, the speed of growth (magnitude) as strategic pace must also be decided. In relation to the strategic path and pace, an interesting development is the fact that in the neo-classical economic school, the thought of absolute convergence that the difference between the first movers and the late comers will converge in the long run, has begun to be challenged by the thought of conditional convergence in the 1990s (Barro & Martin, 1994), which implicitly indicates the

importance of selecting the growth vector in an ever-changing environment.

IV. INDUSTRY POWER

The components of the industry power can be identified in the same analogical way as the case of the firm power based on the social physics. That is to say, industry competence (IC) corresponds to mass, market size (MS) to volume, industrial system density (ISD) to density, and industry driving forces (IDF) to acceleration and velocity. Now, dynamic relationship among the components of industry power can be expressed as follows:

$$[IP]_t = [IC]_{t-1} \cdot [IDF]_t$$
$$[IP]_t = [MS \cdot ISD]_{t-1} \cdot [IDF]_t$$

(Effects)　　(Initial conditions)　　(Flow)

$$= (MS)_t \cdot (ISD)_t$$

4.1 Market Size as Industry Profit Potentials

Market size $(MS)_t$ as the deposit of the industry profit potentials refers to the size of the customer group unsatisfied in a marketplace as physical market and/or an e-marketplace as virtual market at time t. The trajectory of the market size in a market space becomes the industry life cycle. In short, MSt during a given period of time represents industry life cycle, and MSt at a given point in time illustrates the size of market and the stage in the evolution of the industry.
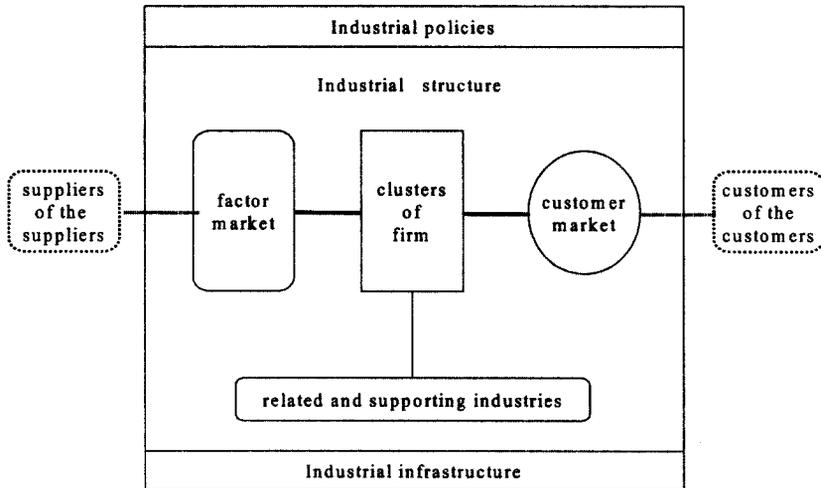
4.2 Industrial System Density

☐ Industrial system

Whereas the industry refers to the clusters of firm offering products that are close substitutes for one another, the industrial system refers to an interrelated collection of the actors in the industrial structure (the clusters of the firm, the customer market, the factor market, and related & supporting industries) that seems to be much similar to the elements in Porter's diamond model, the industrial infrastructure and the industrial policies (Figure 8).

☐ Industrial Structure as the set of the supply chain and value network

While the factor markets supply the inputs for production/operations to the firms to be flowed to downstream to customers, the actors in the related and supporting industries provide the components, machines, or services to the firms as a final flow. Since the Internet revolution, the boundaries of industries are explicitly becoming blurring and more ambiguous, and the interdependency and complexity among
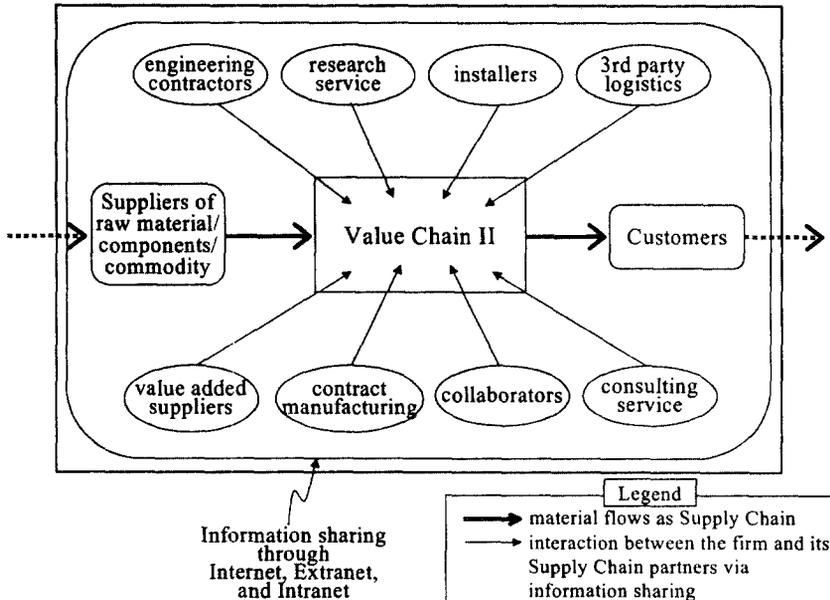
⟨Figure 8⟩ Industrial System

actors in an industrial system are becoming intensified as the industrial fusion or fission has been occurred frequently. Notwithstanding, the industrial structure is the foundation for firm to work on, reflecting not only the conditions of the factor market, demand market, and related and supporting industries as shown in the Porter's National Competitive Diamond Model (Porter, 1990) but also the structure of competition in the Porter's 5-Forces Model (Porter, 1980). In practice, the industrial structure reflects the set of supply chain as a system whose constituent parts including material suppliers, production facilities, distribution services and customers linked together via the feed forward flow of materials and feedback flow of information (Stevens, 1989) that shows the suppliers of the

suppliers in the factor markets through the firm to the customers of the customers, which can be divided into two parts, that of procuring from the suppliers and that of providing to the customers. The industrial structure can be specified in terms of the set of the supply chain and the supply chain partner relationships, which is already defined as value network by PricewaterhouseCoopers (Figure 9).

With the notion of supply chain and value network, the industry segment as a group of interrelated actors can be identified in an industrial system. A relationship among the number of target market segment, industry segment, and competitor can be outlined as follows.

[Number of market segments] ≤ [Number

〈Figure 9〉 Value Network as Supply Chain and its Partner Relationships

of industry segments] ≤ [Number of competitors]

When the value networks are tightly integrated through information sharing based on the intranet/internet/extranet, the value chain II of a firm will bring about more effective business paradigm fit (advantage) through which firm power will become stronger.

□ Industrial Infrastructure

The industrial infrastructure contributes indirectly to form the competitiveness of a certain industry by supporting to make firms more innovative, effective and/or efficient. Recently, technological infra as public goods becomes more and more important as the

global technological war becomes fiercer and speedier (Justman and Teubal, 1995). Techno infra consists of human and intellectual capital as well as physical capital. In contrast to the concept of social infrastructure that is directed at satisfying well-defined needs of an existing market, the techno infra is directed at actualizing potential needs through new capabilities. Although the techno infra assists in enhancing the existing business paradigm fit or building new ones at the firm level, it does not have its own business but rather indirectly creates economic value. In relation to the techno infra, the national innovation system approach emphasizes the facts that the entire innovative surroundings are very

important for the innovative activities of firms/industries in a nation. This notion casts an extremely profound implication for the government's role and the formation of the government's industrial policies to induce innovation under the WTO regime.

□ Industrial policies

The scope and influence of governments industrial policy variable to help obtain national competitive advantage is likely to be more restricted and its usefulness will also decrease. Industrial policy includes rules and regulations on corporate activity, market competition and its structure, and the operation of supporting institutions. On the other hand, the ongoing global race of technological innovation will reinforce the role of industrial policy in a different sense. Industrial policy variables affect the components of industry power through taxation, authorization, subsidization, institutionalization, and/or regulation/ deregulation/ re-regulation. Industrial policy variables have direct/indirect impacts on industry power as a factor of the industry driving forces.

□ Industrial System Density as Density

Industrial system density refers to the degree of relationship among elements (actors) in an industrial system, which can be recognized in aspects of quantity and quality. From the quantity point of view,

the industrial system density depends on the material flows from the suppliers through the firm to the customers which consists of two parts: the degree of self-sustaining capacity of procuring materials from home-based suppliers (DCS) that illustrates how much the home-based suppliers capacity in factor markets to the industrys requirements (the domestic factor markets' capacity/the industry's requirements); the degree of self-sustaining capacity of providing products to buyers (DCB) in an industrial system that illustrates how much the industry capacity can satisfy a target market demand (the industry capacity/ target market size). From the quality point of view, the industrial system density depends on the industry competition intensity (ICI) and the industrial infra fit (IIF); industry competition intensity (ICI) that represents how fierce among competitive factors in an industrial system as indicated in the Porter's 5-forces model, and industrial infra fit (IIF) that reflects the degree of sufficiency and adequateness of the industrial infra to help the firms in the industrial system to innovate and enhance their capabilities to create wealth.

4.3 Industry Driving Forces (IDF)

The industry driving forces as industry drivers refer to the environmental forces that

affect the evolution of industry. The major sources are the technological change, demographic shift, market needs change, economic income change, change of competition structure, and the industrial policy variables. In particular, the technological change affects not only the supply-side (firm and industry competence) but demand-side (market needs) at firm and industry level. The technological change can strengthen or weaken the firm power of current leaders, or even provide opportunities for new entrants and latecomers. Whereas metabolic technological change may strengthen the competitive advantages of the existing first movers, metamorphic technological change may negate the competitive advantage of industry leaders. The patterns that IDF takes are generally classified into four different types: equilibrium; fluctuating equilibrium; punctuated equilibrium; and disequilibrium (D'Aveni, 1999). The type of technological change usually characterizes the nature of industry driving forces, that is to say, metabolic technological change brings about the fluctuating equilibrium, while metamorphic technological change gives rise to punctuated equilibrium or disequilibrium. According to the dynamic relationship,

$$DFt \ = \ \frac{IP_t}{IP_{t-1}}$$

As seen above, the industry driving forces

are the industry power change vectors.

Thus, $IDFt \quad = \quad [\ \varDelta MS \cdot \varDelta ISD]t$

(Market growth change) (Change in industrial system density)

Where the change in the industrial system density involves the change in degree of self-sustaining capacity in providing to buyers ($\varDelta DCB$) and in procuring from suppliers ($\varDelta DCS$), the change in the industry competition intensity ($\varDelta ICI$) and in the industrial infra fit ($\varDelta IIF$). This aspect can be helpful to understand and measure the industry driving forces.

V. STRATEGIC CHANGE MODES

Strategic change mode as the way to adapt to or to create industry driving forces (IDF) with strategic behavior variables (SBV) reflects the effect of interaction between the drivers of industry and those of firm in the evolution of the industry and/or co-evolution between firm (technology) and industry (market). The strategic change mode can be selected and implemented by considering the initial conditions, industry driving forces, and the available combinations of innovation and growth vector as SBV, based on the enviromental determinism in biology which can be regarded as a rationale for the interaction between industry(phenotype) and

firm(genotype) In other words, th developmental biology can analogically be used as a rationale for selecting the strategic change mode.

According to biology, there exist three kinds of types for the developmental processes in biology field : the path-dependency, the environmental determinism, and the cell division. The basic model of the environmental determinism from which a rationale for the interaction between industry and firm might analogically derived can be shown as follows.

phenotype$_{t+1}$ = f (genotype$_t$, intermediate fitnesses during development)

intermediate fitnesses during development = f (exogenous variables or other developing phenotypes)

Based on this model, an industry can be understood as a function of firm within it and the fitness between industry driving forces and strategic behavior variables or other related industries. That is,
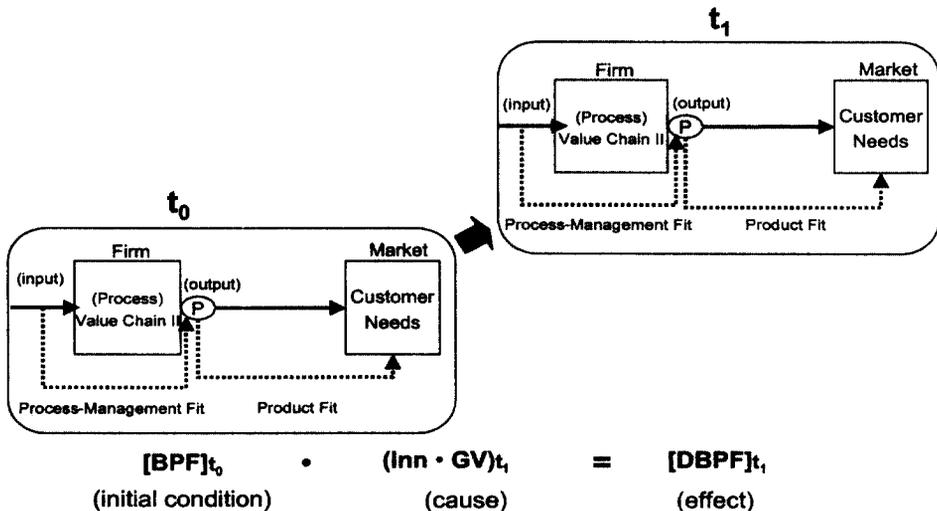
industry$_{t+1}$ = f (firm$_t$, fits during industry evolution)

fits during industry evolution = f(industry driving forces and strategic behavior variables, or other related industries)

The result of the strategic change mode would finally be expressed as the dynamic business paradigm fit. The dynamic business paradigm fit during over time t reflects the dynamic strategic fit, which means the effect of interaction between the drivers of market and the firm's innovative efforts over time t, based on the static fit at the starting time t.

Dynamically, it can be expressed as follows.

〈Figure 10〉 Dynamic Business Paradigm Fit

[BPF]t_0 • (Inn • GV)t_1 = [DBPF]t_1

(initial condition) (cause) (effect)

$$[BPF]_{t-1} \quad \cdot \quad (INN)_t \quad = \quad [DBPF]_t$$

(initial conditions) (cause) (effect)

where $[BPF]_{t-1}$ = Business Paradigm Fit as static fit at the starting time t, which represents the structures

$DBPF]_t$ = Dynamic Business Paradigm Fit at the ending time t, which is the result of dynamic fit during overtime t

$(INN)_t$ = Innovation as flow, which represents processes during over time t.

As shown in this relationship, the business paradigm fit at time t-1 (initial condition) can be changed into the dynamic business paradigm fit at time t (effect) through innovative efforts with certain growth vectors (cause) over time t (Figure 10).

If the initial conditions are the same among firms, the result of dynamic strategic fit (Zajac, Kraatz and Bresser, 2000) between the industrial driving forces (external vectors) and the strategic behavior variables (internal vectors) becomes equal to the dynamic business paradigm fit in all firms. It does mean that the same strategic change mode can give rise to quite different dynamic business paradigm fit, depending upon the initial conditions and the nature of the industry driving forces.

With regard to the strategic change modes, there will be some normative guidelines derived from the contingency views based on the universal laws about the relationship between the dynamic business paradigm fit and the firm performance (see Proposition SCM 2).

VI. LAWS OF INTERACTION AND PROPOSITIONS ABOUT THE RELATIONSHIPS AMONG THE CONSTRUCTS IN THE THEORETICAL MODEL

In this paper, some propositions about firm power, industry power, and strategic change modes were subjectively derived from the laws of interaction among constructs of the dynamic model of the firm performance. The law of interaction states the general relationship among constructs, whereas the proposition predict the specific values that one or more construct will have in relation to the values of other(s). In brief, the law of interaction tells what the relationship is, and the proposition states what the predicted values of the constructs will be. Since propositions deal with the

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1) Dubin originally termed 'strategic' to show simply the significant ones among numerous propositions in his 'Theory Building', but in this paper, 'meaningful' was used instead of it to avoid semantic confusion.

interaction between two or more concepts, there can be a countless number of propositions. A true statement of significant relationships between constructs becomes a meaningful[1] proposition (Dubin, 1978).

6.1 Laws of interaction among constructs in the theoretical model

L1: [Firm Performance]$_t$
$$= f[(MS)_t, (IP)_t, (FP)_t, \varepsilon]$$
$$= f[(MS)_t, \quad (IC)_{t-1} \cdot (IDF)_t,$$
(profit potentials)   (industry effect)

$$(FC)_{t-1} \cdot (SBV)_t, (SCM)_t, \varepsilon]$$
        (firm effect)   (interaction effect)

L2: Dynamic Relations about the Firm Power

$$FC_{t-1} \qquad \cdot (SBV)_t \qquad = FP_t$$
$$(FS \cdot BPF)_{t-1} \cdot (Inn \cdot GV)_t = FP_t$$
(Initial Conditions)   (Causes)   (Effects)

L3: Dynamic Relations about the Business Paradigm Fit

$$[BPF]_{t-1} \quad \cdot \quad (INN)_t \quad = \quad [DBPF]_t$$
(initial condition)   (cause)   (effect)

L4: Dynamic Relations about the Industry Power

$$[IC]_{t-1} \qquad \cdot \qquad [IDF]_t \qquad = \qquad [IP]_t$$
$$[MS \cdot ISD]_{t-1} \cdot \quad [IDF]_t \qquad = \qquad [IP]_t$$
(Initial conditions)   (Effects)   (Flow)

6.2 Descriptive propositions relating to the firm power

FPD 1: Firm size (FS) carries economies of scale, but its influence on firm power and on relative firm power is conditional. If the business paradigm fit (advantage) is good (better), then firm size contributes to firm power. If not, firm size damages to the existing firm power.

FPD 2: Firm competence (FC) can bear economies and diseconomies of scale, entropy and obsolescence, inertia and indivisibility.

FPD 3: In relations between Market Needs and Firm Competence:

i) If (firm competence) = (market needs), there is a balance fit which is the optimal condition for business paradigm fit.

ii) If (firm competence) is smaller than (market needs), there is an under-fit and the difference indicates the critical factor. If (firm competence) is greater than (market needs), there is an over- fit and the difference is slack. Either under-fit or over-fit means misfit, but the latter is better than the former (Zajac, Kraatz and Bresser, 2000).

FPD 4: The source of business paradigm fit (BPF) is core competence, and the source of business paradigm

advantage (BPA) as a relative expression of (BPF) by competitors, is distinctive competence. The relationship between BPF and BPA is as follows.

i) If BPF is good, then BPA is also secured.

ii) Even though BPF is bad, if competitors' BPF is worse, then BPA is secured. That is, BPF is a necessary condition of BPA.

iii) While the business paradigm advantage gives rise to a short-term success, the business paradigm fit results in an intermediate and long-term success of a business (Analogous to the fitness landscape of Kauffman, 1993). It implicitly implies that the business paradigm fit approach is more recommendable than the competitive advantage approach from the long-term point of view.

FPD 5: With regard to market (customer) needs:

i) The customer generally has a combination of needs attributes such as $(A \cdot P \cdot Q \cdot D \cdot F \cdot S)^N$ where A is the amount, P is the price, Q is the quality, D is delivery, F is the flexibility, and S is the services. Now, in order to satisfy this combination of needs attributes, the product must have an attribute set of $(A \cdot P \cdot Q \cdot D \cdot F \cdot S)^S$

ii) People want to obtain greater amounts of low-priced and high-quality products as quickly as possible.

iii) Given the same price, people want better, more, quicker, greater reliability and variety.

FPD 6: With regards to the relationship between market and technology:

i) Greater unmet needs accelerate technological innovation. (Analogous to Demand Pull)

ii) Innovation can turn potential markets into actual markets. (Analogous to Technology Push)

iii) Technology and market coevolves through innovation enlarging actual markets, and potential markets inducing innovation.

FPD 7: Innovation generally depends on a firm-specific learning process that interacts with changes in market needs and new scientific technologies. However, innovation activities differ because each firm has different initial conditions $(FP)_{t-1}$, long-term directions $(GV)_t$ and strategic objectives $(FP)_t$, and strategic will $(Inn)_t$ to cope against the industry drivers. In whichever case, unless the dynamic business paradigm fit can be formed through innovation,

firm success cannot be expected.

FPD 7-1: Success of innovation has no direct relations with firm size (FS).

FPD 7-2: Before there appears the dominant design in metamorphic (radical) innovation, the first mover would be advantageous over competitor(s) (Lieberman & Montgomery, 1988; Kerin, Varadarajan & Peterson, 1992;), but when there is the dominant one in the industry, either the first mover or the latecomer advantage depends entirely on whether and how to obtain the dynamic business paradigm fit.

FPD 8: Selection of the target market segment is important in establishing business paradigm advantage. However, it may be more important to secure the resources that make it possible to introduce products that vitalize the firm's competitive advantage (Prahalad & Hamel, 1990). However, such resources are not sufficient but necessary conditions for business paradigm advantage.

6.2 Normative Propositions relating to the firm power

FPN 1: In case of enhancing the existing competencies, the fit at each busi-ness paradigm level must be secured in successive order. That is, business entity fit, business identity fit, and business position fit must be secured in advance rather the business unit fit and the business system fit. In other words, product innovation should be followed by process and/or managerial innovation, and even in product innovation, the core product innovation should be done first and then the actual product innovation and the augmented product innovation successively (Table 3).

FPN 1-1: FPD 7-3: Innovation should be done, taking into accont the Red Queen effect (Van Valen, 1973; Barnett & Hansen, 1996), the threshold effect, and the butterfly effect (Waldrop, 1992; Kauffman, 1993).

FPN 2: To secure business paradigm advantage, the firm must outdo its competitors in procuring, producing and providing product(s) to meet the customers needs in the target market (s) through supply chain management (SCM), enterprise resource planning (ERP), and customer relations management (CRM).

FPN 3: In relation to the Pursuit of Business Advantage:
i) If the business paradigm ad-

vantage is better than competitor(s), an upsizing strategy should be pursued because firm size positively contributes to firm competence.

ii) If the business paradigm advantage is average, firm size does offer no differentiability; the firm should carefully pursue a differentiation strategy since firm size does offer no differentiability.

iii) If the business paradigm advantage is mediocre, a downsizing strategy through divestiture or retrenchment should be looked for because firm size has a negative contribution to firm competence.

6.3 Descriptive Propositions Concerning the Industry Power

IPD 1: Concerning market size (MS):
  i) As MS increases, so does market attractiveness (MA), where MA= MS-IP.
  ii) As MS increases, technological change (innovation) occurs at a faster pace (market pull).
IPD 2: Among industry driving forces (IDF), the effect of technological change on MS depends on the type of change.
  i) Metabolic technological change

(Mb) enlarges the existing market size (Technology push).
  ii) Metamorphic technological change (Mm) (or the emergence of substitute products) shrinks or replaces the existing market, while enlarging the MS of the new market (Dosi, 1982).
IPD 3: Concerning the balance of supply chains: with regard to DCB (degree of self-sustaining capacity in providing to buyers) expressed as industry capacity/market size and DCS (degree of self-sustaining capacity in procuring from the home-based suppliers) stood for as home-based suppliers' capacity/industry's requirements:
  i) DCB is always less than or equal to DCS. In other words, DCB is confined to DCS.
  ii) DCS depends on a few bottleneck items so called core parts/components from home-based suppliers in the supply chains.
  iii) In seller's market, DCS is more critical than DCB, but in buyer's market it depends on.
  iv) When DCB ranges between zero and one, the greater DCB becomes, the stronger the industry power will be (or the weaker the buyers' bargaining power will be).

〈Table 3〉 Strategic guidelines for innovation by business paradigm level

Business Paradigm Levels	In terms of long-run sustainability		Strategic Guidelines
	Fit in terms of absoluteness	Advantage in terms of comparativeness	Search routines for strategic alternatives
Business Entity (BE)	Good	Strong	Go to BI
	Bad	Strong	Go to BI
		Average	Strengthen BEF Core Product Innovation
		Weak	Disrupt the existing BE and search for new core product(s), or enhance the existing BE with strategic alliance
Business Identity (BI)	Good	Strong	Go to BPo
	Bad	Strong	Go to BPo
		Average	Strengthen BIF Actual Product Innovation
		Weak	Disrupt the existing BI and search for new actual product(s), or enhance the existing BI with strategic alliance
Business Position (BPo)	Good	Strong	Go to BU
	Bad	Strong	Go to BU
		Average	Strengthen BPoF Product/Market Redefinition
		Weak	Disrupt the existing BPo and search for new BPo, or redefine the existing BPo with strategic alliance
Business Unit (BU)	Good	Strong	Go to BS
	Bad	Strong	Go to BS
		Average	Strengthen BUF Process Innovation
		Weak	Disrupt the existing primary activities and build new BU, or enhance the existing primary activities with strategic alliance
Business System (BS)	Good	Strong	Upsizing to lead market
	Bad	Strong	Strengthen support activities and upsizing to lead market
		Average	Strengthen BSF Managerial Innovation
Business Base (BB)	Good	Strong	Continue Current Strategy
	Bad	Strong	Continue Current Strategy
		bad	Destroy the existing competencies and build new BB

Source: Author

But when DCB is greater than 1, the greater DCB becomes, the stronger the buyers bargaining power will be.

v) When DCS ranges between zero and one, the greater DCS becomes, the weaker the industry power will be (or the stronger the suppliers bargaining power will be). But when DCS is greater than 1, the greater DCS becomes, the weaker the suppliers bargaining power will be.

vi) The market (competitive) structure varies with DCB. If DCB depends on one firm, it implies pure monopoly, if on two firms, duopoly, if on few firms, oligopoly, and if on many firms, perfect competition.

IPD 4: Concerning industry competition intensity (ICI) and industrial infra fit (IIF):

i) ICI depends on the market structure giving impacts on the in-

dustry power positively or negatively.

ii) Supply chains in an industrial system tend to form industry segments. The more the industry segment increases, the less competitive the market becomes (Analogous to Gause's competitive exclusion principle).

iii) IIF gives positive or negative effects on the industry power, depending on the nature of the technological change. That is, whereas the existing IIF under metabolic technological change gives positive effects on the industry power, under metamorphic technological change it impacts negatively on it.

IPD 5: Concerning IDF (industry driving forces):

i) At the industry level, IDF impact the market size and the industrial

⟨Table 4⟩ Characteristics of the patterns of IDF

	Equilibrium	Fluctuating equilibrium	Punctuated equilibrium	Disequilibrium
Characteristics of IDF as turbulence	Stable and low	Fluidly changing	Occasional upheaval	Chaotic
State of system to which IDF impacts	Equilibrium	Near-to-equilibrium	On the edge of chaos	Far-from- the equilibrium
Types of feedback among actors in the system	Negative feedback	Negative feedback	Negative & positive feedback	Positive feedback

Source: Author

system density. At the firm level, they affect the business paradigm fit.

ii) The characteristics and natures of the patterns that IDF takes (equilibrium; fluctuating equilibrium; punctuated equilibrium; and disequilibrium) are as follows (Table 4).

iii) With regard to the technological change in IDF, the impact of metamorphic technological change (Mm) is greater than that of metabolic technological change (Mb). Within metamorphic innovation, sub-system change (SSC) is superseded by technological system change (TSC), which is in turn overshadowed by techno-economic paradigm shift (TEPS).

iv) Metabolic technological change exhibits continuity with existing technology and encourages firms and businesses to evolve, giving rise to the pattern of fluctuating equilibrium in turbulence. However, metamorphic technological change exhibits discontinuity with existing technology, giving rise to the pattern of punctuated equilibrium or disequilibrium in turbulence.

v) The accumulation and combination of metamorphic technological changes boosted by the progress of science and technology result in a new technological system and make it possible for new industries to emerge as well as for existing industries to disappear.

vi) The technological fusion brings

〈Figure 12〉 Dynamic Business Paradigm Fit Matrix

Where does the External Changes impact mainly on the Business Paradigm?

Impacts on Internal Efforts / What kind of the efforts does the firm do?	Product Fit Area	Process/ Management Fit Area	No Impact
Product Innovation	Dynamic Product Balance Fit	Dynamic Over Fit	Mal Fit
Process/ Management Innovation	Dynamic Under Fit	Dynamic Process/ Management Balance Fit	Mal Fit
No Innovation	No Fit	No Fit	Static Balance Fit

about either fusion or fission of the industry. It can also cause the techno- economic paradigm to shift to an entirely different one.

vii) When the turbulences in the industry driving forces are fierce, the industry effect to firm performance is greater than the firm effect, and vice versa, when turbulences are relatively peaceful.

IPD 6: Concerning the industrial policy variables (IPV):

i) Laissez-faire is a kind of industrial policy variable.

ii) Laissez-faire policy is in principle most effective in countries that possess world-class industries with competitiveness. However, in the event of a metamorphic technological change where the technological system changes or the techno-economic paradigm shifts, even such countries adopt industrial policy variables as a strategic tool to make their firms more innovative in obtaining national competitiveness.

6.4 Propositions concerning the Strategic Change Modes

SCM 1: In terms of the impacts of environmental change on business

paradigm of a firm and the firm's innovative efforts for them via strategic change modes during a given period of time. Dynamic Business Paradigm Fit can be expressed and identified as the following matrix ⟨Figure 12⟩.

Where,

Dynamic Product Balance Fit refers to the good match between the product innovation and the impacts of the environmental changes on the product levels.

Dynamic Process/Management Balance Fit refers to the good match between the process/management innovation and the impacts of the environmental changes on the process/management in the existing business paradigm.

Static Balance Fit refers to the good match by doing nothing since there's no changes at all in the environment.

Dynamic Over Fit refers to the mis-match by doing the excessive efforts in product innovation against the impacts of the environmental changes on the process/management area in the existing business paradigm fit.

Dynamic Under Fit refers to the mismatch by doing the process/ management innovation against the impacts of the environmental changes on the product area in the existing business paradigm fit.

Mal Fit refers to the mis-match by doing

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the innovative efforts in product and/or process/management while there's no impact at all in the existing business paradigm fit including Over Fit. It will probably become the source of being first mover by working on as an organizational slack (Cyert and March, 1963; Cheng and Kesner, 1997) only if it is contingent with the environment in the future.

No Fit refers to the case of doing nothing at all in spite of that there are impacts of the environmental changes on the existing business paradigm fit.

SCM 2: It can be generally accepted that the firm success comes from obtaining the dynamic business paradigm fit in the existing business(es) as well as in the new business(es) by creating or adapting to the environmental change with the firm's innovative efforts. That is, there are some universal laws about the relationship between the dynamic business paradigm fit and the firm performance as follows.

SCM 2.1: The Dynamic Balance Fit will give rise to the most desirable outcomes (firm performance).

SCM 2.2: The Dynamic Over Fit will give rise to better outcomes than the Dynamic Under Fit.

SCM 2.3: The Mal Fit by the excessive energetic activities that can be re-

garded as an organizational slack will be able to result in the desirable outcomes only if it were contingent with the nature of the environmental turbulences.

SCM 2.4: The No Fit will bring about the worst outcomes, resulting possibly in firm failure.

SCM 3: The combination of innovation and growth vector as strategic behavior variables should be contingent with the external vectors (industry driving forces) taking into account the initial conditions (relative firm power at the starting time) (Table 5).

From contingency point of view, the strategies in an equilibrium or fluctuating equilibrium environment are regarded as the traditional (old) strategy paradigm, while ones in a punctuated equilibrium or disequilibrium environment are considered to be the new one. In the old strategy paradigm where the strategic planning and/or strategic intent based on the reductionism/determinism are still effectively working well, enhancing the existing competencies is basically emphasized. On the other hand, disrupting the existing competencies as a means of creative destruction and building the new ones are the focal points in the new strategy paradigm. While the strategic jump (quantum leap) at the bifurcation point to

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〈Table 5〉 Normative guidelines for strategic change mode from the contingency point of view for obtaining and/or creating the dynamic business paradigm fit

RFPt-1 (initial condition)	Patterns of IDFt[1] (external vectors) SBVt (internal vectors)	Equilibrium	Fluctuating equilibrium	Punctuated equilibrium	Disequilibrium
Superior to the major competitor(s); dominant player	Growth vector (GV)t	Maintain the present path and pace as dominant player.	Follow the predictable patterns.	Search for new path to major revolution(s), when necessary, in particular at bifurcation point.	Search for new paths incessantly.
	Innovation (Inn)t	Reinforce the strength by enhancing the existing core competence.	Add up new competencies to the existing core competence through incremental Innovation, identifying the existing business paradigm advantage.	Disrupt the existing competencies for creative destruction, identifying the existing business paradigm advantage.	Disrupt the existing competencies and build new competencies repeatedly, by strengthening the search routines through break-through Innovation, seeking for dynamic fit.
Inferior to the major competitor(s); challenger	Growth (GV)t	Maintain the present path and speed up the pace to catch up the dominant player.	Follow the predictable patterns.	Search for new path to major revolution(s).	Search for new path incessantly.
	Innovation (Inn)t	Reinforce the weakness to break down the barriers by enhancing the existing core competence.	Speed up adding new competencies in advance, identifying the existing business paradigm advantage.	Disrupt the existing competencies for creative destruction, identifying the existing business paradigm advantage. Build new competencies through radical Innovation	Disrupt the existing competencies and build the new competencies repeatedly by strengthening the search routines through radical Innovation, seeking for dynamic fit.
Focus of strategy		Strategic planning/ strategic intent[2]		Strategic jump (quantum leap)	Strategic maneuvering
Major tool(s) for strategic approach		SWOT		Vision	Adaptive walk[3]
Rationale for strategic thinking		Reductionism/Determinism		Complexity thinking[4]	

Source: 1) D′Aveni, R. A. (1999), 2) Hamel, G. and C.K. Prahalad (1989), 3) Beinhocker, E. D.(1999), 4) Sherman, H. and R.Schultz (1998)

get into the new revolution(s) in the industries becomes important in a punctuated equilibrium environment, the emphasis in a disequilibrium environment has to be put on the strategic maneuvering to cope with the incessant disruptions.

VII. CONCLUSION

This paper attempts to build a dynamic model of the firm performance named, The Firm Power Theory, as a general theory for the firm dynamics based on social physics and sociobiology in an integrated, holistic, and Dynamic way with the notion that wealth creation (firm performance) depends on the market size as the industry profit potentials, industry power (industry effect), the firm power (firm effect), and strategic change modes (interaction effect), recognizing that the ongoing shift from the Newtonian paradigm to the Complexity paradigm requires a quite different theoretical framework for wealth creation. Firstly, new concepts that construct the model are developed and defined: value chain II, business paradigm and business paradigm fit, firm competence, strategic behavior variables, firm power, industrial system and industrial system density, industry competence, industry driving forces, industry power, strategic change modes, and

〈Table 6〉 Static Management, Strategic Management, and Dynamic Management

	Static Management	Strategic Management	Dynamic Management
Type of Environment	equilibrium environment	fluctuating and/or punctuated equilibrium	punctuated equilibrium and/or disequilibrium
Nature of Environment	stable / predictable	turbulent / predictable	chaotically turbulent / short-termly predictable but intermediate & long-termly unpredictable
No. of Market Segment	one or a few	some	many
No. of Competitor	one or a few	many by market segment	some by market segment
Characteristics of Product	standardized commodity	some by market segment	many by market segment
Production Mode	mass production	mass production by strategic business unit	mass-customization
Focus on	Efficiency	Competitive Advantage	Dynamic Business Paradigm Fit

Source: Author

dynamic fit. And then some descriptive and normative propositions relating to the firm power, industry power, strategic change modes, and firm performance were also derived subjectively from the laws of inter-action among the constructs of the model.

This paper points out that in what situation, where, and what type of inno-vation should be sought for firm success, while Schumpeter (1934) raised the im-portance of innovation in economic growth.

This paper focuses on advocating the necessity of the introduction of the dynamic Management View, by comparing it with the Strategic Management and the traditional (Static) management in view of the con-tingency approach(Table 6). Here, the static management can be compared to the case of shooting the fixed target at the fixed po-sition, the strategic management to the case of shooting the moving targets at the fixed position, and the dynamic management to the case of shooting the moving targets at the moving positions.

This paper also suggests that in explaining firm performance, 'The Dynamic Business Paradigm Fit Approach' based on customer-oriented perspective in the dynamic manage-ment would be more recommendable than 'The Competitive Advantage Approach' based on competition-oriented perspective in the strate-gic management or 'The Efficiency- oriented Approach' in the (static) management. This

suggestion, however, does not imply that the Dynamic Management view can be applied mutually exclusively with the existing ones, rather it emphasizes that it will be applicable complementarily with them.

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