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Exploring the Impact of Industry Structure On the Emergence of E-marketplaces

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Exploring the Impact of Industry Structure On the Emergence of E-marketplaces

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"I'd like to go by climbing a birch tree
And climb black branches up a snow-white trunk
Toward heaven, till the tree could bear no more,
But dipped its top and set me down again.
That would be good both going and coming back.
One could do worse than be a swinger of birches."

-------------For those sweet and sour days in my 20's life

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Abstract

The emergence of e-marketplaces is a tremendous phenomenon across nearly all industry in the beginning of 21ths century. As a population of strategic IT initiative, e-marketplaces interact with their surrounding industry structures to win their competitive advantages. In this research, the impact of industry structure on e-marketplaces is investigated through the inter-organizational network roles e-marketplaces play and the industry linkages e-marketplaces own. Based on intensive literature review, the dissertation developed a theoretic model and its propositions for the interaction between industry structures and e-marketplaces characteristics. Using both the quantitative and qualitative methods, the dissertation found that the success of e-marketplaces in a particular industry structure was determined by the interaction among three different industry structures and various types of e-marketplaces business models and governance models.

Chapter 1 Introduction

1.1 Background

Today, most U.S. corporations are participating in emerging "e-marketplaces" where goods are sold through auctions, bid systems, and exchanges. In just about every industry - from automobile manufacturing to chemical production - an electronic marketplace has been created to handle the buying and selling of goods and services between manufacturers and suppliers.

One common bond that unites these markets is the hope that the automation of exchange processes will dramatically cut time, cost, and waste. It is believed that E-marketplaces can connect fragmented buyers and sellers through a business to business (B2B) hub where online transactions can be executed quickly and confidently. By leveraging e-marketplaces, trading partners can increase efficiencies for the exchange of goods and services while significantly reducing sourcing and transaction costs.

For buyers, e-marketplaces offer a broader range of sourcing options. Close collaboration with trading partners speeds product time-to-market while fostering stronger relationships. Also, upfront investment costs are reduced because buyers can connect to multiple suppliers simultaneously. For sellers, e-marketplaces can help to rapidly identify and respond to requests from new prospects at a lower cost—while allowing those sellers to extend their reach to new markets. Excess inventory and even unique, single, high-value items and constrained goods can be moved through the trading hub. Again, cost of entry is significantly less expensive for sellers than connecting to one buyer at a time—and trading partner relationships can be managed more efficiently.

Because e-marketplaces allow buyers and sellers to collaborate in real-time, they help to integrate and optimize the flow of materials, finished goods, and services (Bakos, 1991).

While B2B e-marketplaces proliferated through the late 1990s because of the huge business potential they can create and the venture capital available, the rapid growth of e-marketplaces met with intensive competition. Evidence of a shakeout and consolidation of B2B e-marketplaces is becoming clear. In August 2000, the formation of B2B electronic marketplaces came to a sudden stop. In July-August 2000, only 15 new B2B e-marketplaces were announced as opposed to 115 two months earlier. It's certain that many of the weaker players will not survive, but the strong marketplaces, despite the impending consolidation, will survive and offer the ability to increase revenues and reduce costs for industry buyers and sellers.

The question at hand, then, is: **What factors lead to the success of an e-marketplace?** This question makes sense for both the providers and adopters of e-marketplaces. For e-marketplaces providers, they are wondering: How can an e-marketplace build a sustained competitive advantage? How can e-marketplaces attract buyers and sellers across the industry? On the other hand, perspective e-marketplaces participants on both the buy and sell ends are eager to understand: What are the benefits their own business can get from B2B e-marketplaces? What costs will they incur when joining a typical e-marketplace? And, what strategies should they develop to enter into, or build, or partner with, an e-marketplace in the next few years?

1.2 Literature Overview

After an extensive literature search, this dissertation identified three streams of relevant literatures: electronic market literature, IT differentiation literature, and relational view literature.

Literature on Electronic Marketplaces (EMs)

The literature on EMs is still quite sparse. However, the existing literature did provide a good starting point by investigating the many potential advantages of electronic markets. For example, Bakos (1991, 1997) explored the implication of reducing buyers' search costs in e-marketplaces, the benefits for the buyer and the seller, the social welfare, and the incentives to create such a marketplace. Bhargava et al (1999) analyzed the intermediary's strategy with respect to the quality of service provided, pricing in electronic markets for decision technologies, how marginal cost, and how the presence of network externalities affects the strategies. Garicano and Kaplan (2000) provide empirical evidence that the benefit of electronic marketplaces may come from price advantage as well as process improvement. Ba and Pavlou (2002) examined the extent to which trust can be enhanced by proper feedback mechanisms in electronic markets and how some risk factors can play a role in trust formation. While their research implicitly considers the governance of e-marketplaces, it represents only a start.

Literature on organizational differentiation through IT

Organizational differentiation through IT (also called IT differentiation) is defined as organizational ability to reap economic rents from a superior execution of business strategy through IT assets, knowledge and competencies. It refers to the leverage attained through deployment and management of IT functionalities in business strategies and value-chain activities. The adoption and diffusion of e-marketplaces by business companies, which is critical to the success of e-marketplaces, is based on the differentiation that an e-marketplace can bring to them. The traditional logic of IT differentiation pervaded IT management thinking for much of the 1980s and has two distinct streams of theory (Sambamurthy, 2000). One of these streams is industrial organization economics (IO), first exemplified by the Bain/mason paradigms (Bain, 1968; Mason, 1939) and the subsequently articulated a theory of competitive strategy by Porter (1980). This stream implies that e-marketplace performance depends critically on the characteristics of the industry in which it competes. The five-force model by Porter (1980) further indicates that the competitive structure of an industry will influence the ability of firms, such as e-marketplaces, to compete successfully. An alternative stream of IT differential theory rooted in the Resource-Based View proposes that individual firms are endowed with differential resources, the heterogeneity of which allows some firms to reap supernormal rents from IT innovation in contrast with other firms (Chamberlin, 1933; Clemons and Row, 1991, Kettinger et al., 1994, Barney 1991, Conner 1991). Based on this view, this research suggests that E-marketplace as an IT innovation can achieve its success only when it can provide exceptional capabilities relative to other firms in an industry.

Literature on the Relational View

The Relational View (RV) complements preceding theories such as the Resource Based View (RBV) by focusing on the relational resources created by the interaction between specific partners who then generate a relational rent (Dyer & Singh, 1998; Peteraf, 1994). This stream of research suggests that a firm's critical resources may span the firm's boundaries and may be embedded in inter-firm resources and routines. The relationship between firms therefore is increasingly important for understanding inter-organizational competitive advantage (Donada, 2002). An electronic marketplace is essentially an inter-organizational information system that allows the participating buyers and sellers to exchange information about prices and product offerings to cooperate on commodity exchanges. The industry relationships associated with an e-marketplace are then at the core of its competitive advantage, according to the relational view. The success of E-marketplaces therefore lies in its successfully coupling with the unique relational resource endowments of firms in its industry.

1.3 Research Questions

Existing Electronic-Market (EM) literatures have taken a positivist perspective to investigate this phenomenon. For example, Bakos (1991, 1997) explored the implication of reducing buyers' search costs in electronic marketplaces, the benefits for buyers and sellers, the social welfare, and the incentives to create such a marketplace. Bhargava et al (1999) analyzed the intermediary's strategy with respect to the quality of service provided, pricing in electronic markets for decision technologies, and how marginal cost and presence of network externalities affects their strategies. While this literature addressed the universal value of electronic markets, it missed the linkage between a typical e-marketplace and a typical business company. Furthermore, none of the literatures considered the competition among electronic marketplaces nor does it attempt to distinguish between the benefits of electronic marketplaces to a particular company versus the other players in the same industry. That is, the electronic marketplace in the view of exiting literature is such a rational object that its emergence can occur without considering the industry context. As a consequence, the existing EMs literature cannot explain why some e-marketplaces are successful but others fail. It also cannot answer why some companies in a typical industry become advocats of an e-marketplace while others are indifferent.

To address this hole in the current literature and to help managers explore their business opportunities in e-marketplaces, this research takes an organizational ecology perspective to propose that e-marketplaces will successfully survive only when the role being played and the linkage needed to support these roles fit with its industry context. The research questions explored therefore are:

- **What are the elements of industry structure that are relevant to the emergence, adoption, and diffusion of electronic marketplaces?**
- **What are the business strategies (business model and governance model characteristics) that discriminate among types of e-marketplaces?**
- **How do these elements of industry structure, business model, and governance model converge to play out in the survival of e-marketplaces?**

1.4 Conceptual Research Model

Here, the success of e-marketplaces is defined in this research as the survival of an E-marketplace during its initial stages of formation and the positive performance it brings to organizational nodes within the inter-organizational network afterwards. According to organizational ecology theory, the environment differentially selects organizations for survival on the basis of fit between organizational forms and environmental characteristics (Hannan & Freeman, 1984). Drawing on this perspective, the survival of an e-marketplace in its industry can be viewed as a result of natural selection based on the fit between the e-marketplace's business model and the industry structure within it exists. That is, to be successful, an e-marketplace must be isomorphic to its industry structure. The success of an e-marketplace, as measured by its survival and its business performance, is the dependent variables in this study.

In this research, industry structure is investigated from three underlying sub-structures: competitive structure, supply chain structures, and norm structure. They are independent variables in this study.

Competitive structure indicates the competitive relationship among players within a particular industry. Intensive research from IO economics indicates that the competitive structure of an industry will influence the ability of firms to compete successfully (Bain, 1968; Mason, 1939; Porter, 1980). The competitive structure can be described by characteristics of the industry in which a firm competes, such as industry concentration, industry competitive barriers, and product differentiation (Porter, 1980). Moreover, IO economics research indicates that strategic groups exist -- defined as groups of firms in the same industry following the same or similar strategies within each industry. The existence of strategic groups exposes the "structure within the industry," which indicates that the industries where e-marketplaces compete can be viewed as being heterogeneous rather than homogenous.

Supply chain structures depict the interdependent relationship among different nodes along the supply chain of industry products. Since collaboration and flexibility within the supply chain have become increasingly crucial for companies to compete and perform within their industry (Landeros & Monczka, 1989), it is not surprising to note that supply chain partnering along with buyer-seller interaction and relationships have been identified as critical factors motivating firms to engage in B2B electronic exchanges (Sheth, 1996). In this regard, many e-marketplaces are playing the role of a hub for multiple industry supply chains within or across industries.

Norm structures in an industry refer to the institutions, standards, or rules that govern industry routine, examples of which can be anti-trust laws and the existence of industry associations. An e-marketplace is a community of buyers and sellers who act within an institutionalized network where they share rules and structures that are controlled by mediating organizations. The norm structures embedded in industry routines can build trust -- the crucial enabling factor when uncertainty and opportunism exist (Jarvenpaa, et al 2000) -- among participators in an e-marketplace through calculativeness (economic rationale based on proper incentives or signals), third parties absorbing transaction uncertainty, and the establishment of cooperative norms (Pavlou, 2002).

An e-marketplace is a hub embedded in industrial network and facilitated by telecommunications created to enable multiple buyers and suppliers to exchange information and complete transactions (Zwass, 1999). The role a hub plays and the industry linkage are critical in managing the economic interdependence across network nodes (Kambil and Short, 1994). Correspondingly, there are two business strategies that are very important if emergent e-marketplaces are isomorphic to existing industry structures such as the EM business model and governance model. The EM business model describes the strategic position or business functions through which an EM intends to create business value. The EM governance model is concerned about the formal and informal relationships among the EM's participants. Accordingly, the EM business model typically defines the value creation roles am EM plays in its surrounding industry context; while the EM governance model reflects the industry linkages used by the EM in enabling these value-creation roles.

EM value-creation roles can be defined as distinct, technologically separable, value-added activities undertaken by e-marketplaces in a given industry structure. Research has identified many different roles for e-marketplaces. For example, a Boston Consulting Group report (2001) distinguished e-marketplaces' business models by nine sources of value creation: aggregation, process automation, transparency, auctions, lower marketing and sales costs, lower transaction costs, lower inventory cost, lower cycle time, and improved asset utilization. The report divided the sources of value creation into value shift activities and value creation activities. Each of these business models requires different and distinct technologies, in terms of knowledge and skills as well as equipment.

In contrast, the EM governance model builds up important industry linkages by which e-marketplaces can manage economic interdependence across value adding roles in the network. Two very important aspects of EM governance model are its ownership and informal industry networks (Lennstrand et al, 2001; Zaltman, et al. 1973; Blau, 1963). By inducing appropriate players into their ownership structure, the EM can build its industry legitimacy -- the acceptance by key stakeholders in its environments (Dimaggio and Powell, 1983) -- and facilitate cooperation among its participants. By building a broad informal industry network, the EM can spread its reputation and attract sufficient participants to reach the critical mass needed for survival.

From the relational view, a firm's critical resources may span firm boundaries and may be embedded in inter-firm routines and processes (Dyer and Singh, 1998). Firms create relational rents through their governance model because governance influences transaction costs as well as the willingness of cooperating partners in value creation initiatives. Therefore, the industry linkages an inter-organizational system such as an EM builds can become critical competitive assets. These linkages interact with the value creation roles an e-marketplace can effectively serve in the industry. By exploring its industry roles and linkages, an EM's business model and governance model address the needs of existing industry structure. For example, in a highly centralized industry like automotive, a few players hold much bargaining power relative to the numerous small suppliers/buyers. These big players can enjoy monopoly rents by keeping loose, separate relationships among their suppliers or buyers. An e-marketplace whose business model focuses on consolidating or aggregating the small suppliers or buyers will disturb the existing industry linkages and reduce the monopoly rent the big players can claim, and thus will not attract major industry players. Furthermore, these major players won't easily trust an e-marketplace unless they can be involved in e-marketplace governance through either formal ownership or informal partnership.

To fit with its industry environment, e-marketplaces need to develop appropriate business and governance models to address their role within existing industry structure and to manage industry linkages effectively. A conceptual model of this research is depicted in the following diagram:

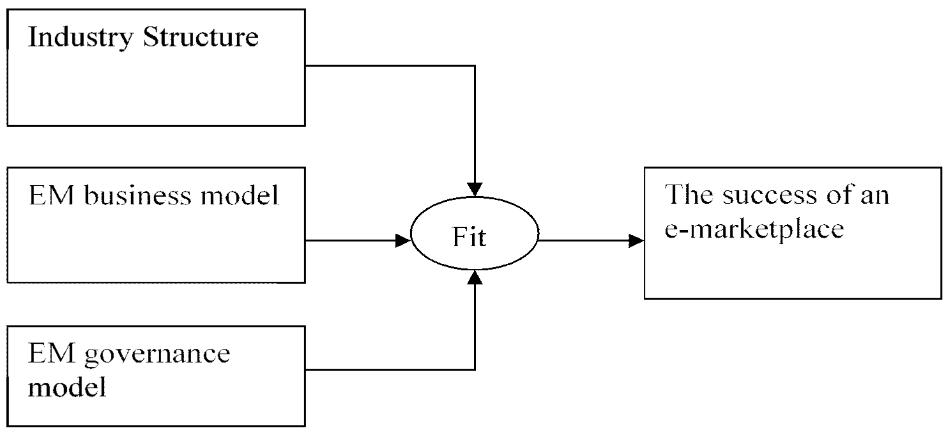

Fig.1-1 Conceptual Research Model

1.5 Summary of Chapters

B2B e-marketplaces are significant phenomena across industries in the 21st century. This dissertation applies a network role and linkage perspective to investigate the industry factors behind the success and failure of e-marketplaces. It also states that, the e-marketplace is viewed as a hub of industrial network in which trading partners cooperate with each other to create value.

Chapter 2 of this dissertation starts with an intensive review of the literature on industry structures and on e-marketplace business models and governance models. The industrial network embedded in e-marketplaces is investigated from three aspects: competitive relationship, supply chain relationship, and institutional IT standardization. Chapter 2 then develops a theoretical taxonomy for e-marketplace business model based the network role of e-marketplaces. Finally, chapter 2 reviews the governance issue of e-marketplace and defines different governance model investigated in this dissertation.

Hence, this chapter develops and defines the research constructs in the research model and become the baseline for later chapters.

Chapter 3 further develops the research propositions on the basis of Chapter 2. Industrial network cooperation becomes the driver of these propositions. The analysis in Chapter 3 determines a hierarchy of e-marketplace functionalities and describes the types of e-marketplace governance models applied to fit an existing industry network. Chapter 3 thus explains the rationales for the "fit" and proposes corresponding propositions.

Chapter 4 presents the research methodology used to examine the theoretic framework proposed in Chapter 3. A combined research strategy including both qantatitive and qualitative methods is proposed. The quantitative method applies regression modeling on archival data. It is designed to capture a snapshot of the relevant industry structure with e-marketplace. The qualitative method is a multiple case analysis that takes a historical analytical approach to study the dynamics of e-marketplace evolution within certain industry structures. Chapter 4 explains the design of both research methods, identifies data sources, and developes the protocols.

Chapter 5 and 6 provide the results and analysis of quantitative and qualitative research. The quantitative research in chapter 5 involves six different industries and 183 sample EM subjects. Both the logistic regression model and Poisson regression model are executed to explore the relationship between industry structures and EM characteristics, and the impact of this relationship on the success of EM. The qualitative research in chapter 6 explores into the evolution of six successful EM cases from two comparative industries: the automotive industry and the semiconductor industry. For each case, the origin and background and the time log of main events since EM launch are given along with the description of EM business model evolution process. The success of EM is evaluated. Lessons learned from each case are laid out.

Chapter 7 concludes the dissertation and discusses the implications of major findings and the contribution of this research.

Chapter 2 Review of Research Constructs

Introduction

The electronic marketplace is the hub of an industrial inter-organization business network, facilitated by telecommunication, created to enable multiple buyers and suppliers to exchange information and complete transactions (Zwass, 1999). Network participators utilize digital, Internet-based information connections through the EM to coordinate their separate, ongoing activities. The success of EM business strategies therefore is determined by the interaction of network participators and the EM. This network perspective on EM guides our thinking of EM business strategies and EM surrounding industry structures. Chapter 2 will develop the main research constructs in this dissertation with a review of supporting literature. Section 2.1 discusses industry structure from horizontal, vertical and institutional aspects. Section 2.2 develops the taxonomy of EM business model used in this research. Section 2.3 analyzes the governance of EM within the inter-organization industrial network. Finally, section 2.4 summarizes the chapter.

2.1 Industry Structure

Although the relevant environment is very broad, encompassing social as well as economic forces, the key aspect of the firm's environment is the industry or industries in which it competes. An industry can be defined as the group of firms producing products that are close substitutes for each other (Porter, 1980). The underlying structure of an industry has a strong influence in determining the competitive "rules of the game" as well as the strategies potentially available to the firm. As Porter (1980) states, "the intensity of competition in an industry is neither a matter of coincidence nor bad luck. Rather, competition in an industry is rooted in its underlying economic structure and goes well beyond the behavior of current competitors." further identified five basic competitive forces—entry, threat of substitution, bargaining power of buyers, bargaining power of suppliers, and rivalry among current competitors. From his view, the goal of competitive strategy for a business unit in an industry is to find a position in the industry where the company can best defend itself against these competitive forces or can influence them in its favor.

Industry structure, reflected in the strength of the forces suggested by Porter (1980), should be distinguished from many short-run factors that can affect competition and profitability in a transient way. Industry structure can be characterized by some key industrial structure features that determine the strength of the competitive forces and hence industry profitability. These features describe the underlying relationship among actors inside and outside of industries. Industry structure both shapes the value chain of a firm and is a reflection of collective value chains of competitors. Structure also determines the bargaining relationships with buyers and suppliers that is reflected in both the configuration of a firm's value chain and how margins are divided with buyers, suppliers, and coalition partners (Porter, 1980). Overall, the relationship underlying industry structure can be defined from three aspects of industrial value chain: competitive structure, supply chain structure, and norm structure. Competitive structure is the relationship among key industry players. Supply chain structure is the relationships across the relevant supply chains. Norm structure is the deeply embedded institutions that influence relationships among industry players.

2.1.1. Competitive structure

The first aspect of industry structure is the competitive/cooperative relationship among firms in the same industry. Since it is mainly about firms producing products that can substitute for each other, it is referred to as competitive structure. Industrial competitive structure tends to change relatively slowly over time. By and large, it exists independent of the policy choices which the firms in an industry may make; most firms themselves cannot significantly change the competitive structure that surrounds them in the short term. Therefore, the best strategy for these firms to survive is to adopt their organizational form to fit their competitive structure (Hannan & Freeman, 1984).

Previous IO economics research has paid much attention to this aspect of industry structure and identified industry competitiveness or industry consolidation as the main measurement of competitive structure (Caves, 1967, Porter, 1980, 1985). According to IO economics, industry consolidation can be investigated by three elements: concentration, product differentiation, and barriers to the entry of new firms (Caves, 1992).

Concentration, the most widely used among these elements, is the extent to which a few firms control the bulk of the industry's sales (Caves, 1967). Previously, IO economics suggested that concentration may affect an industry's performance -- highly concentrated industries are likely to perform inefficiently because they allocate resources inefficiently. Concentration also determines firms' bargaining power along its value chain. Firms in highly concentrated industries exhibit more bargaining power over their suppliers or buyers that do firms in less concentrated industries (Porter, 1980). It is believed that it is easier to achieve the integration of inter-organization information system and data/knowledge sharing in highly concentrated industries because there are more uniform industry information system standards and infrastructure facilitated by this power over supplier/buyers (Pfeffer and Salancik, 1978, Ang and Cummings 1997, Hart and Saunders 1997, 1998; Lacovou et al. 1995; Premkumar and Ramamurthy 1995). In addition, as concentration rises, industry advertising -- one important market information source -- can fall due to increased recognition by firms in the industry (Needham, 1978).

Product differentiation, i.e., brand identification and customer loyalty, stems from strategies around advertising, customer service, product quality, or simply being first-to-market(Caves, 1992), Commodity products, i.e., items such as wheat or steel whose physical units cannot be distinguished, will tend to be undifferentiated in the market place. Even where physical differences exist, no economic differentiation may arise if the buyers can make an exact appraisal of the differences and if every buyer makes the same appraisal. The heaviest product differentiation falls in consumer goods industries—durable goods industries display the most, basic household necessities the least and other nondurable consumers' goods usually fall somewhere in between. Outside of the manufacturing sector, local retail and service trades usually show significant differentiation based on location and qualities of service.

Product differentiation creates a barrier to entry by forcing entrants to spend heavily to overcome existing customer loyalties. This effort usually involves start-up losses and often takes an extended period of time. Such investments in building a brand name are particularly risky since they have no salvage value if entry fails (Porter, 1980). Therefore, product differentiation can reduce the threat of entry. However, due to the high barriers it creates, product differentiation can increase the fragmentation of industry structure. Production differentiation will also lead to specialization and heterogeneous industry processes, which will bring difficulties to the establishment of industry standards and norms for information or knowledge sharing across an industry.

Barriers to entry comprise another major segment of industry competitive structure. Just as concentration reflects the number of actual market rivals of a firm, so the condition of entry tells the story about potential rivals. Barriers to entry fall into three analytical categories (Caves, 1992): scale-economy barriers when firms cannot achieve the lowest possible production costs until they have grown to occupy a large portion of the national market, absolute-cost barrier when the production cost curve of a new firm lie above that of a going concern, and product differentiation barriers as discussed above. Most service and retail trade industries are characterized by relatively low entry barriers, as are the agriculture and forestry industries. Conversely, local public utilities and much of the transportation sector reveal blockaded entry, in this case enacted via public legislation in that franchises tend to be granted to only a limited number of firms in a given market.

The existence of barriers to entry contributes to the integration of industry. With the rise of barriers to entry, fewer newcomers can break into the industry, which results in fewer competitors in the industry. Market power thus tends to be concentrated to a few big players, and industry standards, i.e., common data or processes, can be easier to implement. With common data and/or processes, the integration of information systems by firms within the industry is more likely to occur (Pfeffer and Salancik, 1978, Ang and Cummings 1997, Hart and Saunders 1997, 1998; Lacovou et al. 1995; Premkumar and Ramamurthy 1995).

2.1.2. Supply Chain Structure

The second aspect of industry structure is the buy/supply relationship among firms across industries along the supply chain. A supply chain is defined as "the series of functional stages that use various resources to transform a raw material into a finished product or service and to deliver this product or service to the ultimate consumer" (Cox 1997a, pg.211). It can be viewed as a series of exchange relationships between buyers and suppliers, which can be depicted from three primary aspects of industry supply chain (Lambert et al., 1998): the members of the supply chain, the structural dimensions of the supply chain, and the different types of process links across the supply chain. EMs' create the connection between buyers and suppliers along their supply chain. The relationship among EM participators along a supply chain therefore is highly relevant to the formation of EM.

Table 2.1 Supply Chain (SC) Structure Taxonomy

Authors	*Supply Chain Structure*	*Comments on classify variables*
Cheng et al. (2001)	Contracting relationship Network structure form	Not specifie variables.
Lin & Shaw(1998) and Shaw (2000)	Convergent SC Network (SCN) Divergent-late differentiation SCN Divergent-early assembly SCN	The characteristics of a SCN are not only distinguished by the physical connections but also by the operations, objectives, and other attributes.
Choi and Hong (2002)	Formalization Centralization Complexity	Very theoretic but they are characteristics of a SCN not applicable taxonomy.
Lambert et al (1998)	Horizontal structure, Vertical structure, The horizontal position of the focal company within the end points of the supply chain	These are deseriptive structural dimensions useful for foeal companies not for the industry.
Ernst & Kamrad (2000)	Rigid flexible postponed modularized	Framework is based on two dimensions: modularization and postponement.
Lamming et al(1999)	SCN of innovative-unique products SCN of functional products	Distinguish SCN by supply of two types of products on the basis of demand patterns.
Cox(1997a, 1997b), Cox et al(2002)	Buyer dominant Supplier dominant Buyer-Supplier interdependent Buyer-Supplier independent	Based on buyer and supplier power regime.

While a comprehensive classification framework does not exist in the literature, the existing supply chain literature has provided a number of alternative ways of classifying supply chain structures. Table 2.1 above lists representative works.

According to existing literature, the primary aim of a firms' business strategy on supply innovation such as EM is to create one or more power advantages in order to earn rents (Cox et al., 2002). Variations in the power balance of these relationships thus affect the flow of value through the supply chain. Power is the ability of a firm (or an entrepreneur) to own and control critical assets in markets and supply chains. That allows it to sustain its ability to appropriate and accumulate value for itself by constantly leveraging its customers, competitors and suppliers (Cox et al., 2002, Blau 1963, Emerson 1962, Thompson 1967, Jacobs 1974, Pfeffer and Salancik, 1978). Rents are earnings in excess of the firm's costs of production that are not eroded in the long run by new market entrants. The possession of critical assets gives a firm the potential to achieve relative market closure through a position of dominance over competitors. A firm in possession of such a critical asset also has the potential to achieve effective leverage over customers and suppliers in the context of particular supply chain transactions. The nature of the power structure in a supply chain thus has a direct impact on the process of exchange and a firm's capacity to appropriate rents. This means that supply chains can differ with respect to the different types of power structures that they contain, structures that are created by the possession of different types of power resources, or resource combinations at different stages in the chain. Cox et al. (2002) further points out that there are four potential power structures for a buyer-supplier exchange depending on who owns these critical assets. These are buyer dominance, supplier dominance, buyer-supplier interdependence and buyer-supplier independence. Figure 2-1 visualizes Cox et al. (2001)'s framework:

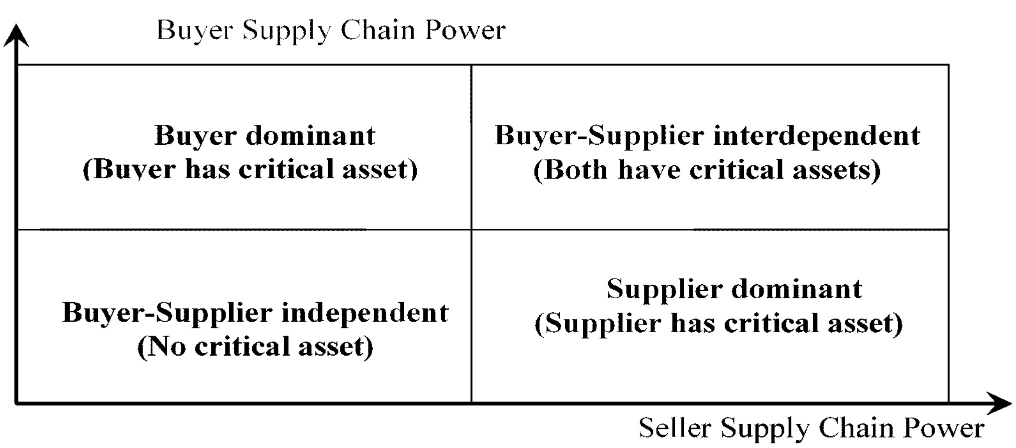

Fig.2-1 Supply Chain Power Structure

Whether the buyers or sellers have the supply chain power is up to their position along industry supply chain and relative bargaining power which is strongly influenced by Industry characteristics such as manufacturing process. A key issue, here, is finding the nature of the critical assets that determine power structure along the supply chain. Cheng et al.(2001), Lin & Shaw (1998) , and Shaw (2000) suggest that industries differ on their manufacturing process, and this difference creates different critical assets that influence the interdependence relationship along supply chain. Generally, four types of industry-wise manufacturing processes and thus four corresponding types of supply chain structures for focal firms can be identified: contracting lineal supply chain, convergent assembly network supply chain, divergent-late differentiation network supply chain and divergent-early differentiation network supply chain.

The contracting lineal supply chain is a traditional supply chain structure, in which project participants work on their own duties and only fulfill their contractual requirements without consideration of improvement in relationships and performance. Since the contracting relationship is usually temporary, neither the buyer or seller side will be able to hold critical assets to establish long term dependence. This structure is considered to lack responsiveness, discourage innovation, (Love et al, 1999) and lacks concentrated power in either the buyer or seller. An example of this structure is traditional construction industry (Cheng et al., 2001).

Convergent assembly network supply chain is a network structure in which a large number of parts are needed to build the products but the assembly facilities are expensive and few. Since the manufacturing processes rely on capital-intensive equipment, a large number and variety of parts for different products, and the assemblers who generate the final products have the critical asset. Most of the manufacturing and assembly processes in this type of supply chain belong to the convergent assembly process, where a lot of unique component parts are assembled into a relatively small number of end items. This characteristic gives the supply chain power to the hand of final product manufacturers (buyers); but not the component suppliers (sellers). In this supply chain structure, the life cycle of products tend to range from one year to several years. The network supply chain in the automobile, aerospace, and agriculture equipment industries can be classified under this type of supply chain (Womack, Jones, and Roos, 1990).

Divergent—late differentiation network supply chain is another network structure. In this type of supply chain, the manufacturing processes in the manufacturers, following the fabrication and assembly sequence, belong to the divergent approach, where the component parts are common to many different product models and can be combined into a large number of different models of end products. Because the parts are more modularized and, therefore, have less variety, assembly of the final product is postponed as late as possible to meet customer orders. This delay differentiation strategy serves the mass-customization purpose. Since the assembly process is performed at two stages (i.e., complex assembly processes for generic, semi-products are executed at factory sites; and, simple assembly processes for customized models are executed at distribution sites), both the manufacturers (sellers) and distributors (buyers) depend on each other to finish the manufacturing process. They both have critical assets and thus share power in driving supply chain. The life cycle of products in such industries ranges from months to years. The appliance, electronic, and computer industries belong to this type of network supply chain.

At last, **divergent—early assembly network supply chain** has a great variety of products made early in the supply chain, with relatively few types of raw material, and then are distributed throughout the network. Because the product models are differentiated very early, the main production process finishes at the manufacturing stage. The manufacturers control product differentiation and thus have the power to influence supply chain. The variety of product models and the quickly changing market shorten the product life cycle. The product life cycle in such industries ranges from weeks to months. Moreover, the shortened product life cycle makes the build-to-forecast approach more challenging due to a lack of long historical data to analyze. The issue of managing this type of supply chain concerns how to meet the quickly changing market. Industry examples are the apparel/fashion industry or toy industry (Fisher, 1994; Hammond, 1990).

2.1.3. Norm structure

The third aspect of industry structure is the industry norm structure -- the rules and procedures in deep control of firm behaviors across an industry. A norm is an established and self-reinforcing pattern of behavior: everyone wants to play their part given the expectation that everyone else will continue to play theirs (Young, 1998). Norms structure an industry in the definition (and division) of property, in the terms of contracts, and in the assignment of social economic roles. Norm structure is the deeply embedded institution layer of industry structure. It is deep because of its further influence on industry's competitive structure and supply chain structure (Porter, 1980). In a recent empirical study, Gruber (2000) examined the role of product standards in determining the evolution of market structure in semiconductors. He suggests that product standards, along with learning-by-doing effects, lead to market concentration and persistence of leadership in product innovation. Generally, industry norms can be categorized as coercive norms and voluntary norms.

Coercive norms, i.e., industry regulation that forces a firm to comply with rules or standards attuned to a local political scene, can be a major source of segmentation in an industry (Porter, 1985). For instance, local industry regulation has probably been a contributing factor in the fragmentation of industries like liquor retailing and personal services such as dry cleaning and fitting eyeglasses. Similarly, government prohibition of concentration (i.e., legal restrictions prohibiting consolidation in industries such as electronic power and television and radio stations; and, McFadden Act restrictions on branch banking across lines) are impeding consolidation in electronic funds transfer systems. The government can use measures such as privatization, regulation and the award of exclusive property rights to substantially change the structure of an industry, to influence the way in which the firms in that industry conduct themselves, and to shape their performance.

On the other hand, there are many voluntary norms, or in particular, industrial standards that are based on industry consensus and are designed to ease communication within an industry concerning performance and safety characteristics of products. No less than 30,000 such standards were in effect in the US in the 1980s (Link, 1983). These standards affect industry in a number of ways such as: consistent information about terminologies and measurement methods, physical compatibility between related products offered by different manufacturers, minimum acceptable product quality levels, and restriction of product varieties allowing realization of production economies (Link, 1983; Tassey, 1992).

Voluntary industry standards usually arise out of the deliberations of voluntary standards-writing organizations or are a de facto result of either a "sponsored" or an "unsponsored" market process (David & Greenstein, 1989). In a sponsored process, one or more entities, suppliers, or cooperative ventures creates inducements for other economic decision makers to adopt a particular set of technical specifications (e.g., pre-divestiture AT&T sponsored telecommunication standards). An unsponsored process has no identified originator with a proprietary interest, yet follows well-documented specifications, e.g., the QWERTY keyboard, (Molka, 1992). To distinguish these two processes, the un-sponsored standardization is named as emergent standardization in this dissertation.

For the emergence of vertical B2B EM that is embedded in an industrial network, the standard of the inter-organizational information system (IOS) is one of the particularly important voluntary norms because of its backbone role on supporting EM implementation, operation and maintenance. The focus of such an IOS standard is on two aspects; defining industry specific business process/documents and defining horizontal standards for the architecture/framework to exchange industry-standard documents. In other words, an industry adopts horizontal information technologies for B2B framework and to describe business process, but the industry itself defines an industry-specific business document form and exchange protocol. Each industry combines horizontal technologies and industry specific standards to define their vertical B2B EM standards.

The development, adoption dynamics, and outcomes of vertical IOS standards are likely to exhibit very different characteristics than those of horizontal IT standards. Vertical standards differ from the horizontal standards not only in their narrower applicability, but also in their technical content. Horizontal IT product standards such as telecommunication protocols, XML, and Windows are applicable in many industries. They focus on elemental levels of interconnection, e.g. telecommunications protocols. By contrast, vertical standards focus on data and business processes and are more concern with how IT is used than IT itself. The key movers in the development of horizontal standards are technology providers and governmental agencies. The competitive marketing tactics of technology firms are likely to play a pivotal role in the adoption and use of horizontal standards. However, those most likely to champion vertical standards development processes are industry players, key suppliers and customers, and industry associations who stand to gain (or lose) most from vertical IS standard. Adoption and diffusion of vertical standards are more likely to reflect competition among industry players than competition among technology providers. And although all standards involve network externalities, collective action to adopt a new standard en masse is more likely to occur within a single vertical industry than it is across industries (Markus et al., 2003).

The development of vertical standards for B2B EM is an outgrowth of an initial market/industry structure such as industry size and competitive relationship, and the dynamic nature of the industry such as the maturity or the clock speed of the industry. It reflects both historical path dependence and revolutionary breakthrough characteristics. Under a long-run view, the ultimate integration into design and supply of interrelated components can be analyzed as an endogenous byproduct of standardization processes and technical innovation (Church & Gandal, 1990a, 1990b). In other words, one standardization episode can shape long-run industry/market structure, which will then shape another standardization episode, and so on (Greenstein, 1992). This suggests two important elements in a study of industry norm structure, and particularly that of B2B ecommerce standards; the existing status of standardization and the dynamics of industry standardization. At the beginning of a standardization episode, standards appear to be very fragmented and inconsistent across the industry. Efforts to develop an industry wide standards framework are sparse and unsystematic. Upon the completing of the standardization episode, the industry together comes to more integrated and consistent standards. A typical sign for more consistent industry standards would be the formation of standards organizations in the industry, for instance, RosettaNet in the electronics industry. The dynamics of industry standardization can be a complex function of industry internal technology & organization innovation. A faster rate of innovation can bring into the industry more new standardization episodes. Therefore, industry with faster rate of innovation can start new round standardization earlier than the others. However, faster rate of innovation can also result in more difficulties to develop technology and organization proximity (Fine, 1998). Industries with faster rate of innovation therefore are less likely to work out industry wide consistent standards. According to recent researches (Fine, 1998, Mendelson, 1999, Guimaraes et al., 2002), the rate of industry innovation can be identified by industrial clock speed that has three dimensions: the rate of change in products, production process, and organizational factors. The faster an industry clockspeed has become, the higher rate the industry innovation has. Fine (1998) also gave a preliminary list of multiple industries using three categories of industrial clock speed. For instance, the mining industries provide examples of a slow-clockspeed industry sector, and the computer software industry is an example of a fast-clockspeed sector (Fine, 1998).

2.2 EM Business Model

2.2.1 Generic Business Model Classification

Business model is a term often used to describe the unique competitive strategies of a given business. A business model is critical to a firm because it is directly relevant to the company's market appearance (e.g., potential customers, core products and services, customer process orientation, sales channels), its competence and strengths, and ultimately its performance (Heinrich and Leist, 2000). Not surprisingly, the business model concept is increasingly attracting attention within research on e-business (Timmers, 1998; Afuah & Tucci, 2001; Amit & Zott, 2001; Applegate, 2001; Cheng et al., 2001; Weill & Vitale, 2001, Hedman and Kalling, 2003). Since e-business business models are a relatively new phenomenon, existing literatures overlap and conflict in their understanding of key components and result in many different business model taxonomies. Table 2.2 below summarizes previous representative literature on business model, its classification dimensions and main components proposed.

Table 2.2 a comparison of business model classifications

…presentative Authors	Business mode…	[illegible]	…mponents	Com…
Afuah & Tucci (2001)			• Customer Value • Scope • Revenue sources • Connected activities implementation • Capabilities • Sustainability	• A comprehensive description of each component; • Interdependency between components is missing
Amit & Zott (2001)			• Content • Structure • Governance	• Both theoretically and empirically rigid • Limited to e-business value creation
Applegate (2001)	1. Focused distributor 2. Portals 3. Producers 4. Infrastructure portals 5. Infrastructure producers	• Generic market role • Digital business Platform	• Concept • Capabilities • Value	• Limited theoretical framework • Empirical method not described • A method for analyzing the impact of IS in e-business context • General applicability
Timmers (1998)	1.e-shop 2.e-auction 3.e-procurement 4.e-mall 5.Thrid party marketplace 6. Virtual communities 7.Value chain service provider 8.Value chain integrators 9. collaboration platform 10. Information brokerage 11.Trust services	• Value Chain de-construction • Interaction patterns • Value Chain reconstruction	• Business activities • Potential benefits • Source of revenues • Marketing strategy • Marketing mix • Product-market strategy	• Limited theoretical framework • Based on a survey of European electronic commerce projects • Provide a framework for classifying e-commerce business model

Weill & Vitale (2001)			• Consumers • Customers • Allies • Suppliers • Flow of product, information and money	• Based on a systematic and practical analysis of several case studies
Rappa (2002)	1. Brokerage 2. Advertising 3. Informediary 4. Merchant 5. Affiliate 6. Community 7. Subscription 8. utility	Unknown		• No specific approach
Dai and Kauffman (2002)		• Market Functions, • Management • Needs, • Technological Adaptation		Good analytic framework, in which business models are classified from different dimensions. But no systematic components taxonomy.
Mahadevan (2000)	1. Portals, 2. Market Makers, 3. Product/Service providers		• value stream • revenue stream • logistical stream	Generic, used an analogy without empirical evidence. General dimensions are complementary
Hedman and Kalling (2003)			• customer • competitor • offering • activities and organization • resources • supply of factor and production inputs • the cope of management	Generic, A complete picture, but overloaded for application

While the above summary indicates that there are many differences in this previous research, it seems that the key elements in understanding the e-business business model are the firm's **roles** and the **value** the firm brings through its roles. For example, Timmers (1998, p.4) defines an e-business model as: "An architecture for the products, service and information flows, including a description of the various business activities and their roles". Weill & Vitale (2001) present a similar definition: "... a description of the roles and relationship among a firm's consumers, customers, allies, and suppliers that identifies the major flows of product, information, and money, and the major benefits to participants." Afuah & Tucci (2001) present a list of components including customer value (distinctive offering or low cost), scope (customers and products/services), price, revenue sources, connected activities, implementation (required resources), capabilities (required skills), and sustainability.

2.2.2 EM Business Model Value-based Components

Value can be defined as "the amount buyers are willing to pay for what a firm provides them. Value is measured by total revenue ... A firm is profitable if the value it commands exceeds the costs involved in creating the product" (Porter, 1985). In the case of an EM, the value created through the EM will be the amount EM's participants (customers) are willing to pay for the information /products /services that the EM provides them.

A business model perspective on value creation within a network seeks to answer the following questions:

(1) How does the firm enable transactions?

(2) How is value extracted from this process of enabling transactions? (Amit and Zott, 2001).

Value creation is the core of a business model. An analysis of the value description of a business model will enable us to identify the activities of the firm and the economic implications of those activities. Generally, an EM business model includes three main components: value proposition, value-generating/adding process, and value appropriation. Each component above implies some sort of relationship between what is physically done and the utility (the financial and non-financial benefits) derived from doing it. The value propositions enable EMs to think about the wants and needs of customers, as well as what must be done (and at which price) to win a larger share of the available market. The value-adding process helps an EM to think about the unique activities that allow the organization to make distinct and unique products and services. The value appropriation allows the EM to think about whether what it does provides an acceptable return on its capital employed. Overall, these three components are complementary yet distinct in EM business model (Cox, Sanderson and Watson, 2001). All three components together define what roles the EM play in the economic network in which it is embedded.

2.2.2.1 EM Value Proposition

The **value proposition component** of an EM business model refers to the utility that the customer derives from the information, product or service acquired from the EM. The utility that EMs offers have been addressed by different literatures. A comparison of these existing literatures is given in the table below.

Based on these streams of literature, this dissertation classified EM's value proposition into several general categories below:

- **Communication enhancement**--rapid transmission of and access to large amounts of information at low cost
- **Transaction automation**—Automated business transactions and order execution including cost savings in logistics, transportation, distribution, inventory and payment systems.
- **Brokerage**-- access to large numbers of buyers and suppliers, consideration of many alternatives and efficient selection of best alternative.
- **Integration**-- tight coupling of buyer and supplier processes enabling lower inventory levels, greater responsiveness

Table 2.3 EM value offering Comparison

Representative Authors	EM Value offering addressed	Comments
Bakos (1998)	▪ **Product:** Increased personalization and customization of product offerings; Aggregation and disaggregation of information based product components; Lower search cost for buyers trying to shop for products; Lower communication cost for sellers trying to communicate information about their products. ▪ **Price:** Electronically making offers and negotiating prices; customized pricing based on EM's ability to track information on customers via data warehousing and data mining; Price discrimination--charging different prices to different consumers in different situations. ▪ **Transaction cost:** Increased information sharing and communication between buyers and sellers; Reduced cost of executing orders including cost savings in logistics, transportation, distribution, inventory and payment systems.	Value description is transaction focused; Value source is not included in classification.
Chatterjee and Segars (2003)	▪ **Revenue** – e.g. increases revenue generation potential by providing access to new markets and by facilitating the creation of better quality products and services. ▪ **Cost** – e.g. reduces cost of administration and operations by streamlining processes and improving transaction efficiency. ▪ **Asset Management** – e.g. facilitates asset utilization by providing access to spot markets for operating resources; by enhancing visibility of the supply chain, the exchanges help companies optimize their inventory levels. ▪ **Risk Management** – e.g. by providing better and quicker access to information, exchanges help business partners improve the accuracy of their demand and supply estimates; by providing shared access to a standardized technology platform, the exchanges reduce the risk associated with new technology investments. ▪ **Quality** – e.g. by helping business partners collaborate on product design, the exchanges help improve the quality of the design. ▪ **Customer Service** – e.g. by enabling and improving electronic linkages between buyers, and sellers, the exchanges empower customers to directly interact with the suppliers; such direct customer involvement results in greater customization and personalization of services.	Extended value description to broader business field, Value source is not included in classification.
A Boston Consulting Group report (2001)	▪ **Aggregation;** ▪ **process automation** ▪ **transparency/auctions** ▪ **lower marketing and sales costs** ▪ **lower transaction costs** ▪ **lower inventory costs** ▪ **lower cycle time** ▪ **improved asset utilization**	Value source is included in classification. Not theoretically rigor.
Malone et al. (1987)	▪ **Communication value:** rapid transmission of and access to large amounts of information at low cost ▪ **Brokerage value:** access to large numbers of buyers and suppliers, consideration of many alternatives and efficient selection of best alternative. ▪ **Integration:** tight coupling of buyer and supplier processes enabling lower inventory levels, greater responsiveness	Value source is included in classification. Theoretically rigor and generalizable

2.2.2.2 EM value generating/adding process/activities

The **value generating/adding process/activities component** of an EM business model refers to the transformation process that takes place within EM as they take less valuable supply inputs and turn them into more valuable supply outputs. Facilitated by different EM functions and technologies, these process or activities are usually bounded with each other to fulfill EM's market functions, satisfy management needs, and serve the role of technology adapters (Dai and Kauffman 2002). Generally, these processes or activities are communication-related, transaction-related, coordination-related, or integration processes-related.

In terms of communication, content provision including public storefronts, capabilities for browsing supplier/ product, Request for Product /Quotation (RFP/RFQ), classified Ads, and other Information services, e.g. discussion forums, industry newsletters, events calendar, bulletin board, scrolling ticker, industry rolodex enhance communication and coordination among multiple parties within the virtual community represented by EM (e.g. Realcommunities, Intralinks, MetalSite, PaperExchange, PlasticsNet). In addition, storage of vast quantities of transaction data becomes the excellent source for developing procurement knowledge as firms analyze purchase patterns (e.g. Instill, RiverOne).

In terms of transaction, electronic cataloging, either private (e.g. SciQuest) or public (e.g. CommerceOne, MarketSite) is the common mechanism that e-markets use to aggregate supplier offerings, through which B2B e-markets compile product information from many suppliers so that buyers can do one-stop shopping on the Internet. Dynamic trading processes or electronic auctions (e.g. FastParts) implement matching what is wanted with what is offered in the market. Facilitation services such as financial services (e.g. TradeCard) and logistics arrangements (e.g. Optimum Logistics) help firms to close interfirm transactions.

In terms of coordination, coordinating demand forecasting and production scheduling in real time (e.g.Transora) make collaborative supply chain management possible. Private trading mechanisms, allowing firms to transact with preferred business partners, accommodate firms' requirements for maintaining preferred business partnership, are favored when the goal is to strengthen strategic buyer-supplier relationships.

Finally, in terms of integration, integrating member firms' back-end enterprise systems with the marketplaces let EMs be able to create value for buyers and sellers by opening up more trading opportunities and by connecting more business partners within marketplaces (e.g. Citadon, NewView Connect (previous E-Steel Connect from e-Steel)). For the same reason, third-party business service providers, such as financial institutions that offer options to close on-line business transactions, can also be integrated into EMs. Standardizing the data formats used in exchanging business documents and implementing common business processes among trading partners enhance the connectivity of a network technology, and helps system integration (e.g. Converge). B2B e-markets also offer platforms to streamline workflow and promote inter-organizational collaboration, supporting business process management (e.g. ChannelPoint). To help member firms to overcome some of the adoption hurdles resulting from technical complexities, IT outsourcing services in terms of systems analysis and implementation is available as well (e.g. PurchasePro).

2.2.2.3 EM value appropriation

The **value appropriation component** of the EM business model depicts the value EM itself can retain from participating at a particular stage in the supply chain. In contrast to the value proposition that addresses the long-term sustainability of the business and often sets the context for identifying revenue streams for an organization, the value appropriation of EM reflects the realization of revenue in the short-term. EMs typically generate revenues through different fees structure, e.g. subscription fees, advertising fees, and transactional income (including fixed transaction fees, referral fees, fixed or variable sales commissions, and mark-ups on direct sales of goods), etc. (Woods 2002, Goldman 1995). They sometimes use variants of these basic revenue-generating modes, and often use them in combination. Table 2.4 gives different revenue stream that EMs currently generates.

Table 2.4 EM revenue stream

Revenue Stream	Definition	Example	Advantage/Disadvantage
Subscription (or membership) fees,	One-time joining fee or annual maintenance fee for membership	• CreditTrade web • PaperExchange	• Easy to track and charge • Attractive to new members for free view..
Advertising and permission marketing fees	Fees for banner advertising and other extended listing services on the website such as "Opt-in"	• VerticalNet	• High requirement on customer retention and loyalty
Transaction fee	Based on the value of the transaction, sometimes with a minimum per trade or a maximum per trade for large deals.	• E-steel -- 7/8 of 1% to sellers. • PaperExchange-- 3% of the value of the transaction for paper related and equipment listings	• High income when transaction volume is high • Raise the hurdle of trading entry • Hard to track over-the-counter tansactions
Posting fees	A fee for each "posting," or order entered into the system.	• Nasdaq charges a fee for each quote	• Dilemma of whether to permit free posting initially to encourage volume or whether to charge
Listing (or hosting) fees	Fees for users to list products on the system for trading	• VerticalNet—a fee to host the supplier's storefront and list the supplier's products in its website	• The exchange have to take regulatory roles mostly
Information selling fees	Fees for receiving valuable and disseminated trading data/information	• Manheim online charges a fee for car dealers to buy the list of all the sale prices from the online auctions held each day	• Based on economic power of trading information. • Limits the initial visibility of the exchange and can slow down the overall rate of take-up in the industry
Information licensing fees	Fees for the use of pricing data used in the formulation of the derivative contracts	• Dow Jones and Standard Poor's indices are licensed to Chicago Mercantile Exchange and the Chicago Board of Trade	limited to Derivative contracts
Revenue Sharing	Revenues generated through strategic partnerships with business partners who provide analytics, ratings, and news services or publishing their own data and analysis.	• Non specific	EM must set up the partnership or provide analysis tools for their data.
Software licensing fees	Fees for licensing sophisticated trading platform with integrated logistics and back-office functionality.	• Maoi Technologies • Commerce One • Right Works • I2 Technologies	EM has to have huge investment on internal system development
private networks sponsorship fee	A monthly administration fee for private network, which depending more on revenue than transaction fee	• BigMachines • Catex • CreditTrade	Private network is tied into the EM's core system—a good way to forge strategic relationships with key industry participants.
value added service fee	A fee per service, e.g. percentage of cost savings	• ESPRIT project TRANS2000 in multi-modal transportation • MarshallNet and Parternet	• Focus on value adding service requiring integration and cooperation along value chain.

2.2.3 EM Business Model: A Network Role Perspective on classification

An EM is a network facilitated by telecommunications created to enable multiple buyers and suppliers to exchange information and complete transactions (Zwass, 1999). The EM business model needs to tell who provides its goods and services, what goods and services will be provided, when and where they are provided, why the EM provides them, how the EM provide them, and how much revenue the EM takes in to continue its effort. To be materialized, an EM business model must depict the design of transaction content, structure, and governance so as to create value through the exploitation of business opportunities (Zott, 2003). Although general e-business research and strategy research covers many if not all of the theoretical components that are included in business model, the business model concept is used more sparsely within EM research. This paper thus proposes that ***an EM business model is the conceptualization of the business roles an EM play in its industry network, which can be defined as distinct, technologically separable, value-added activities undertake by e-marketplaces in a given industry structure.***

This network role-based abstraction is appropriate for EM research for three reasons. First, since EMs operate as the hub of existing industry network, it will reduce the complexity of analyzing industry networks by focusing attention on the roles undertaken by EMs rather than the EMs themselves. This will simplify representation of the business network structure. Second, role delineation on the basis of technological separatability focuses attention on how changes in technology affect the population of role providers, i.e., the EMs, and the ways of organizing tasks within a role. Third, transitions in individual EM strategies can be systematically mapped by considering the roles by which an EM positions itself in its industry and how it manages interdependence with other roles in the industry network (Kambil and Short, 1994).

Previously, Bakos (1998) explained the functions or roles of electronic markets as matching buyers and sellers, facilitating transactions, providing institutional infrastructure, aggregating product information, price discovery, and providing procurement and industry specific expertise. Each of these functional roles requires different and distinct technologies, in terms of knowledge and skills as well as equipment. Hence, these roles are technologically separable where technology is defined as inclusive of specialized types of applied knowledge and equipment (Nelson, 1982; Perrow, 1986). Other writers have also discussed the specific roles that EMs play; a comparison of these is provided in Table 2.5.

Table 2.5 EM Roles Literature Review

Representative Authors	*Roles of EM*	*Comments*
Chatterjee and Segars (2002)	• Project/Specification Managers • Supply Consolidators • Liquidity Creators • Aggregators • Transaction facilitator	Specific but not theoretical taxonomy
Weller, Todd C. (2000)	• EM Platform providers • EM operators	Specific but not sound taxonomy
Timmers(1998)	• E-shop, E-procurement, E-auction, e-mall • Virtual Communities • Value Chain Service provider • Value Chain Integrator • Collaboration Platform • Information Brokers	Specific but not be able to differentiate each other theoretically
Malone et al. (1987)	• Communication • Brokerage • Integration	Functionality focused, not specific roles
Bakos (1998)	• Matching buyers and sellers including determination of product offerings, search, price discovery • Transaction facilitation including logistics, settlement, trust • Institution infrastructure, e.g. legal or regulatory	generic and applicable to both electronic and non-electronic market, not specific roles

Dai and Kauffman(2002)	• Complete market functions • Fulfill management needs • Adapt technology	Generic, complementary but not distinguishable taxonomy

Overall, these classifications of EMs' roles overlap and are functionality-oriented; however, they are either not specific roles or not based on a theoretic taxonomy. Therefore, this research proposes four elementary EM business models: communicator model, transaction facilitator model, valued chain coordinator model, and collaboration enabler model. Each model represents different roles of EM in its economic network. The difference among them can be described from the three value components discussed before.

Communicator model enhances the communication between participants in the EM as its value proposition. EMs adopting this model mainly serves the role of an information intermediary within an industry network. In this communicator model, the creation, approval, and release of content (or information) are predictable and controllable as any manufacturing process. EM examples of the communicator model include Introlinks.com, Worldoil.com, Rfpmarket.com, and wtexpo.com, etc.

Content management is the major value-adding process of this model, which includes providing public store fronts, supporting buyer/seller information search, facilitating requests for products or quotations (RFP/RFQ), dispersing customized news feeds, and providing document management, etc. Accurate and timely content can speed the exchange of goods, match buyers and sellers, and determine customer satisfaction. For example, Content Intelligence Services (CIS) organizes business-critical content by automatically tagging and categorizing it -- turning unstructured content into intelligent, structured content. With these powerful capabilities, CIS enables precise searching, easy navigation, and effective personalization while promoting content reuse across multiple initiatives and increasing productivity through process automation. In addition to content management, some other communication services provided by this model include discussion forums, industry newsletters, calendars of industry events, bulletin boards, scrolling tickers, industry rolodexes, and classified Ads, etc.

Since the communicator model creates value mainly through information processing, it is not surprising that companies adopting this model make money from information exchange through the EM. Charges on information flow, e.g., advertising fees, permission marketing fees, products posting fees, information selling fees, and listing (or hosting) fees, etc., represent the main revenue stream.

The ***transaction facilitator model*** specializes in offering spot trading, search and price discovery services. The value proposition of this type of model is to facilitate transaction automation and aggregation. EM examples of this model include Arbinet.com, BigMachines, E-chemicals, and PlasticsNet, etc.. These EMs try to provide a one-stop shop for many types of products and services. By affiliating themselves with other marketplaces, they can offer great reach and connectivity for companies trying to increase market share and/or looking for scarce direct and indirect materials and other supplies.

The underlying value-added from this model is reduction of cost through process improvement and/or access to more sources of supply or more potential customers. Major value-adding processes in this model include spot trading, search and price discovery services, and post-sale transaction automation, e.g., e-procurement, aggregated catalogs, online issuing of P.O., invoicing, and automatic clearing and settlement.

The membership costs in these open marketplaces are likely to be low or nonexistent; the fee structure is likely to be flexible to make it attractive for clients conducting both low and high volume transactions. Main revenues of transaction facilitator model come from transaction fees, listing (or hosting) fees, and information licensing fees.

While deceptively simple, firms driving exchange in these marketplaces face a number of challenges. Foremost among the challenges is the retraining of procurement personnel and the redesign of business processes. Many firms have discovered that simply adding web-based technology and conducting business without redesign of process or adjustment of skills is more costly than traditional commerce. An additional challenge is developing a marketplace that both attracts and retains participants, especially, those participants whose technology and business processes are sophisticated enough to enable the marketplace to realize its potential benefits.

The ***Value Chain Coordinator model*** specializes in offering tools and functionalities that will enhance information visibility and speed up information sharing across the entire supply chain. The overall goal of this model is to help integrate the business processes of manufacturers with those of the buyers, sellers and distributors. It is through such end-to-end supply chain integration that companies can realize value in many different ways: superior inventory management, manufacturing on demand, customized product offerings, and relatively accurate demand forecasting. Therefore, the value propositions of this model are reduction of demand uncertainty through brokerage and perfect information for better supply chain coordination.

The value-adding processes in this model include selections, dynamic pricing and logistic coordination, e.g. different auction/reverse auction, online negotiation, online comparison of offers & recommendation (auto-matching), centralized clearing and settlement, warehousing, transportation, quality assurance, and credit analysis, etc.

EMs taking this model can charge higher subscription fees and services fees as compared to the transaction facilitator model because they are providing higher margin value-added services; often, this form of market facilitator is likely to be a technology vendor with considerable experience in supply chain management, i.e., NewView and Commerx.

The ***collaboration enabler model*** is suitable to further enhance a buyer–seller relationship by enabling collaborative relationships in which companies are working jointly with others, especially in an intellectual endeavor (Noekkenved, 2000). EMs adopting the collaboration enabler model are usually characterized with closed memberships. This is obviously because of the difficulty of trust building and high cost of exchanges of knowledge as well as other forms of complex information. The focus of their value proposition lies in developing new products and services through collaboration among the participants. However, the collaboration among participants cannot occur without the integration of their information system and organizations. Therefore, their value source ultimately lies in process and data integration for innovation purposes.

Value-adding in this model is achieved through collaboration, enabled by system integration among EM participants, e.g., private sellers' extranets with pricing personalized to individual customers, inventory visibility, design sharing, or co-R&D as well as co-marketing etc. Tight integration among trading partners enables them to work together to better understand future demand and put plans in place to satisfy it profitably. During this process, information is not just exchanged and transmitted, but it is also jointly developed by the buyer and seller. For example, in the case of working collaboratively on customer requirements, trading partners might collaborate on new product designs and customer demand forecasts (Grieger, 2003).

Since collaboration is the main source of their value creation, revenue streams in support of this model are the subscription fees, membership fee, private networks sponsorship fee, and revenue sharing. The milestones of collaboration are perfect knowledge and strategic flexibility. In essence, the participants seek to identify future market opportunities and then invest collaboratively to probe and exploit potentially new boundaries for the industry.

Based on this classification schema, current EM business models can be depicted as the table 2.6 below:

Table 2.6 Electronic Marketplaces business Model Comparison

EM business model Type (Network Role based)	EM business model Components (Value-centered)		
	Value Proposition	**Value Adding Process**	**Value appropriation**
Communicator model Eg. Introlinks.com, worldoil.com, Rfpmarket.com	Communication enhancement	**Content provision, e.g. :** public storefronts, capabilities for supplier/ product search, Request for Product /Quotation (RFP/RFQ), classified Ads etc.. **Other Information services** discussion forums, industry newsletters, Events calendar, bulletin board, scrolling ticker, industry rolodex	✓ advertising and permission marketing fees, ✓ posting fees, ✓ information selling fees, ✓ Listing fees ✓ Information licensing fees
Transaction Facilitator model Eg. Arbinet.com BigMachines E-chemicals PlasticsNet	Transaction automation & aggregation	**Spot trading, search and price discovery related services, e.g. :** E-trading and aggregated catalogs **Post-sale transaction automation, e.g.:** Online issuing of P.O., invoicing, e-payment	✓ Transaction fee, ✓ Listing (or hosting) fees ✓ Information licensing fees,
Value Chain Coordinator model Eg. Catex PaperExchange CreditTrade Newview.com Commerx.com	Brokerage & logistics coordination	**Selection and Dynamic pricing, e.g.:** auction/reverse auction, private negotiation, online comparison of offers & recommendation (auto-matching) **.Logistic coordination, e.g.** warehousing, transportation, quality assurance , clearing and settlement, Escrow	✓ value added service fee (percentage of cost savings,) ✓ subscription fee,
Collaboration-enabler model Eg. Covisint Snecma	Integration & initiation of innovation	**Collaboration facilitation, e.g.:** private sellers' extranets with pricing personalized to individual customers, inventory visibility, design sharing Co-R&D or Co-marketing	✓ subscription fee, ✓ membership fee, ✓ private networks (PN) sponsorship & customization fees, ✓ Revenue Sharing

2.3 EM Governance Model

2.3.1 Organizational Governance and Its Theories

Governance is the determination of the broad uses to which organizational resources will be deployed and the resolution of conflicts among the myriad of participants in organizations. It concerns "the structure of rights and responsibilities among the parties with a stake in the firm" (Aoki, 2000: 11). An organization's governance structure relates to formal and informal contractual agreements among its stakeholders. These may include the pay-off structure for the suppliers of capital (including owners and creditors of the firm), the incentive structure of corporate decision makers, and the organizational structure for maintaining an effective balance in bargaining power of the participants. Existing literature has found that governance structure influences, or is ultimately responsible for, critical resource allocation decisions pertaining to investments in new products and technologies (Bower, 1970; Burgelman, 1991), competitive attacks and responses (Hambrick et al., 1996), entry into new geographic markets (Bartlett & Ghoshal, 1989; Hudson & Lublin, 1994), and corporate acquisitions and divestitures (Haspeslagh & Jemison, 1991), etc..

Governance structure represents a significant source of organizational variation (Blau and Scott, 1962). The variety of governance structure can be explained through different theoretic perspectives.

According to transaction cost theory, the transfer of goods and services in a market -- electronic or otherwise -- take places in an exchange context where information is imperfect, where parties have made asset specific investment, and where either party may seek to promote its own interest at the expense of the other by engaging in strategic or opportunistic behavior. An appropriate governance structure -- either market or hierarchy or intermediate forms depending on the context -- can reduce transaction cost, i.e., the cost involved in negotiating, monitoring, and enforcing exchanges between two parties, thus improving firm performance and market efficiency (Williamson, 1981, 1985, 1991a, 1991b). Transaction cost theory has been employed to examine different governance structures such as hierarchies, franchises, multidivisional, conglomerates, holding companies (Williamson, 1975), and extended to clans (Ouchi, 1980) and networks (Jarillo, 1988) as well as market-hierarchy hybrids (Williamson,1991b). In each of these cases, the combination of bounded rationality and uncertainty creates the prospect that costly negotiating and monitoring costs may accompany exchanges conducted within the market. Observed organizational designs, or governance structures, are thought to be those that minimize the costs associated with opportunism, meanwhile economizing on bounded rationality (Roberts and Greenwood, 1997).

Agency Theory (Jensen & Meckling, 1976; Fama & Jensen, 1983) focuses on the conflict of interests between principal (the owner) and agent (the manager) and assigns to the governance structure the task of controlling the management's work to avoid opportunistic behavior resulting in reduced performance. Agency theory holds the notions that humans are self-interested and generally unwilling to sacrifice personal interests for the interests of others. Corporate governance mechanisms thus provide shareholders assurance that managers will strive to achieve outcomes that are in the shareholders' interests (Shleifer & Vishny, 1997). For example, boards of directors keep potentially self-serving managers in check by performing audits and performance evaluations. Boards communicate shareholders' objectives and interests to managers and monitor them to keep agency costs in check. Outside (non-management) board leadership and membership are desirable to ensure that proper management oversight occurs. These mechanisms enable boards to monitor managers and advise them in ways that align their interests with owners, improving the quality of the firm's strategic decision making.

Agency theorists have identified several governance mechanisms that can protect shareholders against management's opportunism (Walsh & Seward, 1990). Internal mechanisms include an effectively structured board, compensation contracts that encourage a shareholder orientation, and concentrated ownership holdings that lead to active monitoring of executives. The market for corporate control serves as an external mechanism that is typically activated when internal mechanisms for controlling managerial opportunism have failed.

In contrast to agency theory, stewardship theorists focus on governance structures that facilitate and empower rather than those that monitor and control. According to stewardship theory, the behavior of the steward is collective because the steward seeks to attain the objectives of the organization (e.g., sales growth or profitability). This behavior in turn will benefit principals (outside owners and managers) through positive effects of profits, dividends and share prices because their objectives are furthered by the steward. Stewardship theorists argue that if the executive's motivations fit the model of man underlying stewardship theory, empowering governance structures and mechanisms are appropriate -- for example, the CEO chairs the board of directors. Thus, a steward's autonomy should be deliberately extended to maximize the benefits of a steward because he or she can be trusted. In this case, the amount of resources that are necessary to guarantee pro-organizational behavior from an individualistic agent (i.e., monitoring and incentive or bonding costs) are diminished because a steward is motivated to behave in ways that are consistent with organizational objectives (Davis et al, 1997; Donaldson and Davis, 1991).

Additionally, legitimacy also performs an important role for firms undertaking a different governance structure. Organizational legitimacy (legitimacy, hereafter) is defined as a status conferred by social actors (Ashforth & Gibbs, 1990; Pfeffer &

Salancik, 1978). From the perspective of a particular social actor, a legitimate organization is one whose values and actions are congruent with that social actor's values and expectations for action (Galaskiewicz, 1985; Pfeffer & Salancik, 1978). The social actor accepts or endorses the organization's means and ends as valid, reasonable, and rational (Ashforth & Gibbs, 1990; Baum & Oliver, 1991; Meyer & Scott, 1983; Singh, et al., 1986; Stinchcombe, 1968). Legitimacy has two related forms. First is cognitive legitimacy, which is the recognizability or taken-for-grantedness of an organizational form. The second form of legitimacy is normative, which is the social consensus around what ought to be (Scott, 1995).

Institutional theory research indicates that legitimate firms are less likely to fail (DiMaggio & Powell, 1983, Barringer and Milkovich, 1998; Eisenhardt, 1988). To gain legitimacy, organizations respond to institutional forces emanating from such sources as suppliers of capital, consumers, and regulatory agencies by adopting the same organizational form (DiMaggio and Powell, 1983; Greenwood and Hinings, 1996). This homogenization process, also known as isomorphism (Hawley, 1968), forces one organization in the population to resemble other organizations that face the same set of environmental circumstances (DiMaggio and Powell, 1983). Researchers have found that isomorphism affects organizational characteristics, such as structures and practices (Meyer & Rowan, 1977; Tolbert & Zucker, 1983). Given the need to influence investors, firms may adopt appropriate governance structures to signal legitimacy because organizations that incorporate society-legitimated rationalized elements in their formal structures maximize their legitimacy and increase their resources and survival capabilities (DiMaggio & Powell, 1983; Meyer & Rowan, 1977; Pfeffer & Salancik, 1978).

Finally, organizational learning (OL) theory poses that appropriate governance structures/mechanisms must be crafted which match the learning intentions of the partners, the type of knowledge sought, and the designed duration for the collaboration, so as to maximize the benefits of learning while minimizing the risks (Mohr and Sengupta, 2002). According to OL theory, unilateral governance (based on one firm's controlling authority) inhibits inter-firm learning, while bilateral governance (based on mutual relational norms) would facilitate such learning. With formal controls and mechanisms put in place to manage the unilateral exchange relationship, personnel involved in the day-to-day management of the relationship would have rules for information sharing and tools to monitor and limit knowledge flows. On the other hand, bilateral mechanisms, with their emphasis on trust, relational standards, and mutuality in the relationship, would facilitate inter-firm learning. As stated by Helper and Levine (1992), interdependent relations governed by trust encourage the transfer of proprietary know-how.

2.3.2 EM's governance

Neoclassical economics regards markets as just decision systems, because markets are regarded as consisting of the aggregation of individual bargains which simply leads to the physical exchange of the goods (Hodgson, 1988). But in reality, markets are embedded in a certain social and technological environment. They have organizational aspects as well in that they possess functional and structural components: someone has to run the infrastructure, e.g., the information systems; someone has to hire and lead the people who administer the market; someone has to find suppliers who are willing to sell within the market; finally, someone has to motivate customers to buy at the market.

Particularly for electronic markets, these functional and structural components have to be constructed, and construction reflects pure intentional planning.

This organizational nature of an EM induces the need of an EM governance model. An EM governance model can be defined as an articulated, consistent system of formal and informal rules. It is made up of collegial and individual boards as well as of decision-making processes that involve representatives of EM owners and/or participants, each of whom bring in resources critical to the organization's development and that ensure its management, control, and accountability. Electronic markets using Internet technology are multilateral inter-organizational information systems that facilitate transactions over telecommunications networks between multiple buyers and sellers. An EM governance model is critical to the adoption, implementation, and operation as well as administration of EM among many market participants or owners.

An EM governance model must reflect EM's industry linkages if the EM is to be successful. Here, industry linkage refers to the different ways that firms or individuals manage economic interdependence across value adding roles in the network (Kambil and Short, 1994). Adapting work by Williamson (1979) on economic governance and Galbraith's (1974) work on information processing organizations, existing literature identifies different types of linkages in an inter-organization network: simple market exchanges, standard linkages, specialized linkages, customized linkages, and mandates (Kambil and Short, 1994). These forms of linkage reflect different models of coordinating and influencing economic exchange relationships between firms or individuals in different network roles. They determine the structure of inter-firm networks and influences firm behavior through access to critical resources and information (Burt, 1983; Davis & Mizruchi, 1999; Windolf, 2002). Previous research on alliance and hierarchies has pointed out that an intriguing aspect of successful inter-organizational network governance is the need to reflect firms' industry linkages in their governance model because of the need to lower transaction cost or uncertainty from asset specialties involved in firms' industry linkages (Williamson, 1979, 1985).

Exsiting research has also found that it is important to reflect firms' industry linkages in order to involve partners with industry linkages with a firm's governance structure (Johnston and Lawrence, 1988; Dwyer et al., 1987; Achrol, 1991; Webster, 1992). For example, the involvement of suppliers in the embedded structures of an inter-organizational network governance model can enable producers to control the opportunism of suppliers by pursuing concurrent exchange relationships with the implied threat of switching to alternative vendors (Joshi and Stump, 1999). The main reason for this involvement can be explained by stakeholder representation theory that acknowledges the potential significance of stakeholder representation. According to this theory, stakeholder representation promotes procedural fairness (Freeman & Evan, 1990; Jones & Goldberg, 1982) by providing a means of ensuring that stakeholder considerations are more directly represented in corporate decision making (Jones & Goldberg, 1982; Selznick, 1992), is central in legitimating (Evan & Freeman, 1993) and safeguarding the interests of corporate stakeholders (Freeman & Evan, 1990) in matters of corporate governance. For this research, mechanisms important to introduce EM's industry linkages into its governance models can be distinguished by the involvement of network nodes (independent, consortia and private), or supply chain position (buyers owned, sellers owned, neutral).

2.3.2.1 EM's Ownership

Ownership and control are rarely completely separated within any firm. The controllers frequently have some degree of ownership of the equity of the firms they control; while some owners, by virtue of the size of their equity positions, effectively have some control over the firms they own. Thus, ownership structure (i.e., the identities of a firm's equity holders and the sizes of their positions) is a potentially important element of any corporate governance. Agency theory researchers point out that greater overlap between ownership and control should lead to a reduction in conflicts of principal, agency's interest and, therefore, to higher firm value (Jensen & Meckling, 1976; Fama & Jensen, 1983). The board literature also suggests that stakeholder representation on corporations' boards is an important way to uphold and legitimate stakeholder interests within these corporations (Luoma and Goodstein, 1999; Evan & Freeman, 1993; Freeman & Evan, 1990; Jones & Goldberg, 1982; Selznick, 1992). It is suggested that having industry-specific expertise (vertical knowledge) on EM boards is of paramount importance (Sculley and Woods 2001).

In reality, three kinds of EM ownership have emerged over the years: the independent EM, the consortium EM, and the private EM (Kambil and Van heck, 2002).

An independent EM is electronic market established by third parties that link buyers and sellers. Examples include Chemdex, PaperX, PEFA, and PartMiner. Independent EMs usually start without the buy-in of key buyers and suppliers and are led by industry outsiders, managers who lacked the required expertise and crucial relationships. Because of a typical low barrier to entry, intensive competition exists among independent EMs, which ultimately lowers margins and has led to the demise of many independent EMs. Such problems have typically limited independent EMs to serve specific niches such as relatively low-risk trading roles, and have led them to add new functional capabilities, such as supply chain coordination, integration and sourcing services, in order to raise competitive barriers. Currently, independent EM ownership is not dominant with new EMs.

A consortia EM, or an industry-sponsored market, is established jointly by a group of key players, either buyers or sellers. Examples are Covisint in automotive, Exostar in aerospace, Quadrem in metals and mining, and Pantellos in the electric utilities industry. These consortia offer major industry players the opportunity to keep the benefits of online trading amongst themselves rather than giving them to independent exchanges. Founders of these marketplaces typically represented a substantial portion of the industry's trading volume, thus marginalizing competitors. For example, the twenty-one founding members of Quadrem, the EM for mining, minerals, and metals companies, represent two-thirds of the industry's total market capitalization and more than 25% of its buying power. In addition to simple search, matching, and ordering capabilities, consortia exchanges can provide substantially higher levels of benefits, including supply chain planning, collaboration, and order and logistics tracking. They also try to be the one-stop shopping source for their industry, offering basic maintenance, repair, and operations products procurement, direct materials procurement and exchange services, price-comparison product catalogs, industry news, expert forums, and standards-establishing authorities. Some consortia are even setting up secure sites on which multiple companies can collaborate on engineering projects (Kambil and Van heck, 2002).

The main challenge consortia EMs face is a lack of trust among industry players and, therefore, their reluctance to join in the consortia.

Private EMs, on the other hand, are trading platforms set up by individual companies to directly reach their key suppliers or customers. Examples include Cisco, Dell, and Walmart's private exchange. Private EMs are usually set up by companies with a dominant industry position or leading supply chain management capabilities. These private EMs have sophisticated e-business capabilities, providing for deeper supply chain collaboration, more exchange of proprietary data, and fuller integration of a firm's business processes with those of its trading partners. For example, a seller-based private EMs such as the Cisco Connection Online enables a company to provide added value to key customers by allowing its customers to configure, place, and check the status of orders. On the other hand, buyer-based private EMs such as Walmart try to make supply chain management more efficient and effective with the capabilities for online ordering, product and shipment tracking, invoicing on basic function level and forecasting, supply planning, product design, exception management at more sophisticated function level.

2.3.2.2 EM's bias

IS research has indicated that organizations tend to use their power, derived from many sources including institutional structures and resource dependencies, to implement new inter-organizational systems (Ang and Cummings 1997, Hart and Saunders 1997, 1998; Lacovou et al. 1995; Premkumar and Ramamurthy 1995). Powerful organizations are believed to be able to require the adoption of certain technologies by less powerful organizations in order to facilitate a trading relationship. However, by using power in this way, organizations may hinder the development of trust and risk damaging long-term inter-organizational relationships (Hart and Saunders 1997). Overall, these and other studies suggest, and somewhat support, the notion that individuals and organizations can be expected to use their power to guide IT implementation, deployment, management and use. Therefore, organizations can take deliberate, strategic IT actions to shape the technological conditions and the market structures within which they operates. Such actions, which might take the form of product, process or supply chain innovation, are designed to influence both the firm's own performance and the performance of those around it.

This research focuses partly on the role of power in the dynamics of exchange and the contribution that it can make to an understanding of business strategy. Correspondingly, there are three types of EM governance bias: buyer-oriented, seller-driven and neutral.

A buyer-driven marketplace is usually set up by the buying firms with the aim of shifting power to the buyer's side. In such a marketplace, buyers have the ability to define and determine the type of marketplace by means of transaction mechanism and revenue model. The ratio between the business partners can be described by 1:n relations (buyer to suppliers) or n:m relations (n is much smaller than m). The buyer-oriented marketplace generally has several objectives, including driving procurement costs down for the participating buyers, allowing buyers to ''aggregate their expenditure'' for inventory saving, to reduce administration costs, to increase visibility, and to facilitate global sourcing. While single-buyer-driven marketplaces such as CommerceOne's MarketSite concentrate primarily on creating sourcing efficiencies for the corporate buyer, some buyers build cooperative procurement hubs (e.g. Covisint) or so called "sourcing networks" to join forces with other large buyers, which can demand more favorable pricing and trading terms. All these relationships are aligned to increase benefits to buyers.

The seller-driven marketplace concentrates on bringing multiple sellers together into a central catalogue and product information repository (i.e. Build-Online, e-Steel). Seller-driven marketplace can be characterized as n:1 relations (buyers to suppliers) or n:m relations (n is much larger than m). Whereas buy-side marketplaces target the procurement needs of corporations, seller-driven marketplaces focus on sales. The key to a seller-driven marketplace is to provide multiple sellers a forum to present their catalogues and conduct trade with as many buyers as possible—in other words to aggregate the ''content'' that will meet the buyers needs. Seller-driven marketplaces also have the ability to aggregate their sellers, acting as a service provider, wrapping products and services together to deliver them to buyers, to EMs, and to aggregate buyer-driven networks directly (Grieger, 2003). All types of relationships are aligned to increase benefits to sellers.

Neutral EMs are the true market makers because they are equally attractive to sellers and buyers. They are almost always set up by a third party (e.g., CPGmarket, Tribon Marketplace, and ChemConnect) to match many buyers to many sellers, but sometimes can be formed by several companies coming together as well (e.g. Envera by 14 chemical and petroleum companies) (Berryman et al., 1998; Chang, 2000). The main optimization potential on a neutral EM can be realized through transaction cost reduction due to network effects of bringing together many market participants. Additionally the marketplace enables a real time virtual community of participants, which would have been more difficult in reality (Hartmann, 2002). Especially for non-transparent industries, the marketplace offers efficient opportunities for matching demand and supply. Also in industries with temporary overcapacity, neutral EM offers significant optimization opportunities for establishing an efficient and effective matching process between demand and supply (Hartmann, 2002). However, these marketplaces often face the ''chicken and egg'' problem: buyers do not want to participate unless there are a sufficient number of sellers, while sellers do not want to participate unless there are a sufficient number of buyers. In addition, these neutral markets also have to overcome channel conflicts to persuade more powerful players to participate. Making deals with more powerful players to gain liquidity is a threat to their independence and neutrality.

2.4 Summary of the Chapter

This chapter provides a baseline for the many of the dissertation chapters that follow. It develops the main research constructs in this dissertation with a review of relevant literature.

The literature review in Section 2.1 discusses industry structure from horizontal (competitive structure), vertical (supply chain structure) and institutional (norm structure) aspects. All of these aspects come from a network relationship perspective. They together define the relationship among network nodes. The theoretical argument about the impact of industry factors will proceed from these three aspects.

The identification of EM business models in Section 2.2 provides a generalizable and rigorous theoretical framework for EM business model at first time. The three value components, that is, value proposition, value adding process, and value appropriation, prove to be able to support strong arguments on EM network roles. The communicator model, the transaction facilitator model, the value chain coordinator model, and collaboration enabler model are a contribution to the taxonomy of EM business models.

The intensive review of EM governance in Section 2.3 illustrates the origin and development of network governance. EM governance model as EM's industry linkages are distinguished by the involvement of network nodes (independent, consortia and private), or stakeholder roles (partnership with peers, critical suppliers or buyers, technology or information providers), or supply chain positions (buyers oriented, sellers oriented, neutral).

Overall, this chapter prepares the theoretical base for three main research constructs. The next chapter will discuss the fit among these three research constructs and describe the association between fit and EM performance.

Chapter 3 Research Propositions

Introduction

Being a hub in the nexus of firms in the same industry or along industry supply chain, an EM is essentially embedded in an inter-organization business network among a set of multiple companies with business relationships, enabled through digital, Internet-based information connections to coordinate their separate, ongoing activities. The emergence of EMs thus can be viewed as a process of inter-organizational network development, which depends on the cooperation of network nodes because of its necessity for innovation and competitive success, high satisfaction for cooperating parties, and strong levels of efficiency and profitability as well as lower governance cost (Smith et al. 1995).

The inter-organization cooperation underlying EMs is reflective of "socially contrived mechanisms for collective action, which are continually shaped and restructured by actions and symbolic interpretations of the parties involved" (Ring and Van de Ven 1994, pg.96). This collective action across inter-organizational networks includes two aspects of cooperation: cooperation on network value flow and cooperation on network governance (Woods, 2002). The first defines the roles of each participator in the network value chain and determines how the value is created and delivered through the network. The second defines power or control relationship across the network and is focused on directing the value creation and delivery functions. The EM business and governance models indicate these two dimensions of the underlying network cooperation and can be viewed as strategic and structural configurations of the underlying industrial network.

Network cooperation occurs in certain industry structures and is influenced by them. These industry structures determine the relationship among network participators, or the structure of network. Industry structure characteristics such as concentration, entry barriers or product differentiation, can be viewed as the contextual configurations of an industrial network.

The success of e-marketplaces is defined in this research as the survival of an EM during the initial stages of its network formation as well as the positive performance it brings to itself and the organizational nodes within the inter-organizational network afterwards. Prior research has pointed out that "increased (organizational) effectiveness (success) is attributed to the internal consistency, or fit, among the patterns of relevant contextual, structural, and strategic factors" (Doty, Glick, and Huber 1993, pg.1196). This suggests that organizations like EMs that have a fit among and within these factors/network configurations will perform better than those are 'misfits.'

The concept of fit has served as an important building block for theory construction in management research. Many different conceptualizations of fit appear in the organizational literature. Drazin and Van de Ven (1985) organized many of these conceptualizations into the interaction, selection, and systems approaches to fit. The interaction approach to fit characterizes many traditional theories, especially "contingency" theories, which typically define fit as the statistical interaction of two variables. The selection approach to fit is adopted by theorists who develop organizational taxonomies and population ecologies. It states that the environment differently selects organizations for survival on the basis of fit between organizational forms and environmental characteristics (Hannan & Freeman, 1984). The systems approach to fit is consistent with the logical arguments of configurational theories. This approach has led strategies to be conceptualized as the combination (profile) of environmental, contextual, and structural elements affecting an organization at any time and explain fit on the process of covariations among the factors that produce organizational survival or effectiveness (Van de Ven, 1979, p.323).

During the late 1990s, many EMs arose across nearly every industry segment. The more recent market shake-out of EMs seems to suggest that there will be only a few successful EMs within each industry (Woods, 2002). This phenomenon seems to be very similar to a natural selection process suggested by organizational ecology theory. At the same time, it is also observed that the business and governance models of successful EMs usually follow different combination patterns in various industries, e.g. collaboration enabler model usually occurs with participant governance model, and most non-participant owned EMs applied transaction facilitator model (Woods, 2002). Practitioners' observation has to some extent suggested that the fit between EMs' characteristics and industry structure can be understood in a systematical approach, in which the industry structure interact with congruent variation patterns among multiple different network configurations that EM business and governance model present. This research therefore defines fit as an interaction of industry structure and covariations among multiple dimensions of EM organizational designs and structures.

From this definition, it is natural that there is no uniformly best organization structure for all firms in all circumstances. Instead, one has to find the appropriate fit among contextual factors (e.g. environment, technology, etc.), design factors (e.g. strategy and institutional models), and structural factors (e.g. complexity, centralization, and formalization) (Drazin and Van de Ven 1985). If contextual factors such as industry structure change, design factors and structural factors may be needed to change to "recalibrate" the fit. This indicates that the nature of fit situations between EMs' business/governance model and industry structure may vary across industries and overtime.

The following sections will discuss the fit among different network configurations and industry structure, and develop research propositions in this dissertation. Section 3.1 first points out the co-variation relationship of an EM business model and governance model. Section 3.2 analyzes the fit between industry competitive structure and EM characteristics. Section 3.3 illustrates the fit between industry supply chain structure and EM characteristics. Section 3.4 discusses the fit between industry norm structure and EM characteristics. Finally, section 3.5 summarizes the chapter. The researcher hopes to demonstrate the effect of industry structure on some coherent or consistent patterns of EM characteristics. Overall, the research model applied is shown in figure 3.1.

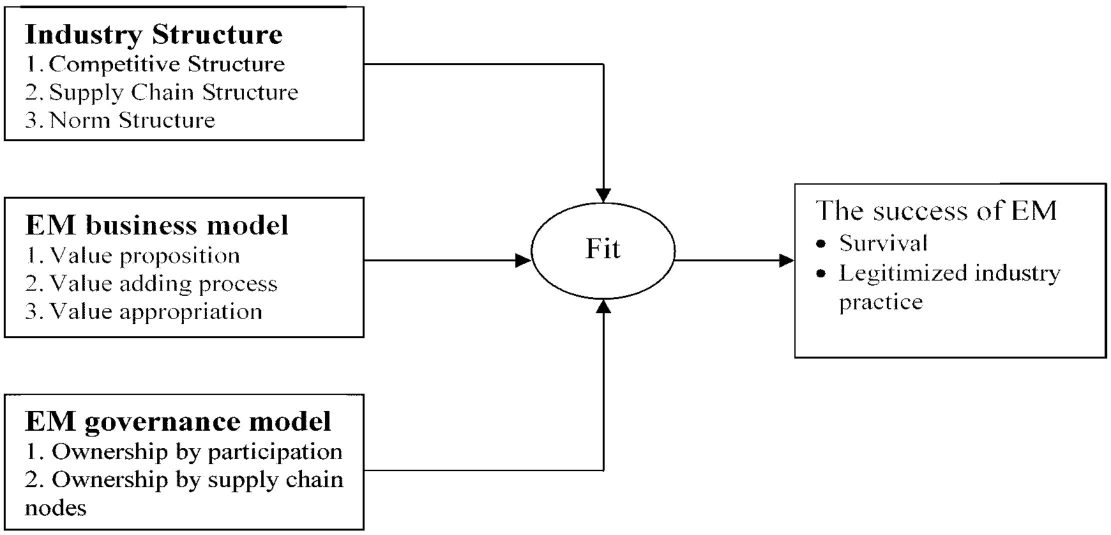

Fig 3.1 Research Model

3. 1 the Fit between EM Characteristics and Industry Competitive Structure

3.1.1 EM Characteristics and Network Cooperation

EM business model in this research refers to the business roles an EM plays in its industry network, which can be defined as distinct, technologically separable, value-added activities undertaken by e-marketplaces in a given industry structure. Generally, EM plays its roles in the network by building different business linkages among network nodes, through which value is created and delivered to organizations within the network (Kambil & Short, 1994). There are basically two ways for an EM to build linkages in an inter-organizational network: aggregation and integration (Davenport et al., 2001). Aggregation is about aggregating buyers and sellers to provide increased information and choices, which only needs loose coupling of organizations through the EM. Integration allows network nodes to synchronize their activities across firm boundaries, and requires tight coupling of participating organizations because of the need to simultaneously lower transaction cost and induce higher relationship rents (Williamson, 1979; Kambil & Short

1994; Ring and Van de Ven, 1994; Dyer et al., 1998; Donada, 2002). Although aggregation is often viewed as the primary function of markets (Woods, 2002), integration can provide significant values, especially with mission-critical activities, e.g. reduced transaction process cost, increased speed and accuracy with witch companies respond to trading partners, lower total supply chain costs that can increase overall demand, more efficient shared work flows, improved supply chain planning, and optimization etc. (Brooks, 2000).

From simply putting their e-catalog together for information exchange to providing fully integrated information platforms for collaboration, the different roles of EM, as reflected in a business model, are distinguished on their different needs for industry members to cooperate closely within the inter-organization network in terms of aggregation and integration. These needs are shown in the table 3.1 based on ideas developed in Chapter 2.

Table 3.1 the cooperation request of EM business models

EM Network Roles (Business Model)	Level of Cooperation	Examples	Representative functionality
Communicator model	Lowest (aggregation of information)	Introlinks.com, worldoil.com, Rfpmarket.com	**Content provision, e.g. :** ▪ public storefronts; capabilities for supplier/ product search; Request for Product /Quotation (RFP/RFQ); classified Ads **Other Information services, e.g. :** ▪ discussion forums; industry newsletters; Events calendar; bulletin board; scrolling ticker; industry rolodex
Transaction Facilitator model	Low (Aggregation of information and products for spot transaction)	Arbinet.com BigMachines E-chemicals PlasticsNet	**Spot trading, search and price discovery related services, e.g. :** ▪ E-trading; aggregated catalogs **Post-sale transaction automation, e.g.:** ▪ Online issuing of Product order invoicing, e-payment
Value Chain Coordinator model	High (Aggregation and loose Integration along value chain)	Catex PaperExchange CreditTrade Newview.com Commerx.com	**Selection and Dynamic pricing, e.g.:** ▪ auction/reverse auction; private negotiation; online comparison of offers & recommendation (auto-matching) **Logistic coordination, e.g.:** ▪ warehousing; transportation; quality assurance; clearing and settlement; Escrow
Collaboration-enabler model	Highest (Deep integration)	Covisint Snecma	**Collaboration facilitation, e.g.:** ▪ private sellers' extranets with pricing personalized to individual customers; inventory visibility; design sharing; Co-R&D or Co-marketing

As a communicator, an EM serves as the information intermediary of an industry business network, a role that does not require network participants' materialized relationship with each other and with the EM.

As a transaction facilitator, an EM offers spot trading, search and price discovery related services and simple transaction automation, through which not only generic information is exchanged but real transactions flow across the network. However, this transaction automation and aggregation requires only dyadic, intermittent cooperation between trading partners. The network cooperation required for value creation 'sticks' to each transaction and therefore is at a relatively low level.

As a value chain coordinator, EM involves market functions from brokering multiple buyers and sellers to coordinating suppliers and distributors along the supply chain, which cannot be done without integrating to some extent the business processes of manufacturers with those of the buyers, sellers and distributors. This end-to-end supply chain integration among network participators generates value in many ways -- superior inventory management, manufacturing-on-demand, customized product offerings, and accurate demand forecasting – all of which are critically dependent on close cooperation among value chain participants.

As a collaboration enabler, EM's value proposition is to develop new products and services through collaboration among the participants. Functionality provided by this role -- private sellers' extranets with pricing personalized to individual customers, inventory visibility, design sharing, or co-R&D as well as co-marketing -- requires collaboration of EM participants that cannot be achieved without fully integrating their information systems and business processes. During these collaborations, information and products are not just exchanged and transmitted but also jointly developed.

Overall, moving from the communicator role to the collaboration enabler role requires closer participant cooperation and tighter integration of information systems and business processes. It is also worthy to note that these different roles are not exclusive of each other. Higher-level EM functionalities are usually provided on a foundation of lower-level EM functionalities.

In addition to the value creation of inter-organizational network, another important aspect of industrial network cooperation involves network governance. Successful inter-organizational network governance induces the cooperation among network participators that is needed in order to reduce transaction cost (Williamson, 1979, 1985). Existing research has found that an important approach to induce cooperation across a network is to involve industry partners in a firm's governance (Johnston & Lawrence, 1988; Dwyer et al., 1987; Achrol, 1991; Webster, 1992). Stakeholder representation theory further explained the importance of acknowledging stakeholder representation in corporation governance (Freeman & Evan, 1990; Jones & Goldberg, 1982). From this theory, representation of important network nodes in EM governance can promote procedural fairness by providing a means of ensuring that their considerations are more directly represented in EM decision making (Jones & Goldberg, 1982; Selznick, 1992) and is central in legitimating (Evan & Freeman, 1993) and safeguarding the interests of network nodes (Freeman & Evan, 1990). As described in Chapter 2, EM governance models vary according to the representation of inter-organization network participators in EM's ownership. These models can be distinguished by the involvement of dominant players (independent, consortia and private), or supply chain bias (buyer-oriented, seller-driven, neutral). Successful inter-organizational network cooperation thus requests appropriate representation of inter-organization network participators in an EM's governance model.

Both the value creation and governance of an inter-organizational network are influenced by industry structures. The existing industry structures are usually difficult to change in the short term. They influence the cooperation of participants within an industrial inter-organization network. Prior research has found that attributes of industry structure impose constraints on the development of collective activity within an industry (Dollinger, 1990). The next sections will discuss their influences on the formation of inter-organization network across industry segments.

3.1.2 Industry Competitive Structure and EM Business Model Selection

As reviewed in Chapter 2, industry competitive structures are those competitive relationship attributes of industry network participants. Industrial organization researches have found that an industry is more segmented if it is characterized by lower concentration, high product differentiation, or low industry barriers (Porter, 1980; Caves 1967, 1990). In a highly fragmented industry, industrial cooperation across organizational boundaries can become particularly difficult because increasing industry segmentations increases the difficulty, and associated costs, of jointly serving these segments with shared activities. For instance, the atomistic information dissemination can raise transaction costs and private ownerships impede public scrutiny; thereby forestalling the development of a central authority to regulate industry members or enforce compliance with a standard set of rules and procedures (Porter, 1985; Williamson, 1979).

The difficulties that a highly segmented industry has in its inter-organizational cooperation will limit the level of functionalities an EM in the industry can effectively and efficiently provide. A business model such as collaboration enabler and value chain coordinator will be particularly difficult, if not impossible, to apply for they both require deep system integration that cannot be performed without a large scale of network cooperation. This suggests that with the increase of industry consolidation, EMs can have fewer problems to apply a higher level business model that require more cooperation within its embedded industrial network. Figure 3.2 depicts this relationship.

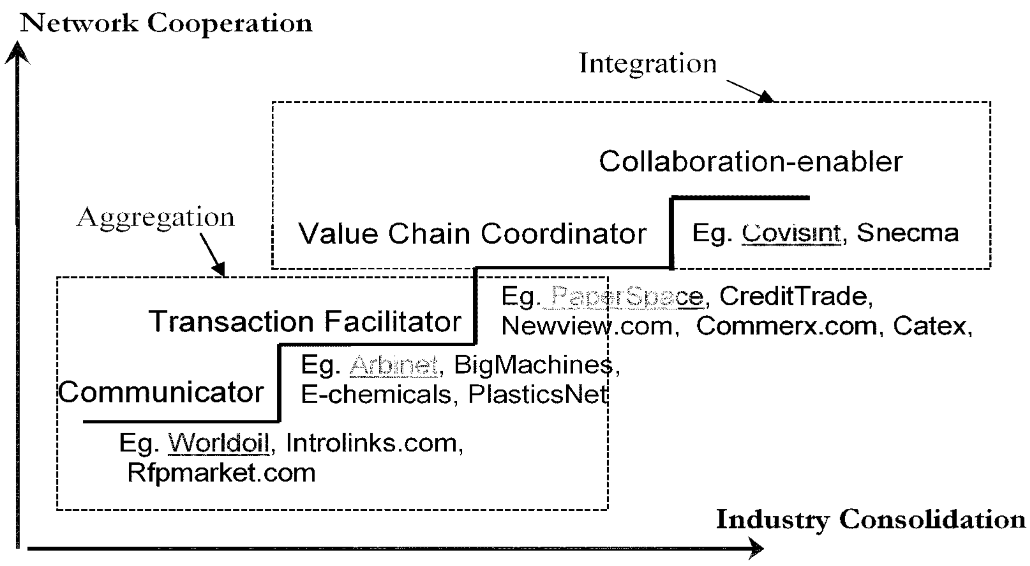

Fig 3.2 the fit between EM business model and industry competitive structure

These arguments lead directly to the first proposition:

Proposition 1: The more consolidated the industry, the more likely that higher-level EM business models will be applied for success.

The consolidation of industry competitive structure is usually characterized by concentration, product differentiation, and barriers to entry (Porter, 1980; Caves, 1992). According to industrial organization theory, an industry is more consolidated when it has high concentration. Higher concentration gives dominant firms more bargaining power over their suppliers or buyers than in less concentrated industries (Porter, 1980). Dominant organizations tend to use their power from institution structure and resource dependency to enforce inter-organizational cooperation on the formation of their information systems (Ang & Cummings 1997, Hart & Saunders 1997, 1998; Lacovou et al. 1995; Premkumar and Ramamurthy 1995). An EM in a highly concentrated industry can benefit from the deeper industry cooperation; therefore,

Proposition 1a: The higher an industry's concentration, the more likely that higher-level EM business models will be applied for success.

Another aspect of industry consolidation is high entry barriers. Low entry barriers ensure the continuing entry of new rivalries and make it harder for firms to maintain their market leadership. The existence of many small privately-held firms characterizes industry fragmentation, which suggests that there is less dominant power to enforce inter-organizational cooperation. Moreover, the intensive and dynamic competition among firms makes long-term and deep inter-organization cooperation nearly impossible. Therefore,

Proposition 1b: The higher the entry barriers within an industry, the more likely that lower-level EM business models will be applied for success.

An industry can also be more consolidated when it has lower product differentiation. Higher product differentiation results in it being difficult for products to be compared and priced for exchange, which can segment the market. Cooperation across segmentation of customers is very difficult due to lower tradability of products and thus higher transaction cost. Therefore,

Proposition 1c: The higher the product differentiation in an industry, the more likely that lower-level EM business models will be applied for success.

3.1.3 Industry Competitive Structure and EM Governance Model Selection

Industry competitive structure depicts the competitive/cooperative relationship among firms in the same industry. With increased consolidation in industry competitive structure, industrial cooperation becomes more possible (Dollinger, 1990). The development of inter-organizational cooperation across industrial business networks generally requires representation of network participators in network governance to reduce transaction costs (Williamson, 1975). Correspondingly, with increased industry consolidation, EM governance models are more likely to reflect participant ownership (consortia or private) rather than independent ownership. Therefore,

Proposition 2: The more consolidated an industry, the more likely that participant ownership will exisit for success.

In a concentrated industry, market trading volume is usually dominated by large firms (Caves 1990). Their involvement in an EM is critical for the EM to build up sufficient liquidity (Woods 2002). To get the involvement of these dominant players into the EM, it is nearly unavoidable that they become involved in the EM's ownership because of transaction costs considerations in network governance (Williamson 1979). Participant ownership like Consortia or private EMs, in contrast with independent EMs, enable the dominant firms within an industry network to coordinate on their grounds interactions with trading partners (Davenport et al, 2001). Although an independent EM may be able to attract one or more big players and obtain an exclusive contract, only an industry participant owned EM will be feasible to tailor the back office integration to best fit their particular systems. Therefore,

Proposition 2a: The higher an industry's concentration, the more likely that a participant ownership will exisit for success.

High concentrated industries are usually characterized by high entry barriers at the same time. The existence of high entry barriers protects network participants from the outsiders' competition. The market powers of those dominant players sustain and can be even more concentrated. It left EMs no choice but have those network participants in their governance board. Therefore,

Proposition 2b: The higher an industry's entry barriers, the more likely that a participant ownership will exisit for success.

IO economics organization research has also found that the segmented industries are usually characterized by high product differentiation (Porter, 1980; Caves 1967, 1990). High industry segmentation inhibits the emergence of dominant players and increases costs associated with cooperation cross industry segments. Network participators from different industry segments have great difficulties to coordinate their inter-organizational interactions due to lack of trust and high risk. In this circumstance, non-participant EM has more chances to compete with other types of governance models because they have low requirement of network cooperation. Therefore,

Proposition 2c: The higher an industry's product differentiation, the more likely non-participant ownership will exisit for success.

3.2 The Fit between EM Characteristics and Industry Supply Chain structure

The industry supply chain structure describes a series of exchange relationships between buyers and suppliers across industries. The integration of supply chain consists of information sharing, logistics coordination, and organizational relationship linkage (Lee, 2000). Researches have found that strong supply-side or customer-side integration improves overall supply chain performance and supports competitive advantage

(Chapman & Carter, 1990; Choi & Hartley, 1996; Tan et al., 1998; Kannan & Handfield, 1998; Stock et al., 2000; Reeder & Rowell, 2001, Frohlich, 2002).

Power variations of the supply chain structure affect its integration. Not only the physical material flow and information sharing are influenced by various supply chain power, more importantly, the manner in which supply chain partners cooperate with each other can also be changed (Cox et. al., 2002). When either buyers or sellers have the power, they can use their power to push supply chain integration to facilitate a trading relationship (Ang and Cummings 1997, Hart and Saunders 1997, 1998; Lacovou et al. 1995; Premkumar and Ramamurthy 1995). However, when power is balanced between buyers and sellers, the integration of supply chain varies with regard to the interdependence of buyers and sellers.

Chapter 2 has identified four types of supply chain structures according to variations in the power balance of buyer-supplier relationships along the supply chain. Table 3.2 summarizes the discussion in Chapter 2.

Table 3.2 Supply chain structures comparison

Supply Chain Type	Who owns power	Physical material flow	Information Sharing Strategy	Integration	Examples
Contracting lineal supply chain	None	Not a lot variety of products and parts	Bi-directional	Lower	Traditional construction
Convergent assembly network	Buyers	a large number of parts assembled at few and expensive facilities	Upwards	Higher	Car manufacturing
Divergent—late differentiation network	Both	a modest number of parts assembled into a great variety of finished products.	Bi-directional	Higher	personal computer
Divergent—early differentiation network	Sellers	a great variety of products are made early in the supply chain, with relatively few types of raw material	Downwards	Higher	Toy manufacturing.

In an industry supply chain structure, EM governance is about whether buyers or sellers control the ownership and therefore are able to drive the information sharing and other services of EM. Chapter 2 has indicated that variations in the power balance of these relationships affect bias of EM governance because powerful buyers or sellers are able to require the adoption of these technologies by their less powerful counterparts. By dosing so, those powerful supply chain parties can enjoy the benefits of supply chain integration in facilitating trading relationships and in guiding the design, deployment and management of these information systems (Ang & Cummings 1997, Hart & Saunders 1997, 1998; Lacovou et al. 1995; Premkumar & Ramamurthy 1995).

Thus, when either buyers or sellers have the power, they tend to use their power to require ownership of the EM, which results in biased EM governance that is aligned to increase benefits to either buyers or sellers. However, when there is balanced power between buyers and sellers, the ownership is naturally shared by or exclusive to both buyers and sellers. The EM governance will then be aligned to increase benefits to both sides; otherwise, the disadvantage side may lose their interest in supply chain cooperation very quickly.

For example, in a contracting lineal supply chain, both buyers and seller have no power to influence the cooperation of the other side because the business linkages between them rely on temporal contracts. The final product and raw material do not involve great variety. The information sharing between buyers and sellers, if any, has to be bi-directional so that their cooperation on a contract can go along well. Biased EM governance will not be able to fulfill the information sharing needs of the contracting lineal supply chain structure because it is used to help either buyers or sellers to acquire information but not both. Typically, in a contracting lineal supply chain, if one side tends to deploy an EM to exploit the other, it is easy and convenient for the other to cut off the business linkages and quit from the EM.

Similarly, in a divergent late differentiation network supply chain, both the manufacturers (buyers) and distributors (sellers) have the power because they depend on each other to finish the two stages manufacturing process, i.e., complex assembly processes for generic, semi-products executed at factory sites; and, simple assembly processes for customized models executed at distribution sites. This type of supply chain has a modest number of parts and semi-products shipped to different sites for assembly into a great variety of finished products. Because the semi-product inventory is distributed throughout the network, it is important to shorten the lead time to meet the demands for customized products by a make-to-order strategy; however, At the same time, sharing components for end products is common in this type of supply chain structure for the sake of improving the throughout of the manufacturing process with less inventory. This suggests that bidirectional information sharing is critical for an EM in this type of supply chain to improve supply chain performance. Neutral EMs exploit information from both buyers and sellers, thus have a better fit with the need of this type of supply chain. Therefore,

Proposition 3: The more balanced an industry supply chain structure, the more likely that a neutral EM governance model will exisit for success.

Proposition 3a: EMs in industries characterized by a divergent late assembly supply chain are more likely to exhibit neutral-driven governance models for success.

In contrast with neutral EM governance, either buyers or sellers biased EM is aligned to increase benefits to either buyers or sellers. This typically reflects in EM's biased information sharing that is used not only for reducing the uncertainties and smoothing out supply chains but simply to eliminate wasteful activities, effort, and resources along the supply chains (Shaw, 2000). In a buyer-driven EM, information sharing appears to be downward supply chain because the buyer has the needs to share suppliers' information. On an opposite way, the seller-drivenEM will drive information sharing upward supply chain because sellers are in need of buyers' information. To fit with the information sharing need of existing supply chain structure, EMs needs to choose appropriate governance bias.

For example, in convergent assembly network supply chain, each product includes many unique components delivered by different suppliers, which gives the supply chain power to the hand of final product manufactures (buyers) but not the component suppliers (sellers). Such early differentiation of product models also makes it difficult to satisfy customer specific demands using the make-to-stock strategy. Therefore, with great uncertainty in the market demand, the finished product inventory is the main inventory cost. To reduce inventory cost and improve supply chain performance, the suppliers and manufacturers usually cooperate in the just-in-time (JIT) approach, by which assemblers can utilize material information from suppliers to schedule production and purchasing and to achieve 'assembly to order' and network visibility. In this type of supply chain, supply information sharing down the supply chain has more significant influence on supply chain performance than demand information sharing. Hence, buyer-driven EM governance can be a better fit for this type of supply chain structure. Therefore,

Proposition 3b: EMs in industries characterized by a convergent assembly supply chain are more likely to exhibit buyer-driven governance models for success.

3.3 Industry Norm Structures and EM Characteristics

3.3.1 Industry E-business Standardization and EM Characteristics

Industry norm structures are the rules and procedures in deep control of firm behaviors across an industry. These norms, especially industrial standards, function as a common backdrop for the trade of goods and will influence transaction costs (Kindleberger, 1983). Due to historical reason, industries have different IT standardization status. Some industries, e.g. the semiconductor industry, started their industry e-business standardization very early by forming industry standardization association like ***RosettaNet***. The others, e.g. the automotive industry, were involved in very proprietary network standards such as EDI.

Inconsistent rules, standards or routines usually cause higher transaction cost for the inter-organizational cooperation within that industry (Williamson 1979). For instance, asset specific investments such as EDI and proprietary networks can inhibit firms from switching to more market type coordination structures applying middleware solutions such as XML (Sarkar, Butler et al. 1995; Clemons, Reddi and Row 1993). Consistent technical standards such as the standards of ***RosettaNet***, on the other hand, can lower technical complexity of information system integration, making the integration of data and business processes among EM participants smoother(***RosettaNet*** website, 2004).

Industrial standardization is an important industrial effort to achieve inter-organizational cooperation based on consistent norms (Link, 1983; Tassey, 1992).

Industrial standardization on an organizational information system is especially important to inter-organization network cooperation underlying the EM. EMs are effectively serving as the communication hubs of inter-organizational networks, through which suppliers, customers and trading partners can connect their systems and realize further productivity improvements. The hub-and-spoke concept enables the numerous communications protocols to be "translated", so that different systems can talk to each other and avoids the need for companies to establish a large number of bilateral links to all other partners. When the industry participators are following inconsistent IT standards, EMs are expected to significantly improve the industry efficiency by solving problems for the communication across systems, e.g. functionality overlaps, information has to be retyped or recaptured, separate database are no longer synchronized, and document version control is lost (Woods, 2002). EMs developing business or information standards for the industry are thus expected to make higher profits with their business model. Generally, standard leadership is offered with higher EM functionality such as the integration of information system for the network participants. Therefore,

Proposition 4a: The more inconsistent an industry's e-business standards, the more likely that higher-level EM business models will be applied for success.

The influence of industry norm structure on network cooperation is a little different from that of industrial competitive structure and supply chain structure, both of which to certain extent involve the power of network nodes. The development of inter-organizational cooperation across industrial business network generally requires representation of network participators in network governance, or ownership in EM case. However, as discussed earlier, consistent industry norms, especially IT standards, promote communication among inter-organizational network participators and increase the consensus of industry members, which then becomes the basis of their cooperation across the inter-organization network. This suggests that consistent IT standards can become a substitute governance mechanism to ownership representation.

In an industry characterized with consistent industry norms, an independent EM can seek legitimacy by apply common IT standards. As institutional theory research indicates, legitimacy means social actors (or network participators here) accept or endorse an organization's resources as valid, reasonable, and rational (Ashforth & Gibbs, 1990; Baum & Oliver, 1991; Meyer & Scott, 1983; Singh et al., 1986; Stinchcombe, 1968). Following the common industry norms and standards, independent EMs can confirm their congruence with network actor's values and expectations for action (Galaskiewicz, 1985; Pfeffer & Salancik, 1978) without sharing ownership. Therefore, they gain legitimacy for their existence and are less likely to fail (DiMaggio & Powell, 1983, Barringer & Milkovich, 1998; Eisenhardt, 1988). On the other hand, if an industry is characterized by inconsistent industry norms, independent EMs will not be able to legitimatize themselves by taking the above strategy. On the contrary, inconsistent IT standards can increase network nodes' asset specialties and request the participation of network nodes in EM ownership to reduce transaction cost (Williamson 1979, 1981). Therefore,

Proposition 4b: the more inconsistent an industry's e-business standards, the more likely that a participant ownership will exisit for success.

3.3.2 Industry Clockspeed and EM Characteristics

The industry norms are never unchanging. In fact, different industries have various clockspeeds—the rate of organization and technology innovation within the industry. It is believed that the faster an industry clockspeed is, the higher rate the industry innovation has (Fine, 1998). Usually, the industry norms will be rewritten once a revolutionary innovation occurrs in the industry. Therefore, the faster industry clockspeed also means a more dynamic nature of the industry norms. Especially for the emergence of industry standards, faster industry clockspeed will bring more innovation into the industry and thus create more new technology and business standards for the industry.

Typically, in a more dynamic industry, industry norms such as industry IT standards keep changing. However, due to their different organizational inertia, organizations cannot all change at the same pace (Hannan & Freeman, 1984). The result is more industry norms become inconsistent across organizations. Mismatched organizational norms, or lack of organizational proximity in the words of Fine (1998), can increase transaction costs (Williamson 1981), and thus let cooperation among inter-organizational network participators be very difficult to maintain. Therefore, in a faster clock speed industry, e.g., the electronic industry, quickly changing industry routines and practices will more likely lead to problems with keeping consistent IT standards. It is then difficult for the cooperation within the inter-organization network of the industry to reach a higher level, which unavoidably restraints EM's functionalities offering. Therefore:

Proposition 5a: The slower an industry's clock speed, the more likely that higher-level EM business models will be applied for success.

Also, if the industry is characterized with a faster clock speed, industry IT standards will keep changing at a fast speed, which can lead to more difficulties in inter-organizational cooperation within the network. The result of this is more consortiums will have problems in syndicating industry IT standards and in reducing transaction costs across different network nodes. Non-participant EMs, instead, are more chances to survive if they focus on local segmentation and don't develop higher level functionalities such as forming and facilitating new industry standards. Therefore,

Proposition 5b: The faster an industry's clock speed, the more likely that non-participant EM ownership will exisit for success.

3.3 The Co-variation of EM Business Model and EM Governance Model

As discussed earlier in this chapter, cooperation of network participators is required for value creation within a network and is influenced by network governance structures. As argued in chapter 2, appropriate governance structures provide the institutional support enabling higher level EM functionalities because of reduced agency cost, increased legitimacy, and more efficient organization learning (Kambil & Short; 1994, Williamson, 1997; Ashforth & Gibbs, 1990; Pfeffer & Salancik, 1978; Jones & Goldberg, 1982; Selznick, 1992, Helper & Levine, 1992; Evan & Freeman, 1993).

Since higher level EM functionalities require deeper cooperation among network participants, it would be difficult for independent third parties to induce this cooperation due to their novelty in the industry--lack of industry experience and lack of existing relationships with network participants. Independent EM startups usually lack relationships with dominant industry players, and hence are unlikely to obtain commitments from them. Their advantages rely on their neutrality within the industrial network. Consortia EMs are established by dominant industry players (either buyers or sellers) and offer these dominant players the opportunity to retain a majority of the value to be created through the EM. Private EMs, on the other hand, are established as proprietary trading platforms by firms (either buyers or sellers) whose trading volumes represent a substantial portion of the industry's trading volume. Both consortia and private EMs, thus, tend to be biased due to the power that their owners have within their industry niche. These differences in the inherent influence being exerted through these governance models are likely to produce very different linkage building behaviors across the industry network and very different network contexts within which the EM might operate. Some consortia EMs, for example, are setting up secure sites on which EM participants can collaborate on engineering projects (Kambil & Van heck, 2002). While independent EMs are attempting to provide more comprehensive business functionalities (Davenport et al, 2001), they face huge challenges in doing so because of their governance model. Therefore,

Proposition 6: EMs applying higher level business models are more likely to exhibit participant ownership for success.

3.4 Summary of the Chapter

This chapter developed the study's research propositions. These propositions, taken together, are illustrative of the interaction between industry structures and EM characteristics including EM business models and EM governance models. At the core of the arguments underlying the fit perspective is the realization that higher levels of EM functionality across a trading network require increasingly deep and rich cooperation among trading partners and, increasingly tight integration of the information systems enabling these cooperative trading relationships. Section 3.1, 3.2 and 3.3 have examined , pairwise, the fit relationship among network configurations. These relationships can be collectively illustrated by the ideal network profiles below:

Industry structure		**EM Business model**	**EM Governance model**
Competitive Structure	High Concentration	Higher	Participant
	Low Product differentiation	Higher	Participant
	High Entry Barrier	Higher	Participant
Supply Chain Structure	Contracting lineal supply chain	Lower	Neutral
	Convergent assembly network	Higher	Biased
	Divergent—late differentiation network	Higher	Neutral
	Divergent—early differentiation network	Higher	Biased
Norm Structure	Consistent IT standards	Lower	Non-participant
	Faster clock speed	Lower	Non-participant

The following chapters will describe the research methods applied in examining these propositions and the study's findings.

Chapter 4 Research Methodology

Introduction

In determining the most appropriate research methodology strategy for a study, it is necessary to clearly understand the purpose and features of the research problem. As noted in preceding chapters, this study investigates three primary research questions (RQ):

- **What are the elements of industry structure that are relevant to the emergence, adoption, and diffusion of electronic marketplaces?**
- **What are the business strategies (business model and governance model characteristics) that discriminate among types of e-marketplaces?**
- **How do these elements of industry structure, business model, and governance model converge to play out in the survival of e-marketplaces?**

These three questions ask "what" and "how" about the relationship between industry structure and EM business strategies including both EM business model and governance model. They determine key features of this study as below:

1. Since very limited empirical research has been conducted in the area of EM to date, a study in this area is essentially explorative in nature, given the lack of grounded theory and data available for quantitative analysis.

2. Both questions cross levels of analysis, which increases the difficulty of data collection. Many industry characteristics are difficult to measure because of the high level of aggregation and complexity. At the same time, many organizational-level EM data are not available in archival form because most EMs are privately held companies that have little public information available.

3. The "what" question is essentially a question of population that needs investigation across industries and their EMs about their elements and characteristics in a statistical sense. In contrast, the "how" question looks at the process of EMs' formation and focus on the theory building side of the interaction between industry structure and EMs' business strategies, which needs to dig into one or several industries to gain a deeper understanding of industry structure's influence on EM business strategies.

Given the features of this study, it would be difficult to use a single research strategy for the researcher's purpose. Utilizing only quantitative techniques would obscure important information inside an industry that is needed for theory building; on the other hand, the use of qualitative methods for a limited set of industry contexts would limit generalization of findings. Therefore, this study applies both quantitative and qualitative methods. Quantitative method in this research can statistically identify the industry structures relevant to this research and EM business strategies profiles (Research Questions 1&2). It also validates the fact that EM's business model and governance model fit with its industry environment and each other. At the same time, the qualitative approach in this research continues to test the existence of industry effect on EM characteristics and more importantly, addresses the "how" question (Research Question 3). Due to the explorative nature of this research that is primarily focusing on theory building, qualitative methods are especially useful to reveal the nature of industry structure's influence on EM characteristics.

Overall, the design of this research can be shown in the methodology tree below:

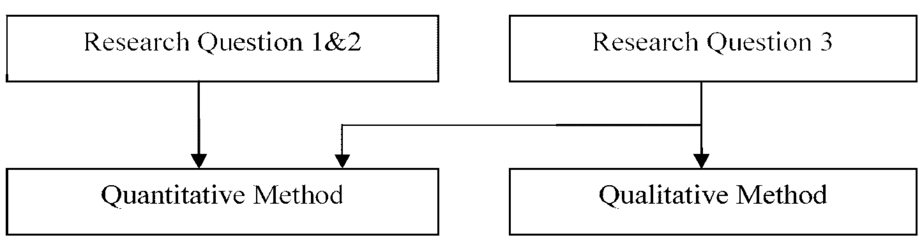

Fig 4.1 Research Design Tree

The research propositions proposed in Chapter 3 are assessed with either or both research strategies as described in Table 4.1. Also provided in Table 4.1 are the variables to be used in assessing each proposition. Following the introduction, section 4.1

describes the quantitative research design. Section 4.2 describes the qualitative research design. Section 4.3 summaizes chapter 4.

Table 4.1 Research Propositions and Methodology

Proposition	Testing Method	Main variables
P1: The more consolidated the industry, the more likely that higher-level EM business models will be applied for success. ▪ **P1a:** The higher an industry's concentration, the more likely that higher-level EM business models will be applied for success. ▪ **P1b:** The higher the entry barriers within an industry, the more likely that lower-level EM business models will be applied for success. ▪ **P1c:** The higher the product differentiation in an industry, the more likely that lower-level EM business models will be applied for success. **P2:** The more consolidated an industry, the more likely that participant ownership will be observed. ▪ **P2a:** The higher an industry's concentration, the more likely that participant ownership will exisit for success. ▪ **P2b:** The higher an industry's entry barriers, the more likely that participant ownership will exisit for success. ▪ **P2c**: The higher an industry's product differentiation, the more likely independent ownership will exisit for success.	**Testing Methods:** 1.Regression analysis on archival data; 2. Case Study	**Independent Variables:** ○ Industry concentration ratio ○ Industry advertising intensity ○ Industry capital intensity ○ EM business model ○ EM ownership **Dependent Variables:** EM success
P3. The more balanced an industry supply chain structure, the more likely that a neutral EM bias will exisit for success. ▪ **P3a:** EMs in industries characterized by a divergent late assembly supply chain are more likely to exhibit neutral governance models for success. ▪ **P3b**: EMs in industries characterized by a convergent assembly supply chain are more likely to exhibit buyer-driven governance models for success.	**Testing Methods:** 1.Regression analysis on archival data; 2. Case Study	**Independent Variables:** ○ Industry supply chain structure types ○ Integration of Industrial supply chain, ○ EM business model level ○ EM bias **Dependent Variables:** EM success
P4. The industry e-business standardization will have interaction with EM characteristics. ▪ **P4a:** the more inconsistent an industry's e-business standards, the more likely that higher-level EM business models will be applied for success. ▪ **P4b:** the more inconsistent an industry's e-business standards, the more likely that a participant ownership will exisit for success.	**Testing Methods:** Case Study	**Independent Variables:** ○ Industrial e-business standardization ○ Industry clockspeed ○ EM business model level ○ EM ownership **Dependent Variables:** EM success
P5. The industry clockspeed will have interaction with EM characteristics ▪ **P5a:** The slower an industry's clock speed, the more likely that higher-level EM business models will be applied for success. ▪ **P5b:** The faster an industry's clock speed, the more likely that non-participant EM ownership will exisit for success.	**Testing Methods:** 1.Regression analysis on archival data; 2. Case Study	
P6: EMs applying higher level business models is more likely to exhibit participant ownership for success.	**Testing Methods:** 1.Regression analysis on archival data; 2. Case Study	**Independent Variables:** ○ EM business model level ○ EM ownership **Dependent Variables:** EM success

4.1 Quantitative Research Design

4.1.1 Quantitative Research Strategy and Variable Definition

The quantitative research applied in this study is regression analysis (Research Questions 1 & 2) based on archival data. This type of analysis is used for identifying the relationship between a dependent variable and one or more independent variables. In regression analysis, a model of the relationship is hypothesized, and estimates of the parameter values are used to develop an estimated regression equation. Various tests are then employed to determine if the model is satisfactory. If the model is deemed to be satisfactory, the hypothesis can be justified or rejected by the model.

Regression models have been widely used in organizational strategy studies that are related to organizational success, e.g. Delery & Doty, 1996; Drago, 1998, etc. Venkatraman (1989) notes that the regression analysis is suitable for a study of strategic fit when the fit is perceived as the interaction of strategic choices and context factors. From the contingence perspective, "fit" is defined as interaction of industry structures and EM characteristics in this research. The moderation of industry structures (context factors) on EM characteristics (strategic predictors) can determine the criteria variable, i.e. an EMs success here. The regression modeling method thus is ideal for providing statistical foundation of Research Question 1 & 2.

The first step of a regression research is to define the dependent and independent variables in the model. This research is exploring the effect of "fit" or "misfit" between industry structure and EM characteristics on the success of EM. The independent variables of this study are therefore industry structure variables and EM characteristics variables. The dependent variable in this research is the success of EM.

An EM can be perceived as successful in terms of both its survival and competence sustainability. As many EMs that were created in each industry in the past years, the survivors in the competition would be more successful than the failures. The survival of EM at certain time point of observation is therefore used as a first measurement for EM success. It provides a snapshot for EM success. Also, given enough time, some survivors come to be highly visible in the industry. Their successful experiences can further become business idols for running electronic marketplaces in the industry. Apparently, these EMs are more successful than their peers. The continuous running of these EMs in the industry through a long time reflects their sustainable competitive advantages and helps them become more visible to the industry. Therefore, the longevity of an EM (years of life) is used as a second measurement to give a longitudinal description of EM success-- the sustainability of good performance.

The survival of EM is a binary variable with two values, "survive" or "failure". A regression analysis for discrete dependent variable typically involves a logistic regression model. This research is not an exception. A hierarchical application of logistic regression is applied to examine the effects of independent variables and their interactions on the survival of EM.

The longevity of an EM (years of life) is a continuous variable with all values greater than 0. A one sample Kolmogorov-Smirnov Test will be first used to explore the variable distribution. Based on the testing results, Poisson regression modeling will be used to identify the relationship between independent variables and the longevity of EM (the success of EM).

Next table gives the variables included in this study, their measurement scales and the data sources.

Table 4.2 Quantitative Study Variables, Measurement Scale and Data Sources

Dependent Variable		
Variable Name	**Measurement Scale**	**Data Source**
EM success	▪ The survival of EM at the end of observation window ▪ The years of life running the EM business	Reviewing individual EM website and Web achieve information --Observation window is from February, 1997 to February 2004
Independent variables		
Variable Name	**Measurement Scale**	**Data Source**
Industry concentration	The ratio of total value of shipments accounted for by the 4 largest firm within the industry	US Bureau of Census, the latest data is issued by Census of Bureau on 1997 -- Harrigan(1981), Hatten and Schendel(1977)
Industry product differentiation	The ratio of advertising expense relative to total value added by manufacture of the industry	US Bureau of Census -- Harrigan(1981), Hatten and Schendel(1977)
Industry entry barriers	The ratio of capital expenditure divided by the number of firms in the industry	US Bureau of Census --Robinson & McDougal(1998), Harrigan(1981), Hatten & Schendel(1977)
Industry e-business standardization	• The use of different computer networks including internet, local area network (LAN), EDI, and Extranet, etc.. • The use of Electronic Marketplaces linking specialized business buyers and sellers	US Bureau of Census, Estats, 2000 Notes: The usages above are all by number of responding manufacturing plants by industries in 2000
EM Business model	Four types of business model: --Communicator model --Transaction Facilitator model --Value Chain Coordinator model --Collaboration-enabler model	Self-code based on reviewing individual EM website.
EM governance model (ownership)	Three EM ownership are: Independent; Consortia; Private	Self-code based on reviewing individual EM website.
EM governance model (bias)	Three EM bias are: Neutral; Buyer-driven; Seller-driven	Self-code based on reviewing individual EM website.

Notes: Industry Type is defined by 3 or 4 digits NAICS codes by US Bureau of Census

4.1.2 Data Collection

(I) Industry Structure Data Collection

Industries analyzed in this research are identified by their 3-4 digits NACIS code level. When a typical industry (e.g. food) can not be identified by their 4 digits NACIS, a more generalized 3 digits code is used. This method is following prior literature such as Robinson & McDougal (1998), Harrigan (1981), Hatten & Schendel (1977), etc. At the 2 digits NACIS codes level, the industry type becomes too broad to precisely classify the industry variables for vertical EMs (EMs primarily serve a single industry). At the 5 digits NACIS code level, the differentiation of industry variables is not as significant as at 3 or 4 digits NACIS code level. The selection of industries for quantitative analysis therefore is primarily a trade off between NACIS code classification and the differentiation of industry variables in each industry. After all, six industries that have very different structures are selected for the quantitative analysis. These very different industries are: the apparel, semiconductors, automotive, pharmaceutical, aerospace, and metal industries. Their characteristics are described in next table:

Table 4.3 Industries Analyzed in Quantitative Study

Industry (NACIS Code)	Concentration	Capital Intensity (1000)	Advertising Intensity	EDI Usage	SCN Pattern	Clock Speed
Apparel (315)	17.60%	$59.4216	0.40%	32.29%	Divergent-Late differentiation	Fast
Semiconductor (3344)	34.30%	$2,482.8873	0.75%	27.43%	Divergent-Late differentiation	Fast
Automotive (3361)	82.45%	$16,139.1313	0.24%	42.41%	Convergent	Medium
Pharmaceutical (3254)	32.30%	$3,326.7073	0.59%	21.11%	Divergent-early differentiation	Medium
Aerospace (3364)	62.30%	$2,047.0948	0.11%	42.41%	Convergent	Slow
Metal (331)	13.80%	$1,598.5653	0.10%	32.78%	Divergent-early differentiation	Slow

The U.S. Bureau of Census has published industry statistics data based on their NACIS code every 5 years. The latest is issued in 2002 for 1997 survey. Some of the industries variables data, e.g. concentration ratio, purchased advertising cost, and capital expenditure by industry can be directly retrieved from U.S. Bureau of Census website (http://www.census.gov). Advertising intensity is calculated by dividing industry advertising cost with industry value added by manufacture. Capital intensity is computed by the division of industry capital expenditure and industry total establishments. The classification of supply chain network pattern for each industry borrows from Cheng et al. (2001), Lin & Shaw (1998), Shaw (2000).

Industrial e-business standardization refers to industrial consensus on typical e-business standards. It reflects the historical status of industry standardization. However, the variable is difficult to quantify because industrial e-business standards cover a broad range from software to hardware and involve different levels of technique standard. To simplify the problem, the researcher calculated the EDI usage ratio from U.S. Bureau of Census 2000 e-commerce survey for industrial IT standardization. The survey itself provides the number of plants that used the different computer networks including internet, local area network (LAN), EDI, and Extranet, etc. at 3 digits NACIS codes level. The calculated ratio therefore can only provides a general idea about the extent of industry e-business standards but is not suitable for the regression model with other industry variables at 4 digits NACIS codes level.

The clock-speed of each industry reflects industrial dynamics or the evolution speed of industrial norm structure. Fine (1998) gives a preliminary list of industries that have three categories of clock speed from slow (>10yr) to fast (<3yrs). Fine (1998) categorizes industries by their product technology clockspeed, process technology clockspeed, and organization clockspeed. As his work is one of the most comprehensive about industrial clock speed so far, the industry clockspeed used in this research is consistent with Fine's work.

(II) EM Characteristic Data Collection

To collect EM subjects for the quantitative research, this research used several comprehensive lists of vertical B2B hubs on the Internet including:

- **eMarketServices.com** (www.emarketservice.com)
- **Forbes.com** (www.forbes.com)
- **Jupiter Media Matrix** (www.nmm.com/kb/#verticals)
- **B2B business.net (**www.b2business.net)

Among these lists, eMarketServices.com is a non-profit project funded by the trade promotion organizations of Australia, Denmark, Holland, Iceland, Italy, New Zealand, Norway, Portugal, Spain and Sweden. Staffs from these ten trade promotion organizations work in a network around the world to produce services and exchange knowledge on electronic marketplaces. A total of 985 B2B vertical EM are listed on this site and updated every 6 months.

Forbes.com maintained "directory of the best of B2B web" across various industries. The 2003 B2B guide contains profiles of 85 best-of-breed companies in 21 different industries from Wireless to Customer Relationship Management, Excess Inventory and Web Services. The selection by Forbes.com is recognized as an honor by many industry players. For example, Primavera Systems, Inc., one of the leading B2B emarket in construction industry, has claimed in its homepage that it received recognition from Forbes magazine as one of its "B2B Best of the Web" companies.

Jupiter Media Matrix is a leading market analyst group, developed a B2B Marketplace Knowledgebase to offer a snapshot of who's doing what, when, and where within the EMarketplace space. The knowledge base of B2B hubs complied Jupiter Media Matrix, provides an industry-wise classification of over 4000 B2B exchanges including vertical hubs.

B2B business.net (http://www.b2business.net/) is another highly recognized global network for B2B professionals. This site also includes more than 1088 vertical B2B EMs across 30 industries.

All the above lists are highly recognized in the field. Also, various search engines such as google.com were used to look for the other EM lists. However, the search didn't find EM subjects beyond the above lists.

Using these internet lists, the researcher systematically examined each EM in their directories for evidence on EM characteristics including business model, ownership, and bias. The evidences were collected from the website of each EM, the old web pages of each EM on web archive machine (http://www.archive.org/), and Lexis-Nexis newswire/newsmedia database. During the examination, if a subject were found not to be an vertical EM, it would be dropped from the sample pool.

The data of EM variables were generated from collected evidences after the above process. Following the same coding rules (see Appendix A), three reviewers separately read through the evidences and coded each EM's business model, ownership, and bias.

The agreements of their opinions based on discussion after their coding determined the final code. To demonstrate the reliability of coding, inter-rater reliability was assessed.

(III) EM Success Judgment

This research has chosen the survival and longevity of EMs as two approaches to measure EM success. It is necessary to point out here that there are many challenges to the judgment of EM success, especially in the quantitative analysis. First, B2B EM are experiencing massive failure rates. Even many current survivors continue to struggle as the enthusiasm for the Internet bubble wanes. Secondly, most B2B EMs operate as private companies not subject to published audit opinions. The quantitative data of their revenue or profit are therefore not accessible. Finally, the factors that lead to the failure of EM are complex. For example, some bankruptcues may reflect planned financial restructurings and B2B EM could cease operations due to mergers and/or acquisitions under favorable "successful" terms rather than vice versea.

For the survival measurement of EM success, the observation window of analysis is from February, 1997 when the EM enthusiasm began to February, 2004 when the EM enthusiasm ends. The survival of EM is defined as the continuing operation of EMs more than one year before the year 2004. Since it is too short to judge the performance of EMs started within 2003-2004, they were dropped from the sample pool.

To determine the continuing operation of EMs in our sample pool, this study follows the analytical schema in Laseter (2003). Appendix C displays the analytical process applied, which starts with an attempt to visit the website and includes browsing the site for 2004 dated material and sending e-mails. In most cases companies can be cleanly classified as "Active" or "Dead", but in a few, the appropriate classification must be "Acquired" or "Uncertain". Both were eliminated from the sample later because of the difficulties in judging EM success.

For the longevity measurement of EM success, the years of an EM's life are the number of years from EM launch time to its ending time. If the EM is still alive by the February 2004, the year 2004 is used as its ending year. Most EM subjects claimed their launch time on their website or their press releases in Lexis-Nexis NewsWare database. For a few of EM subjects that didn't have their starting years information in the above sources, the first year their homepage was collected by the web archive machine was used as their starting year. The same rule applies to the EM ending year. When there is no evidence about the time an EM failed, the last year its homepage was collected by the web archive machine was used as its ending year.

4.1.3 Methods to Insure and Enhance Quantitative Research Quality

The content validity, that is, the degree to which items in an instrument reflect the content universe to which the instrument will be generalized, and the construct validity that is the extent to which an operationalization measures the concepts that it purports to measure for the quantitative method, are ensured by careful and deliberate literature reviews in chapter 2 (Carmines & Zeller, 1991; Straub, 1989). Prior researches on industry economics, strategy management, and electronic markets, e.g., Porter (1989), Caves (1990), Laseter (2003), Chatterjee & Segars (2002) etc., serve as the judges for the content validity and provide confidence on the construct validity in the quantitative research. The variables for industry structures, the classification of EM business model and governance model, are all well documented with strong theoretical grounds.

To ensure the predictive validity, the operationalization's ability to predict something it should theoretically be able to predict, a multicollinearity test will be conducted. The result of multicollinearity test is used to exclude the possibility that there is statistical correlation among independent variables. The model fit will also be evaluated for both logistic regression models and Poisson regression models. A good model fit indicates that the set of independent variables can well predict the criterion, the success of EM. To enhance the predictive validity, two measurements of EM success, the survival and the longevity have been applied. If the analytical results from two models are consistent, the predictive validity will be enhanced.

External validity refers to the extent to which the results of a study are generalizable or transferable. It is enhanced by the selection of six industries that have diversified competitive structures, supply chain structures, norm structures, and a complete search of EM subjects in each industry during the quantitative data collection.

4.2 Qualitative Research Design

4.2.1 Qualitative Research Strategy and Variable Definition

The qualitative method in this study is a historical analysis of multiple cases study from two industries (archival data will be used here as well in compiling these histories). As a qualitative method, case study focus on understanding the nature and complexity of a process, as well as the dynamics that occur within a setting, and to gain valuable insights and generate theory from practices (Benbasat et al., 1987; Eisenhardt 1989). The primary strengths of case study methodology are the high levels of explorability and representability available to the researcher (Gable 1994). Case studies are also conducted to explore under-researched topics that are heavily dependent on context (Yin 1994). Benbasat et al.(1987) pointed out that the case study method is particularly well-suited to IS research due to the organization objective of the field. In this research, the multiple case studies are designed to investigate the process of the interaction between EM characteristics and the elements of industry structures. It is expected that this historical process described in the designed case study can provide the foundation for a study into the causality of industry structure's influence on EM characteristics.

In case studies, the criteria for deciding whether causality is apparent include the coherence of the evidence, its consistency with the patterns ascribed to it, and its inconsistency with other explanations. For a multiple cases study, these criteria are mainly achieved through replication logic rather than sampling logic, which requires each case to be carefully selected and analyzed so that it can either predicts similar results (a literal replication) or produce contrasting results for predictable reasons (a theoretical replication) (Yin, 1994).

This research utilized multiple industry cases from two industries to provide diversity and increase the confidence in the robustness of the theory. Based on available information sources, the automotive manufacturing industry and the semiconductor industry were selected for the study. According to table 4.3, these two industries appeared to have very contrastable industry structures. The significant differences of the two industry structures provide good contexts to study the different evolution processes of EM cases in each industry.

Within each industry, three successful EMs were selected to compare and contrast their business and governance models. If there were similar EM characteristics or evolution patterns within one specific industry, the similarity of EM cases could be inferred as a result of its industry structure. At cross industry level, an analysis will also be proceeded to find out whether the characteristics and evolution patterns of successful EMs vary by their industries. The within and across industry analysis together will provide robust evidences for the causality between industry structure and successful EM characteristics. The historical process supporting the case evidence findings then can explain research question 3-- "how" the industry structures affect EM characteristics for their successes. The next figure visualizes the qualitative research process:

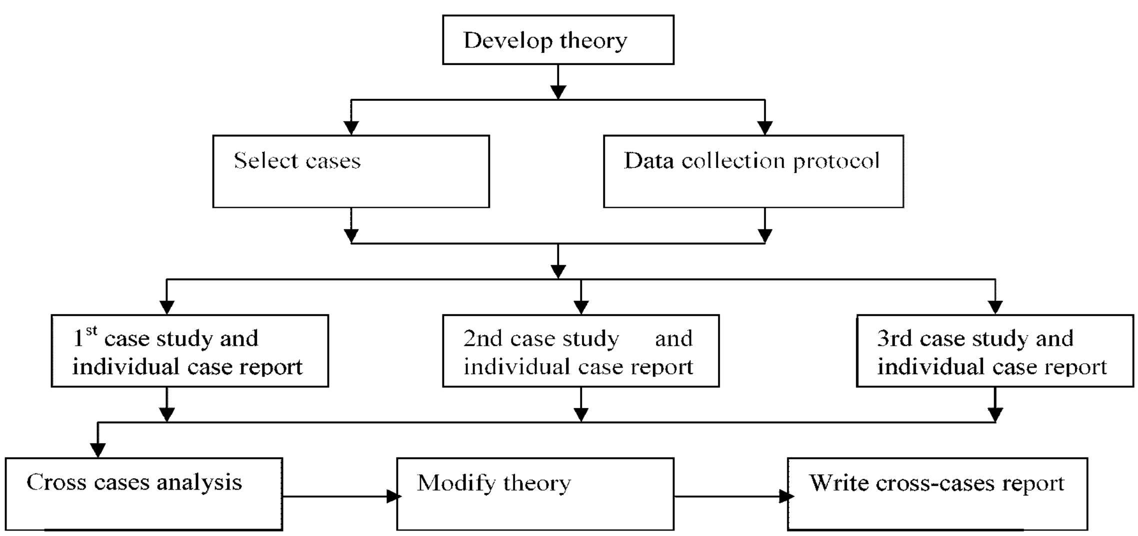

Fig.4.2 Case Study Procedure

The independent variables in qualitative research include industry structures and EM characteristics. The dependent variable is still the success of EMs that has both the survival and competence sustainability meaning. They are the same as in the quantitative research but are approached in a narrative way.

4.2.2 Cases Selection

The selection of cases is the first step in a case study. Case study research is not sampling research; however, selecting cases must be done so as to maximize what can be learned in the period of time available for the study (Yin, 1994). This requires appropriate application of a theoretical framework to maximize the diversity of cases while keeping research complexity under control. In this research, six successful EM cases were selected from two very different industries. The six successful EMs are picked primarily from Forbes Best of Web list. The Forbes Best of Web list judged EMs in each industry on their strategies, execution, and financial staying power. Websites in Forbes's selection are widely viewed as the "best of the best" in each industry. A review of Forbes Best Web list results in six EMs cases in the next table:

Table 4.4 Cases Selection

Industry (NACIS code)	Successful EM Cases
Semiconductor (3344)	✓ www.converge.com ✓ www.e2open.com ✓ www.partminer.com
Automobile (3361)	✓ www.covisint.com ✓ www.SupplyOn.com ✓ www.RubberNetwork.com

4.2.3 Case Study Protocol

A case study protocol is more than an instrument. The protocol contains the instrument but also contains the procedures and general rules that should be followed in using the instrument. The development of the rules and procedures contained in the protocol is a primary tactic to enhance the reliability of case study research. This study follows Yin's (1994) recommendation to develop its case study protocol that includes the following main components:

1. An overview of the case study project: chpaters 1 and 2 provide an overview of the case study objectives, case study issues, and presentations about the topic under study.

2. Field procedures: The "Evidence Collection" section of this chapter details information comprise the field procedures such as procedures reminders, credentials and access to data sources, location of those sources in this study.

3. Case study questions: The two questions that lead the collection of qualitative data in this research are: (a) Does the industry structure affects the emergence of electronic marketplaces? (b) If so, how does industry structures, more specifically, industry competitive structure, supply chain structure and norm structure, and determine e-marketplaces' characteristics?

4. A guide for the case study report: Case studies do not have a widely accepted reporting format. In this multiple-case design, a combination of a report for each individual case and cross case analysis will be incorporated. First, the industry profile will be established so that the reader can develop a picture of the context. Then, each individual case is described on its background and governance model, the historical log of business model evolution, success assessment, and key findings from the case

sequentially. The description will try to be as sufficiently detailed as possible so that the participants, events, and context come alive for the reader. Next, a cross-case analysis will denote the consistencies and difference of the cases in the same industry. Lastly, cases from two industries are pulled together. The comparison of different industry cases does or does not support the propositions in chapter 3.

4.2.4 Case Evidence Collection and Analytical method

Due to the resources available to the researcher, this research primarily relies on secondary data as case evidences. Data sources used in this research include EM website, government publication, market research agency report, business magazine, Lexis-Nexis Newswire, to published articles etc. Although these sources can be challenging in terms of ease of retrieval and selectivity sometimes, the advantage of public document and archival records is that they are stable, unobtrusive, exact, broad coverage, precise and quantitative (for archival records only). Using multiple secondary sources data also benefits this research by providing triangulation of evidence (Yin, 1994). Multiple sources of evidences not only addressed the potential problems of construct validity, but also can provide depth into the researcher's underrating of the phenomena. Appendix B lists the major data sources used in evidence collection. Most of the information in the list can be pulled off online.

The primary analytical method used for this case study is historical analysis. The emergence of EM is a historical process in which industry structures have influences. Recognition of the success or failure of an EM takes a lengthy time to occur (Laseter et al. 2001). Meanwhile, some EMs might adapt their business strategies to fit with their industry structures. A snap-shot study thus is limited in providing causality across time.

Historical method otherwise provide "richness of reality" and enhance the understanding the context—industry structure. As Mason et al. (1997) pointed out,

> *"A study of history offers a valuable perspective with which to view present circumstances. It provides a backdrop from which to determine what is novel in the current situation and which factors serve to distinguish the present situation from any others in the past. History helps one understand the sources of contemporary problems, how they arose and how their characteristics unfolded through time. It also identifies the solutions that worked in the past and those that did not. Perhaps most importantly, history reminds us of the richness of the human experience and of the broad degree of complexity, intricacy, and unpredictability that surrounds any real circumstance."*

Historical case analysis consists of examining, categorizing, tabulating, or otherwise, recombining the evidence to address the initial propositions of a study. Following Mason et al. (1997), the historical analysis in this study begins with "the selection and marshaling of facts" and turning them into "historical facts", during which "accidents" will be distinguished from consequential "historical facts", but with an open mind. The assemblage of admissible and ordered facts will be interpreted and its meaning determined. The final outcome of this historical analysis will be an account: a comprehensive story, a complete episode about the evolution of EM business strategies that has a beginning, a middle, and an end. As the account unfolds, it illuminates the events and forces that brought about the circumstances during the evolutions of successful EMs. It also identifies the immutable forces from industry structure that remained unchanged throughout the transformations of EM business strategies.

4.2.5 Methods to Ensure and Enhance Qualitative Research Quality

The quality of any research needs to be judged according to certain logical tests. Several tests have been widely used to establish the quality of any empirical social research including case study (Yin, 1994). These tests include internal validity, external validity, and reliability. The next table gives a summary of these tests and responding tactics incorporated to enhance qualitative research:

Table 4.6 Case Study Tactics

Tests	**Case study tactics**	**Phase of research in which tactic occurs**
Construct validity	• Use of multiple sources of evidence • Establish chain of evidence	Data collection & Composition
Internal validity	• Pattern matching • Explanation building • Chronology analysis	Case analysis
External validity	• Replication logic	Research design
Reliability	• Case study protocol • Use case study database	Case data collection

Construct validity establishes correct operational measures for the concepts being studied. In this study, construct validity is concerned with the study's success at measuring industry structure variables and EM characteristic variables, as well as the success of EM. To increase its construct validity, the qualitative research includes two tactics in its design such as use of multiple sources of evidence and establishing a chain of evidence.

The use of multiple methods for data collection is from methodological triangulation (Merriam, 1988). The rationale for this strategy is that the flaws of one method are often the strengths of another, and by combing methods, observers can achieve the best of each, while overcoming their unique deficiencies (Denin, 1970). In this study, both document and archival records are explored for case evidence. This evidence is also from multiple sources such as government publication, website reviews, market agency reports and Lexis-Nexias Newswire database etc.

A chain of evidence is based on a notion similar to that used in criminal investigations. As with criminal evidence, evidence presented in "court"—the case study report—is assuredly the same evidence that was collected at the scene of the "the crime" during the data collection process (Yin, 1994). In this research, deliberate efforts, e.g., the use of a case study database and consulting with key informants and experts, have been taken to ensure original evidence is not lost or treated carelessly or with bias.

Internal validity in this research is to establish causality between the success of EM and the interaction of industry structures and EM characteristics and making inferences about the relationship. Following the suggestion of Yin (1994), three tactics have been taken to ensure internal validity here: pattern matching, explanation building and chronology analysis.

Pattern-matching compares an empirically based pattern with a predicted one. Chapter 3 proposes that the fit between industry structures and EM business strategies will determine the success of EMs within the industry. This essentially has two aspects of meaning for pattern-matching: 1) successful EMs' business strategies in a given industry will display a similar pattern; 2) successful EMs' business strategies will follow different patterns across industries. If the patterns from six case findings coincide with the theoretic proposition, the result strengthens the internal validity of this case study.

Explanation building, which in most case studies occurrs in narrative form, is to stipulate a set of causal links about a phenomenon. It is in fact a specific type of pattern-matching. However, the final explanation may not have been fully stipulated at the beginning of a study. The explanation building in this research is a process of refining ideas and entertains other plausible or rival explanations. A series of iterations were requred to develop its final explanation. Reviewing over initial propositions and comparing them with case details are reiterated. Internal validity was enhanced during this reiteraration.

Chronological analysis in this research is established through the historical log of EM evolution. All the events relevant to the implementation of EMs' business strategies were documented on their time. The chronological sequence of the applied business models of each EM allows an investigator to trace the impact of industry structures over time. If the actual evolution patterns of EM cases in one industry have followed the predicted sequence of the industry, not those of a rival sequence that will provide basis for casual inferences of the interaction of industry structures and EM characteristics. Comparison with other cases, as well as the explicit consideration of threats to internal validity, will further bolster this inference.

External validity deals with establishing the domain to which a study's findings can be generalized. It is different from survey research that relies on statistical generalization, as case studies rely on analytical generalization, in which the investigator is striving to generalize a particular set of results to some broader theory (Yin, 1994). This qualitative research has taken a multiple case study approach, by which the theory in chapter 3 was tested through replication of the findings in three cases in one industry. Once such replication has been made, the results can be accepted for a much larger number of similar cases, and the external validity of proposed theory will then be enhanced.

Reliability in the qualitative research is approached by making as many as steps as operationally possible, use of case study protocol, and deliberately archive case data as tactics to increase reliability of case study.

Similar to Cadogan (2001), the following tactics are also incorporated to address the threat to construct validity, internal and external validity, and reliability during the case study process:

1. *Prolong the processes of data gathering:* the researcher devoted ample time to the gathering of data and revisited the EM sites and industry document several times during the data gathering phase.

2. *Employing the process of "Triangulation":* the researcher utilized a variety of data sources to ensure triangulation of evidence,

3. *Conduct member checks:* the researcher initiated and maintained collaboration and communication on the interpretation of data between the research and those who provided the data.

4. *Collect referential materials:* the researcher collected material from additional sources such as media reports and additional analysis information, when available.

5. *Engage in consultation:* in the process of composing the final draft of the report, the researcher consulted with various informants to establish validity through combined judgment.

6. *Clarify researcher's bias:* the theoretical propositions in Chapter 3 assumed that EMs must adapt their business strategies to their industry structure for success. The changes EMs brought to industry structures are ignored in this study.

4.3 Summary of the Chapter

This chapter develops the research methodology used to test Chapter 3 propositions. The designed research methodology combines both quantitative and qualitative methods. The quantitative method relies on secondary source archival data for regression analysis. The qualitative method has multiple cases for historical analysis. The Data sources are identified. Data collection and analytical strategies are explained. The approaches to enhance research quality are introduced as well.

Chapter 5 Quantitative Results

Introduction

Here, quantitative analyses are used to test relationships between EM success and the interaction of selected EM characteristics with industry structures. The dependent variable is EM success and the independent variables include two EM characteristics (business model and governance model including ownership and bias) and three industry structures (competitive structure, supply chain structure, and norm structure). As described earlier in Chapter 4, EM success can be viewed in two ways: their survival (i.e., continuing operation at a point-in-time) and their competitive sustainability (i.e., the length of time an EM survived). The advantage of looking at success in terms of survival lies with its simplicity and intuitive appeal; the disadvantage is that EMs fail for many reasons, e.g., running out of cash, in addition to a lack of competitiveness. Thus, in addition to survivability, it is also useful to consider the length of time an EM 'survived.' Generally, the longer the life of an EM, the more likely the EM has positioned itself competitively in the market.

Chapter 5 first describes the sample data profile and examines the nature of the EMs across the industry groups that were studied. The existence of distinct patterns of EM business models and governance models in particular industries provides an initial sense of interactions amongst the study's variables. Then section 5.2 and 5.3 report on, respectively, survival analysis and longevity analysis in order to test research proposition. Section 5.4 summirizes the chapter.

5.1 Sample Data Profiles

Data collection occurred from May to August 2004. The process of sample selection and evidence collection has been described in Chapter 4. In total, 183 EMs from six industries were collected and coded. During the data collection, most EMs were found to have changed their business and governance models since their inception. In these cases, the most recent business and governance models were used in the analyses. In the data collection, three coders read through all collected evidences on the 183 EMs, separately coding the business model and governance model of each EM. They then met as a group to reach consensus and finalize codes for each EM in the sample. Based on their discussion, the group agreement on each code is used as the final code for the sampled EMs. Table 5.1 provides the inter-rater reliabilities, assessed through the use of Cohen's Kappa. With one exception, coders' reliabilities reflect "substantial" (0.61-0.80) agreement (Landis & Koch, 1977). Coder 1's reliability for the EM bias coding reflects "moderate" agreement, reflecting a tendency to code more biased EMs, i.e., about 30 instances where coder 1 rated a EM's services as biased when the final code was neutral.

Table 5-1 Inter-Rater Reliabilities

	Coder 1	Coder 2	Coder 3
EM Business Model	75.07%	75.58%	66.65%
EM Ownership	80.87%	74.97%	74.25%
EM Bias	54.08%	73.06%	69.79%

5.1.1. EM Business Model Distribution by Industry

Table 5.2 EM business model counts by industry

Business Model / Industry	CM	TRANS	VC	CL	BMTotal	LowBM	HighBM
	By counts					By percentage	
AERO	3	14	6	2	25	68.00%	32.00%
AUTO	9	13	6	3	31	70.97%	29.03%
Semi	6	18	5	3	32	75.00%	25.00%
Pharmacy	7	22	9	0	38	76.32%	23.68%
Metal	6	20	8	0	34	76.47%	23.53%
Apparel	3	17	3	0	23	86.96%	13.04%
Total	34	104	37	8	183		

Notes: CL--collaboration enabler; VC-- value chain coordinator; Trans-- transaction facilitator; CM—communicator

Table 5.2 gives the counts of each EM business model in the sampled industries. The percentages of higher level business models, i.e. collaboration enabler and value chain coordinator, and lower level business models, i.e. transaction facilitator and communicator in total are provided. In the samples data, the majority of EMs are acting as transaction facilitators (103/183). On the contrary, the collaboration enabler model has the least number among all four business models (8/183). According to the discussion in chapter 3, higher level business models represent advanced network roles that require more collaboration from the industry network. The smaller number of collaboration enabler models is apparently due to the difficulties involved in developing industry collaboration.

Chapter 3 also points out that higher industry consolidation will help the development of industry collaboration. Based on the percentage of higher level business model relative to the industry total, the sample industries can be ranked from high to low as Aero, Auto, Semi, Pharmacy, Metal, and Apparel. Both automotive and aerospace industries are highly consolidated. Not surprisingly, the two industries have more EMs taking higher level business models than the others. The apparel industry, on the other hand, has the lowest industry concentration ratio. The sample data shows that the apparel industry has the least percentage of higher level EM business model. This observation on sample data gives a first sign of correlation between industry consolidation and EM business model.

5.1.2 EM Governance Model Distribution by Industry

Table 5.3 EM ownership distribution by industry

Governance Model / Industry	NP	CS	PR	Total	NP	PR+CS
	By counts				By percentage	
AUTO	14	8	9	31	45.16%	54.84%
AERO	12	4	9	25	48.00%	52.00%
Pharmacy	26	3	9	38	68.42%	31.58%
Metal	24	5	5	34	70.59%	29.41%
Semi	24	3	5	32	75.00%	25.00%
Apparel	20	0	3	23	86.96%	13.04%
Total	120	23	40	183		

Notes: NP—non-participant ownership; CS—consortium ownership; Pr—private ownership

Similar to table 5.2, table 5.3 describes the counts of each EM governance model across industries as well as the percentage of non-participant ownerships and participant ownerships (including both private and consortium ownerships) relative to the total in each industry. Non-participants ownership is the major governance model EMs have chosen (120/183) in the data pool. In contrast, the number of private ownerships is relatively less and that of the consortium is the least. From chapter 3, consortium ownership requires more industry linkages than the others, which usually leads to more problems for a consortium to be built up. The sample data confirms this pattern.

After calculating the percentage of participant governance model, the industries can also be observed from high to low in rank. Again, Auto and Aero industries have the highest percentage of participant governance models relative to the other industries. The semiconductor industry and the apparel industry, on the other end, have the lowest percentage. According to chapter 3, participant models will more likely occur in industries with higher industry consolidation because non-participant EMs have difficulties getting the participation of the major players who exhibit considerable control within the industry network. From the data in table 5.3, the industry rank of the percentage of participant governance model in the total is close to that of industry concentration ratios. This intuitively supports chapter 3's propositions.

It is noted that the industry rank here is similar to the rank based on higher level business models except for the semiconductor industry. According to chapter 3, participant governed EMs are more likely to offer higher level business models because participant ownership can provide the industry linkages needed by higher level network roles. The patterns identified by table 5.3 and table 5.2 seem to generally support Chapter 3's theory.

5.1.3 EM Bias Distribution by Industry

Table 5.4 EM bias counts by industry

Industry \ Bias	NEU	BD	SD	Total	Biased	Neu
	By counts				By percentages	
AUTO	19	7	5	31	38.71%	61.29%
AERO	21	4	0	25	16.00%	84.00%
Pharmacy	27	9	2	38	28.95%	71.05%
Semi	29	0	3	32	9.38%	90.63%
Metal	27	4	3	34	20.59%	79.41%
APPAREL	22	0	1	23	4.35%	95.65%
Total	145	23	15	183		

Notes: Neu—neutral; BD—Buyer biased; SD—seller biased

Table 5.4 provides the counts of samples EM bias, where bias is characterized as neutral or biased (both buyer biased and seller biased), for each industry. A review of table 5.4 shows that most of the sample EMs have a neutral position in their supply chain (145/183). Among the six industries, auto and pharmacy industry have the highest percentages of biased EMs. In contrast, apparel and semiconductor industry are more neutral, while aero and metal industries stay in the middle. In the sample industries, EMs also have different bias preferences. In aero and pharmacy industry, there are more buyer-biased EMs than seller-biased EMs. In auto and metal industry, buyer-biased EMs are only slightly more than the seller biased EM. Only in semiconductor and apparel industry, are more seller-biased EMs observed. Figure 5.3 portrays these percentages visually.

According to chapter 3, the convergent assembly SCN is argued to favor a buyer-biased EM, the divergent early differentiation SCN to favor a seller-biased EM and the divergent late differentiation SCN to favor a neutral EM. From Chapter 4, the auto and aero industry are using the convergent assembly SCN, the pharmacy and metal industry are taking the divergent early differentiation SCN. The semiconductor and apparel industry are close to the divergent late differentiation SCN. The industry distribution of EMs' bias in the sample does not appear to support the predictions of Chapter 3.

Overall, the descriptive data seems supportive of business of the developed theory regarding business models and ownership models but not EM bias. In next two sections, survival analysis and longevity analysis are applied to test the propositions associated with these variables (listed in Table 5.4).

Table 5.4 Tested Propositions

The effect of Industry Competitive Structure:

P1: The more consolidated the industry, the more likely that higher-level EM business models will be applied for success.

- **P1a:** The higher an industry's concentration, the more likely that higher-level EM business models will be applied for success.
- **P1b:** The higher the entry barriers within an industry, the more likely that lower-level EM business models will be applied for success.
- **P1c:** The higher the product differentiation in an industry, the more likely that lower-level EM business models will be applied for success.

P2: The more consolidated an industry, the more likely that participant ownership will exist for success.

- **P2a:** The higher an industry's concentration, the more likely that participant ownership will exist for success.
- **P2b:** The higher an industry's entry barriers, the more likely that participant ownership will exist for success.
- **P2c**: The higher an industry's product differentiation, the more likely independent ownership will exist for success.

The effect of Industry Supply Chain Structure:

P3. The more balanced an industry supply chain structure, the more likely that a neutral EM bias will exist for success.

- **P3a:** EMs in industries characterized by a divergent late assembly supply chain are more likely to exhibit neutral governance models for success.
- **P3b:** EMs in industries characterized by a convergent assembly supply chain are more likely to exhibit buyer-driven governance models for success.

The effect of Industry Norm Structure:

P5. The industry clockspeed will have interaction with EM characteristics for success

- **P5a:** The slower an industry's clock speed, the more likely that higher-level EM business models will be applied for success.
- **P5b:** The faster an industry's clock speed, the more likely that non-participant EM ownership will exist for success.

The co-variation of EM business model and Governance model

P6: EMs applying higher level business models is more likely to exhibit participant ownership for success.

5.2 EM Survival Analysis

To test the relationship between the success of EMs and the characteristics of EM and their surrounding industry structure, a survival analysis is applied to the collected data. In the analysis, the success of EMs is defined as whether the EM is still operating at the ending time point of data collection period (Feb., 2004). This definition thus indicates a binary dependent variable. A binary logistic regression model is thus used for estimation of the survival probability. Such a logistic regression model allows one to predict a discrete outcome, such as group membership, from a set of variables that may be continuous, discrete, dichotomous, or a mix of any of these (Hosmer & Lemeshow, 1989). It has been used in ecological research (Trexler & Travis, 1993; Connor et. al., 1994). The execution of logistic regression here follows Agresti (1996).

A dummy variable S/F_S is generated to indicate the survival status of EM by the end of the observation period. Value 1 of the S/F_S means a survival and 0 the failure. During the data collection, some EMs were observed to have been acquired by another EM in the sample pool. As it proved difficult to judge whether the acquired EMs were performing in a manner that would have led them to survive otherwise, the EMs that were acquired by the others were dropped from the sample pool. This reduced the total number of valid samples from 183 to 165 with 99 survivals.

Two variables were used to describe the EM characteristics. Dummy variable GBM_H was used to describe the level of EM business model: 1 for GBM_H represents the two higher level business models and 0 the two lower ones. High level business models consisted of the collaboration enabler and value chain coordinator because both require more sophisticated network roles. In comparison, transaction facilitator and communicator are counted as lower level business models. Dummy variable GOSPR was used for EM governance model with 1 for participant ownership and 0 non-participants ownership. The participant governance model includes consortium and private ownership because both of them require the involvement of industry participants. The two variables together identified 38 higher level business models and 59 participant governance models among the total 165 sample subjects.

Industry structure variables are independent variables in the logistic regression model. Initially, industry competitive structure variables included concentration ratio, capital intensity, advertising intensity, and Research&Development intensity. Industry norm structure includes clockspeed and industry EDI usage and Industry integrated CAD usage. Industry supply chain structures is one four categorical variable. Table 5.5 provides the definitions of used variables.

Table 5.5 Regression Model Variable Definitions

Variable Name	Definition	Scale
S/F_S	EM survival	Binary: 1--survival; 0-- failure
GBMH	EM business model applied	Binary: 1—higher; 0--lower
GOSPR	EM governance model applied	Binary: 1—Participant ownership; 0--non-participant ownership
Gbias	EM bias	Categorical variable: Neu—neutral; BD—buyer biased; SD—seller biased
Concentration	Industry 4 largest concentration ratio	Continuous
Clockspeed(1)	Slow clockspeed Industry	Binary: 1—slow; 0—non-slow
Clockspeed(2)	Fast clockspeed Industry	Binary: 1—fast; 0—non-fast
CapByFirm	Capital Intensity	Industry total capital expense divided by the total number of companies in the industry
AdsByValAdded	Advertising Intensity	Industry total advertising expense divided by industry total value added
SupplyChain	Industry Supply Chain structure	Categorical variable : conv—convergent; DE—divergent early differentiation; DL—divergent late differentiation

Initial analyses found that capital intensity, advertising intensity, and industry supply chain, and EM bias were not significant predictors; these variables were therefore dropped from the logistic regression models. The remove of industry supply chain and EM bias resulted in the inability to test proposition 3 in logistic regression model. In the final analyses, only concentration ratio and clockspeed were used as industry variables. Concentration ratio is a continuous variable reflecting each industry's four largest firms. Clockspeed, on the other hand, is categorical (fast, medium, and slow) and is represented by two dummy variables: Clockspeed(1) is a dummy variable for slow clockspeed industries, Clockspeed(2) is a dummy variable for fast clockspeed industries, and the medium clockspeed industries serve as the reference group.

5.2.1 Model Testing Strategy

Several variations of the logistic regression model are executed to explore the influence of the variables. With these models, the independent variables are introduced step by step so that the effect of new variables can be clearly compared to that of existing variables. Model 1 involves only the industry structure variables, and assesses whether industry structures determine the survival of EMs. Model 2 introduces the EM business and governance model variables, thus assessing whether EM business model and governance model separately influence EMs' survival probability. Model 3 adds the interaction of EM business model and governance model. Model 4 adds the interaction of industry competitive structure variables (concentration ratio) and EM characteristics. Model 5 adds the interaction of industry norm structure variables (clockspeed) and EM characteristics in place of the interaction of industry concentration ratio and EM characteristics of Model 4. Model 6 includes all three interactions.

Each model was run using SPSS 13.0. The results of statistical test and overall model estimates are given in Appdendix D and discussed next.

Table 5.6 Model fit comparison

	Chi-square	Df	Sig.	-2 Log likelihood	Log likehood ratio [a]
Model 1	4.867	3	.182	217.227	2.19%
Model 2	10.253	5	.068	211.841	4.62%
Model 3	16.325	6	.012	205.769	7.35%
Model 4	25.269	8	.001	196.825	11.38%
Model 5	27.564	10	.002	194.529	12.41%
Model 6	**34.129**	**12**	**.001**	**187.965**	**15.37%**

a. the -2* (original model log likehood) = 222.1

5.2.2 Model Fit Assessment:

Table 5.6 compares model fit statistics from the SPSS omnibus tests for the six models. The omnibus tests of model coefficients results gave the model chi-square χ^2 and its significance level. From SPSS output in table 5.6, the chi-square for model 1 and model 2 are 4.867 and 10.253 respectively. Both are not significant at 95% confidence level in comparison to an original model that contains only an intercept. This suggests that industry variables and EM characteristics by themselves are not good predictors of the survival of EMs. This finding gives a first sign in support of the proposition in Chapter 3, which proposes that the interaction between industry structure and EM business and governance model will influence the success of EMs. Model 3, 4, 5, and 6 assess the effects of various interactions. The model chi-squares of these 4 models are 16.325, 25.269, 27.564 and 34.129. All four models are significant at the 95% confidence level. Together, they suggest that models with interaction effect are better than models without interactions in predicting the survival probability of EMs.

A further examination of the log likehood ratio of models 3, 4, 5, and 6 indicates the goodness of fit of each model. The log likehood ratio R_L^2 explains the proportional reduction in the absolute value of the log-likehood measure. It can be calculated with model chi-square divided by -2 * (original log likehood). The log likehood ratio for the models 3, 4, 5, and 6 are: 7.35%, 11.38%, 12.41%, and 15.37%, respectively. These ratios suggest that among all four models, model 3 would be the worst fit model. Model 3 has the interaction of EM business model and EM governance model only. In contrast, models 4, 5, and 6 all include the interactions of industry variables and EM characteristics in addition to that of EM business model and EM governance model. Therefore, it can be concluded that models with industry effects are better than models without those effects for the predication of EM survival probability. This confirms the existence of industry structure effects on the survival of EMs, which is the undying principal of the proposed Proposition.

A second look of the log-likehood ratio of model 4 and model 5 shows that while they are only slightly different on their goodness of fit, model 5 is marginally better than model 4. This can be explained by that the effect of industry clockspeed is stronger than that of industry concentration. This finding is not surprising because industry norm structure is fundamental to industry competitive structure. Finally, the log likehood ratio results suggest that model 6 has the best goodness of fit. Table 5.7 reports the estimated coefficients, their standard errors, the Wald statistics that tests whether each coefficient equals 0, degree of freedoms of the variable, the significance level of each coefficient estimates, and odds ratios, in model 6.

Table 5.7 Coefficient estimates for logistic regression model 6

Explanatory Variables	B	S.E.	Wald	df	Sig.	Exp(B)
GBM_H	1.642	1.537	1.140	1	.286	5.165
GOSPR	-.255	1.337	.036	1	.849	.775
Concentration	.040	1.070	.001	1	.970	1.041
ClockSpeed			.908	2	.635	
ClockSpeed(1)	.237	.561	.179	1	.672	1.268
ClockSpeed(2)	.550	.588	.874	1	.350	1.733
GBM_H by GOSPR	3.965	1.533	6.685	1	.010	52.711
ClockSpeed * GOSPR			5.246	2	.073	
ClockSpeed(1) by GOSPR	-2.782	1.220	5.197	1	.023	.062
ClockSpeed(2) by GOSPR	-1.704	1.198	2.023	1	.155	.182
ClockSpeed * GBM_H			1.956	2	.376	
ClockSpeed(1) by GBM_H	-2.195	1.642	1.786	1	.181	.111
ClockSpeed(2) by GBM_H	-1.555	1.393	1.246	1	.264	.211
Concentration by GBM_H	-5.305	3.056	3.014	1	.083	.005
Concentration by GOSPR	5.430	2.637	4.240	1	.039	228.050
Constant	-.026	.659	.002	1	.969	.974

5.2.3 Model Interpretations

The Wald statistics in table 5.7 are used to test the statistical significance of each coefficient (β) in the logistics regression model (Hosmer & Lemeshow, 1989). Overall, among all the variables, the logistic regression model 6 identified three interactions that have significant influence on the survival probability: GBM_H by GOSPR, ClockSpeed (1) by GOSPR, and Concentration by GOSPR. Their Wald statistics are 6.685, 5.197 and 4.24 respectively. All responds to p-value less than 0.05 in a chi-square distribution. Together, the significance of these three variables suggests that the interaction of EM business model and governance model, the interaction of fast clockspeed and EM governance model, and that of industry concentration and EM governance model are the major significant predicators for the survival of EMs across sample industries. This finding is consistent with the theory propositions in Chapter 3.

It is interesting to review the signs of the coefficients of each interaction variable and their odds ratio and compare them with the Proposition in Chapter 3. The logistic regression coefficient can be interpreted as the change in the dependent variable, logit (Y), associated with a one-unit change in the independent variable. The signs of coefficients in logistic regression model indicate whether the contribution of variables to the overall probability of Y=1 is positive or negative. In model 6, Concentration by GOSPR has a positive coefficient, which indicates an increase of EM survival probability with EM participant ownership in a higher industry concentration environment. Proposition 1a (P1a: the higher industry concentration, the more likely that participant ownership will be applied for success) is thus supported. GBM_H by GOSPR is also exhibiting positive contribution to the probability of EM survival. This indicates that the fit between higher level EM business models and participant ownership will more likely allow EMs to survive than any other combinations. This support Proposition 6 that *EMs applying higher level business model are more likely to exhibit participant ownership for success.* Finally, ClockSpeed (1) by GOSPR is assigned a negative coefficient. Because the medium clockspeed was used as reference group in SPSS, a negative coefficient means that participant ownership fits medium clockspeed industry better than the slow clockspeed industry. This finding seems to contradict the expectation of the Proposition *5b that the slower an industry's clock speed, the more likely that participant EM ownership will be taken for success.* However, a further look at the sign of Clockspeed (2) by GOSPR finds out it is negative too. Although the interaction of Clockspeed (2) by

GOSPR in model 6 isn't significant at 95% confidence level, it does marginally support proposition 5b.

The odds ratio provided by SPSS in Exp (B) offers similar information as the signs of coefficients do. Odd ratios represent the proportional change of the odds of Y=1 when the event of explanatory variable occurs. Since the values of coefficients in a logistic regression model can be hard to interpret, it is suggested that odds ratio associated with each variable be used to understand the effect scale of the variable (Menard, 2002). As SPSS output displayed, the odds ratios for Concentration by GOSPR and GBM_H by GOSPR are 228.050 and 52.711. A comparison of these two ratios suggests that while participant ownership fits with both higher industry concentration and higher level EM business model, concentration has a stronger influence on the odds of EM survival than EM business model.

Unfortunately, the model did not find any significant effect from the interaction of industry structure and EM business model. Therefore, there is no support for proposition 1 and 3 However, because the model supports the interaction between EM business models and governance models, the lack of industry effect on EM business model can be explained. Possibly, the EM governance model mediates the relationship between industry structure and the EM business model. Instead of determining the role EMs can play in the inter-organizational network directly, industry structure will influence EMs' network role through its industry linkage.

Model 6 doesn't show a significance effect for the interaction between fast clockspeed (Clockspeed (2)) and participant ownership. However, model 5 reports that this interaction is significant when clockspeed as industry variable is included in the model. The sign of clockspeed (2) by GOSPR in the model 5 is negative. The odds ratio for ClockSpeed (2) by GOSPR is 0.085<1. A very low ratio seems to suggest that participant ownership in a fast clockspeed industry will reduce the odds of EM survival. Interestingly, in model 5, the interaction of clockspeed (1) by GOSPR also has a negative sign and less than 1 odds ratio. Together with clockspeed (2) by GOSPR, this seems to suggest that the participant ownership fits with the medium clockspeed industry better than both fast and slow clockspeed industries. A possible explanation for this finding is that as the clockspeed becomes very slow, the industry e-business standards become more consistent. The consistent standards will then increase the chance of non-participant EMs survival.

Indicators of possible multicollinearity among industry variables and EM characteristics variables were examined. SPSS reports that the VIF (variance inflation factor) for all the variables and their interactions is less than 10. This result demonstrates that there is no serious multicollinearity identified for the models. Table 5.8 shows these multicollinearity results:

Table 5-8 Testing for Multicollinearity in Model 6

Variables	**Collinearity Statistics**	
	Tolerance	VIF
GBM_HbyGOSPR	**.350**	**2.858**
clockspeed(1)ByGOSPR	**.566**	**1.766**
concentrationByGOSPR	**.159**	**6.297**
GBM_H	**.463**	**2.160**
GOSPR	**.170**	**5.876**
ClockSpeed(1)	**.636**	**1.571**
Concentration	**.475**	**2.105**

5.3 EM Longevity Analyses

EM longevity is measured by the number of years from the EM's launch year to the EM's failing year. If an EM survived to the end of the observation window (2004), the number of years between the starting year and the ending year of the observation window is used as the EM's lifetime. A careful examination of the sample data finds out that there are no EMs starting within 2 years of 2004. This excludes the possibility that EMs that failed within a 2 year period are treated the same as those launched just prior to the ending of the observation window.

Since longevity is a continuous variable with all values greater than 0, its values are unlikely to follow a normal distribution. The one-sample Kolmogorov-Smirnov Test was conducted to determine the distribution of this variable. Table 5.9 gives the results of four distribution tests. The asymptotic p-values for Normal, Exponential, and Uniform distribution are all less than 0.01. This means that the distribution of longevity is significantly different from any of them. Instead, the longevity variable seems to follow a Poisson distribution -- its asymptotic p-values for Poisson distribution 0.237 is greater than 0.01.

Table 5.9 One-Sample Kolmogorov-Smirnov Test on Longevity distribution

		Poisson	Normal	Exponential	Uniform
N		165	165	165(c)	165
Distribution Parameters (a, b)		Mean: 4.21	Mean: 4.21; Std: 2.747	Mean: 4.24	Min: 0; Max: 25
Most Extreme Differences	Absolute	.080	.169	.245	.638
	Positive	.080	.169	.115	.638
	Negative	-.032	-.115	-.245	-.034
Kolmogorov-Smirnov Z		1.032	2.170	3.139	8.190
Asymp. Sig. (2-tailed)		**.237**	.000	.000	.000

a. Test distribution
b. Calculated from data.

c. There is 1 value outside the specified distribution range. This value is skipped.

Since the data appears to fit a Poisson distribution, the Poisson regression model was used to analyze the study's propositions. Poisson regression is often used to analyze count data. It has been used to model the number of occurrences of an event of interest , or the rate of occurrence of an event of interest, as a function of a set of independent variables, e.g., rate of insurance claims, number of doctor visits, incidence of diseases, crime incidence, number of days a child is absent from school, colony counts for bacteria, etc. (Long, 1997).

The Poisson regression model can be written in the following form:

$$\text{Log}\ (\mu) = \text{intercept} + b1*X1 + b2*X2 + \ldots + b3*Xm,$$

Where μ is the mean of dependent variable; intercept is used as an offset, that is, a regression variable with a constant coefficient of 1 for each observation. In the Poisson regression model, the log of (μ / exp (intercept)) is modeled as a linear function of the independent variables.

5.3.1 Model Building & Fit Assessment:

Building an adequate Poisson regression model involves the introduction of different variable sets in a hierarchy approach. Here, the first variables that are introduced are the EM characteristics variables, EM business model and governance model. Then, industry structure variables including competitive structures, norm structures, and supply chain structures are introduced. Finally, interactions among these variables are added into the model. The whole model building process was run on SAS 8.0. The variables included in the longevity analysis were described earlier in Table 5.5.

Another consideration in the building of a Poisson regression model is the choice of offset term. Apparently, the ending point of observation window will determine the years of life for successful EMs. Since some EM subjects started late in the observation window, their years of life will therefore be shorter no matter how successful they were. To reduce the systematic error caused by this problem, the log of mean longevity for all sample EMs was used as the model offset term. The log of (μ / mean longevity) therefore refers to a relative longevity ratio indicating under the constraints of certain explanatory variables, how long the estimated mean of EM longevity is relative to the total sample mean longevity.

SAS outputs report the deviances and Pearson chi-squares of the Poisson regression model. The residual deviance is the log-likelihood ratio statistic for testing the fitted model against the saturated model in which there is a regression coefficient for every observation. The Pearson statistic is the score test statistic for testing the current model against the saturated model. Both statistics have approximately a Chi-square distribution with the number of degrees of freedom equal to the number of observations minurs the parameters. Scaled Deviance and Scaled Pearson X2 are Deviance and Pearson Chi-Square, respectively, divided by the dispersion parameter. They are the same if the dispersion parameter is 1 for the Poisson distribution. Table 5.10 shows the SAS assessment of model goodness of fit.

Table 5.10 Assessment of Goodness of Fit for Poisson Regression Model

Criterion	DF	Value	Value/DF	P-Value
Deviance	140	163.3551	1.1668	0.0862
Scaled Deviance	140	163.3551	1.1668	0.0862
Pearson Chi-Square	140	153.7010	1.0979	0.2024
Scaled Pearson X2	140	153.7010	1.0979	0.2024
Log Likelihood	140	297.8478		

In the above criteria of goodness of fit, the deviance value is 163.3551. Compared to a chi-squares distribution with 140 degree of freedom, its p-value is 0.0862, greater than 0.05. This indicates a good fit. Deviance and Pearson Chi-Square divided by the degrees of freedom are often used to detect over-dispersion or under-dispersion. For the fitted model, both are approximately one, which implies that the fitted distribution has nearly equal mean and variance (Poisson distribution has equal mean and variance). It can therefore be concluded that the fit of the Poisson model is adequate.

5.3.2 Model Interpretations

The estimations of Poisson regression model parameters from SAS are given in table 5.11 (Complete SAS output see Appendix E)

Table 5.11 SAS Parameter Estimates of Poisson Regression Model

Parameter			Coefficient Estimate	Chi-Square
Intercept			-3.3685	37.86[a]
GBMH			0.0572	0.03
GOSPR			-0.1899	0.34
GBias		BD	-0.0136	0
GBias		Neu	-0.015	0
GBias		SD	0	.
Concentration			1.0512	1.14
AdsByValAdded			170.7954	2.24
CapbyFirm			0	0.02
ClockSpeed		F	-0.8384	3.81[b]
ClockSpeed		M	-0.6023	3.64[b]
ClockSpeed		S	0	.
SupplyChain		CONV	0	.
SupplyChain		DE	0	.
SupplyChain		DL	0	.
GBMH*GOSPR			0.4162	2.8[b]
GBMH*ClockSpeed		F	0.7062	1.18
GBMH*ClockSpeed		M	0.787	1.59
GBMH*ClockSpeed		S	0	.
GOSPR*ClockSpeed		F	1.4047	5.96[a]
GOSPR*ClockSpeed		M	1.2898	5.22[a]
GOSPR*ClockSpeed		S	0	.
GBMH*Concentration			-2.1121	5.27[a]
GOSPR*Concentration			1.8029	5.41[a]
SupplyChain*GBias	CONV	BD	-0.1739	0.19
SupplyChain*GBias	CONV	Neu	-0.2705	0.56
SupplyChain*GBias	CONV	SD	0	.
SupplyChain*GBias	DE	BD	0.4548	0.78
SupplyChain*GBias	DE	Neu	0.1394	0.1
SupplyChain*GBias	DE	SD	0	.
SupplyChain*GBias	DL	BD	0	.
SupplyChain*GBias	DL	Neu	0	.
SupplyChain*GBias	DL	SD	0	.
GBMH*AdsByValAdded			-47.392	0.21
GOSPR*AdsByValAdded			-227.39	5.7[a]
GBMH*CapbyFirm			0	0.2
GOSPR*CapbyFirm			-0.0001	4.89[a]

Note: a—P-value < 0.05; b—P-value approach 0.05

From the results in Table 5.10, all coefficients of EM characteristics including business model, ownership, and bias, are not reported to be significant by themselves (i.e., main effects), which suggests that none of the EM characteristics by themselves influence the relative longevity of EM. Similar results are seen with the industry competitive structures including concentration, production differentiation, and entry barriers, and supply chain structures. According to chapter 3, only the fit of EM characteristics with industry structure, but not each of them separately, can influence the success of EMs. These findings seem to support the theory from chapter 3.

The effect of industry competitive structure

The interaction terms involving industry competitive structure include GBMH*Concentration, GOSPR*Concentration, GBMH*CapbyFirm, GOSPR*CapbyFirm, GBMH*AdsByValAdded, and GOSPR*AdsByValAdded. Among the six interaction terms, the Poisson regression model found that the coefficients of GBMH*Concentration, GOSPR*Concentration, GOSPR*CapbyFirm, and GOSPR*AdsByValAdded were all significant at 95% confidence level (p-value < 0.05). These significant coefficients identified the effects of industry competitive structures on EM characteristics.

Among the interaction terms, GBMH*Concentration and GOSPR*Concentration, reflect the influences of industry concentration. A positive coefficient sign of GOSPR*Concentration indicates that industry concentration increases the relative longevity of participant ownership. This supports the proposition **2a** that *the higher an industry's concentration, the more likely that participant ownership will exisit for success.* The sign of GBMH*Concentration coefficient is negative, which seems to contradict the proposition **1a** that *the higher an industry's concentration, the more likely that higher-level EM business models will be applied for success.* However, the occurrence analysis in section 5.1.1 points out that in highly concentrated industries such as the auto and aero industries, there are more higher-level EM business models. Therefore, the reason why higher-level EM business models have shorter longevity in highly concentrated industries can be explained the competition among large numbers of EMs taking these models. Having the perception that higher-level EM business models will bring significant benefits to the concentrated industries, more EMs seek to make profit from the higher level business model. But the intensive competition among similar business models results in more failures and thus reduced the industry average longevity of these models.

GOSPR*CapbyFirm and GBMH*CapbyFirm are the interactions of industry entry barriers and EM characteristics. Different from that of GOSPR*Concentration, the sign of GOSPR*CapbyFirm is negative. However, the coefficients estimate of GOSPR*CapbyFirm is only slightly lower than zero. GBMH*CapbyFirm also gets a zero coefficient estimate even though it is not a significant variable in the regression model. Zero coefficients seem to suggest entry barriers have neutral effects on the relative longevity of EMs. Proposition 1b and 2b are therefore are not supported.

The coefficient of GOSPR*AdsByValAdded is negative too. As GOSPR*AdsByValAdded and GBMH*AdsByValAdded are the interactions of advertising intensity with EM characteristics, the meaning is straightforward here. With the increase of advertising intensity, the relative longevity of participant ownership EMs is lowered. According to Chapter 3 & 4, advertising intensity represents the industry product differentiation. The finding of negative GOSPR*AdsByValAdded coefficient therefore supports proposition **2c** that t*he higher an industry's product differentiation, the more likely independent ownership will exisit for success.* The SAS output also reports a negative sign for GBMH*AdsByValAdded, the interaction between higher level business model and advertising intensity. Although this interaction isn't significant, it implies to some extent support for proposition 1c that *the higher the product differentiation in an industry, the more likely that lower-level EM business models will be applied for success.*

The effect of industry supply chain structure and EM bias

The SAS output did not find any significant relationships for the supply chain structure variables and for EM bias. This analysis, thus, is not supportive of Proposition 3 that *the more balanced an industry supply chain structure, the more likely that a neutral EM bias will exisit for success.*

The effect of industry norm structure

The impact of industry clockspeed is the primary focus of the investigation of industry norm structure effects on EM longevity. Clockspeed is a class variable with three categories from fast to slow. SAS orders categories alphabetically and takes the last one as a reference category. The estimates of Poisson regression coefficients thus reflect a comparison between variable category and reference category. The results of the Wald Chi-Square tests in table 5.10 indicate that there is a significant difference between Clockspeed (F)*GOSPR and Clockspeed (S)*GOSPR (Chi-Square=5.96, p-value <0.05), as well as, between Clockspeed (M)*GOSPR and Clockspeed (S)*GOSPR (Chi-Square=5.22, p-value <0.05). The SAS results also show that the main effects of clockspeed are approaching significance with chi-square 3.81 for Clockspeed (F) and 3.64 for Clockspeed (M). Both have p-values close to 0.05. The model therefore identified the effects of industry norm structures on EM characteristics.

The main effect of clockspeed has negative coefficients in the model. Negative parameters for Clockspeed (F) and Clockspeed (M) indicates that the mean number of EM longevity for fast and medium clockspeed industry is lower than that of EMs for slow clockspeed. The coefficient value of Clockspeed (F), -0.8384, is even lower than that of the clockspeed (M), -0.6023. The increasingly lower negative coefficients suggest that faster industry clockspeed, in general, will reduce the longevity of EMs in the industry. According to the theory in Chapter 3, this can be explained. Faster clockspeed EMs have greater difficulty building needed network linkages. Without these essential linkages, EMs will more likely fail and therefore have shorter lives.

The model also reports positive coefficients for GOSPR*Clockspeed (F) and GOSPR*Clockspeed (M). Positive parameter for the interactions means an increase of longevity for participant owned EMs with the change of clockspeed from slow to fast or medium. It suggests a reverse effect by participant ownership against the negative influence of industry clockspeed on EM longevity. The coefficient value of GOSPR*Clockspeed (F) is 1.4047, greater than that of GOSPR*Clockspeed (M), 1.2898. Therefore, with the increase of industry clockspeed, the reverse effect of participant ownership is enlarged. The relative longer life of participant ownership in faster clockspeed industry can come from the higher rate of non-participant owned EMs failures in the same industry. Because a turbulent industry environment causes EMs difficulties in developing industry linkages, EM failures can occur more easily in faster clockspeed industry than the others. As non-participant owned EMs cannot leverage industry linkages from their governance structure board, they exhibit a greater propensity to fail than the participant owned EMs.

Combining together the findings about the main effects of clockspeed and its interaction effects, the model implies that: the faster an industry's clockspeed, the more difficulty it will experience in building needed industry linkages. This conclusion is consistent with the logic underlying proposition 5b that *the faster an industry's clock speed, the more likely that non-participant EM ownership will exist for success.* Proposition 5b is thus supported.

GBMH*Clockspeed(F) and GBMH*Clockspeed(M) are the interactions reflecting the effect of industry clockspeed on EM business model. The results indicate that neither are significant, suggesting a lack of support for P5a -- t*he slower an industry's clock speed, the more likely that higher-level EM business models will be applied for success.*

The effect of the co-variation of EM business model and governance model

The co-variation of EM business model and governance model is investigated by the coefficient of GBMH*GOSPR. The regression model found that the chi-square of GBMH*GOSPR variable is 2.80 with a p-value 0.0945 approaching 0.05. The variable coefficient is 0.4162, greater than 0. Therefore, it can be concluded the interaction of higher EM business model and participant ownership can increase relative EM longevity. Proposition 6 that *EMs applying higher level business models is more likely to exhibit participant ownership for success* is thus supported.

5.4 Summary of the Chapter

Chapter 5 is the quantitative analysis of the interaction of industry structures and EM characteristics and its effect on EM success. Both logistic regression and Poisson regression models are used to test propositions. The analysis and the results are explained. The testing results are summarized in the following table 5.13. Overall, the quantitative analysis identified the influence of industry structures on EM characteristics. The interaction of them is found to determine the success of EM in terms of both survivability and longevity.

Table 5.13 Summary of Quantitative Research Results

Proposition	Logistics Regression	Poisson Regression
P1: The more consolidated the industry, the more likely that higher-level EM business models will be applied for success.	Not Supported	Not-Supported
P1a: The higher an industry's concentration, the more likely that higher-level EM business models will be applied for success.	Not Supported	Not-Supported
P1b: *The higher the entry barriers within an industry, the more likely that lower-level EM business models will be applied for success.*	Not applicable	Not-Supported
P1c: *The higher the product differentiation in an industry, the more likely that lower-level EM business models will be applied for success.*	Not applicable	Not-Supported
P2: The more consolidated an industry, the more likely that participant ownership will exisit for success.	**Supported**	**Supported**
P2a: *The higher an industry's concentration, the more likely that participant ownership will exisit for success.*	**Supported**	**Supported**
P2b: *The higher an industry's entry barriers, the more likely that participant ownership will exisit for success.*	Not applicable	**partially Supported**
P2c: *The higher an industry's product differentiation, the more likely independent ownership will exisit for success.*	Not applicable	**Supported**
P3. The more balanced an industry supply chain structure, the more likely that a neutral EM bias will exisit for success.	Not Supported	Not-Supported
P3a: EMs in industries characterized by a divergent lately assembly supply chain are more likely to exhibit neutral governance models for success.	Not Supported	Not-Supported
P3b: EMs in industries characterized by a convergent assembly supply chain are more likely to exhibit buyer-driven governance models for success.	Not Supported	Not-Supported
P4. The industry e-business standardization will have interaction with EM characteristics for success.	Not applicable	Not-applicable
P4a: the more inconsistent an industry's e-business standards, the more likely that higher-level EM business models will be applied for success.	Not applicable	Not-applicable
P4b: the more inconsistent an industry's e-business standards, the more likely that a participant ownership will exisit for success	Not applicable	Not-applicable
P5. The industry clockspeed will have interaction with EM characteristics for success	**Supported**	**Supported**
P5a: The slower an industry's clock speed, the more likely that higher-level EM business models will be applied for success.	Not Supported	**Supported**
P5b: The faster an industry's clock speed, the more likely that non-participant EM ownership will exisit for success.	**Supported**	**Supported**
P6: EMs applying higher level business models is more likely to exhibit participant ownership for success.	**Supported**	**Supported**

Chapter 6 Qualitative Results

Introduction

Chapter 6 reports the results of qualitative anlaysis in this research. The study is conducted in two industries that have very different competitive structures, supply chain structures, and norm structures. Three EM cases from each industry are selected and researched. Their different business and governance model patterns are compared and contrasted to support or reject the propositions from Chapter 3.

Section 6.1 is an analysis of the automotive industry and its cases. Section 6.1.1 first establishes the profile of the automotive industry. It describes the industry's competitive structure, supply chain structure, and norm structure. Section 6.1.2 studied three successful EM cases in the auto industry. The evolution of their business and governance models are described and discussed in terms of the success of each EM. Section 6.1.3 summarizes the case findings and discusses the consistent patterns of these successful EMs within the automotive industry.

Section 6.2 performs a similar analysis for the semiconductor industry. Section 6.2.1 gives the profile of the semiconductor industry including the industry's competitive structure, supply chain structure, and norm structure. Section 6.2.2 describes three successful semiconductor EM cases. Section 6.2.3 summarizes the case findings and the consistent patterns of the successful semiconductor EMs.

Finally, section 6.3 compares and contrasts the cases in two industries. The case findings from different industries are analyzed to discuss the relationship between industry structures and EM characteristics. Section 6.4 summirazes the chapter

6.1 Analysis of the Automotive Industry EMs

6.1.1 Automobile Manufacturing Industry Profile

The automotive industry, which includes passenger vehicles, commercial trucks, buses, bodies, and chassis of these vehicles, is among the largest manufacturing industries in the United States. As a critical economic driver, it contributes substantially to employment and productivity. As the world's largest single-country producer and consumer of automobiles, and the most influential country for investment and competition among global automobile producers, the U.S. produced 11.4 million units of passenger and commercial vehicles and sold 17.5 million units in 2001(Ward's Automotive Reports, Feb 2002, p.8, p.2). The automotive industry in the U.S. is characterized by a constant organizational and technological change, an increasing global presence, extensive international alliances, greater cooperation among domestic rivals, and improved responsiveness to consumers(Standard and Poor's Industry Survey, Oct. 2000).

6.1.1.1 Competitive Structure:

Concentration

The U.S. automotive manufacturing industry is highly concentrated. More than 97% of the total production is with U.S. passenger vehicles. In 2001, the traditional U.S. manufacturers known as the Big Three -- General Motors (GM), Ford and Chrysler (as of 1998 a subsidiary of DaimlerChrysler of Germany) -- accounted for approximately 76% of U.S. passenger vehicle production. Japanese automakers Honda, Mitsubishi, Nissan, Subaru-Isuzu, and Toyota accounted for 18%, and European automakers BMW and Mercedes-Benz (a division of DaimlerChrysler) accounted for nearly 2%. There are two

U.S.-Japanese joint ventures – AutoAlliance International (Ford-Mazda) and New United Motor Manufacturing, Inc. (NUMMI) (GM Toyota) – which accounted for nearly 4% of US passenger vehicle production (Ward's Automotive Reports, Feb 2002, p.8).

Geographically, most U.S. automotive and automotive related production is concentrated in the Midwestern United States and centered in Michigan. This region has many headquarters offices, R&D centers, vehicle and parts production, and tool suppliers, and which provides location advantages for automobile producers. In recent years, however, the industry has expanded considerably in the southeastern part of the country; this growth is led by foreign-based automakers, e.g. Hyundai. The following diagram (Fig.6.1) shows the distribution of U.S. automotive production among the states in 2000.

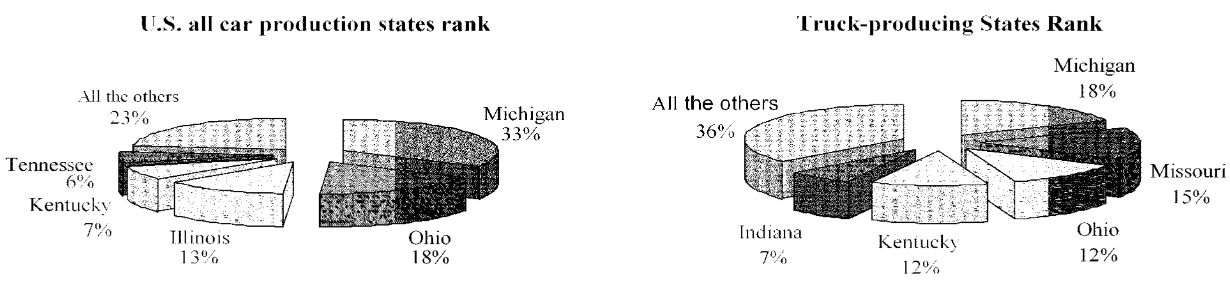

Fig 6.1 US all car and truck production state distribution

Product Differentiation

Fierce competition within the U.S. auto markets has forced the U.S. automotive manufacturing industry to spend tremendous research and development (R&D) expense on differentiating their products. The automotive industry reports that it devotes more funds to R&D than any other manufacturing industry. Over $18 billion in R&D of new advanced technologies annually aimed largely at areas such as emissions, fuel efficiency, safety, and performance. In the past 5 years, several technologies have become the focus of R&D efforts in the automotive industry, including diesel technology, integrated starter-generators, cylinder deactivation, continuously variable transmissions, clutchless manual transmissions, active suspension, ultrasonic park assist technology, and night vision technology. There have been many electronic advances, such as drive-by-wire, steer-by-wire, brake-by-wire, electronic stability control, adaptive cruise control, advanced airbag systems, tire pressure monitoring, powertrain control systems, digital radio, hands-free phones, telematics, and rear-seat entertainment systems. In addition, research is ongoing concerning the transition to 42-volt alternators to handle the demands that future electrical systems in vehicles will require. (USITC Publication, 2002)

However, it is worthwhile to note that being competitors in the marketplace, the Big Three also work together on shared technological and environmental concerns. One of these collaborative initiatives is the United States Council for Automotive Research (USCAR) formed in 1992 to fund, share and coordinate their R&D efforts as well as the industry's interaction with government researchers.

Entry Barriers

Barriers to the entry of new competition are substantial in the automobile industry. Large capital commitments are required to keep pace with product development and model changeovers. For example, Ford's capital expenditures in recent years have exceeded $8.0 billion per year and are expected to total $9.0 billion, as the firm spent heavily to update its vehicles and power trains (engines and transmissions). GM capital expenditures had increased to $7.0 billion by 1999 and approximately $8 billion in 2000. Chrysler, with less vertical integration, invests 5.6 billion euros in capital improvement for 2000 (Standard and Poor's Industry Survey, Oct. 2002). This level of commitment reflects the companies' efforts to improve plant efficiency, product quality, increase assembly capacity, introduce new and updated products more frequently, and expand their global presence. The second significant barrier to the competition is high advertising expense. In 2002, the advertising cost for GM was $4.6 billion and for Ford was $2.9 billion dollars. The huge advertising expense reflects an important non-production economy of scale. Only with the Big Three's large size of production, the advertising cost of per car can be reduced. In addition, a well-assembled dealer system is also critical to a new entrant for distribution and service. In the beginning of 1990s, the Big Three cars are sold through 15585, 8975, and 10499 dealer franchises, respectively (Walter, 1990, p.g. 110).

6.1.1.2 Supply Chain Structure: The power of automakers sectors

The automobile industry is engaged in the design, production, marketing, sale, and servicing of automobile. Many different companies and participants are involved in production and sales, as these processes require collaborative efforts. Along the industry supply chain, major industry sectors include tier 1 & 2 auto parts suppliers, autommanufacturers, and auto dealerships.

The **auto parts manufacturing sector** of the U.S. auto industry is highly fragmented, consisting of thousands of parts suppliers that range in size from small shops to large multinational corporations. It is comprised of four lines of business: original equipment manufacturing (OEM), replacement parts manufacturing, distribution, and rubber fabrication. OEM companies manufacture parts and components that automakers use in the assembly of new vehicles. Some of them are independent while others are subsidiaries of large diversified companies or automakers. The replacement market also known as the aftermarket, which is comprised of new car dealers, a few major parts distributors, and thousands of other small jobs and local firms. It produces parts and components to replace or supplement parts that were included in a vehicle's original assembly. Some firms, like Dana, participate in both original equipment and replacement sectors. Replacement parts distribution companies distribute automotive accessories and parts such as air filters, light bulbs, and fuses, which replace or supplement original vehicle parts. Their sales are primarily to automotive parts retail stores and fleet owners. Rubber fabricators manufacture tires, belts, hoses, and other rubber products for the automotive industry. Half of worldwide tire production is estimated to come from three companies: Compagnie Generale des Etablissements Michelin (France), Goodyear Tire & Rubber (U.S.) and Bridgestone/Firestone Inc. (Japan) (Standard and Poor's Industry Survey, Oct. 2002).

Part makers help automakers by enabling them to accelerate the introduction of new car lines, by sharing the high cost of developing new models, and by minimizing automakers' exposure to damaging strikes. Traditionally, automakers have used vertical integration to coordinate mass production due to the complicated nature of designing and building automobile. During the 1990s, the automaker-supplier relationship in the U.S. automobile industry changed significantly with the development of various manufacturing techniques and management trends such as modularization and outsourcing. Some automakers, most notably GM and Ford, started to move to horizontal modular coordination by selling off certain parts-making operations. For example, GM spun off Delphi Automotive Systems in May 1999 and Ford spun off Visteon in June 2000. With the increased outsourcing of services such as staffing, product design, document storage, quality analysis, and warranty management, automakers have come to depend on suppliers to assume greater design and engineering responsibilities in creating new parts and systems. Key suppliers now are involved in the earlier design phases of new products or processes, helping to reduce component costs. One study reports that several years ago, suppliers accounted for 40 percent of the value of a new passenger vehicle; today that percentage is 60-70 percent, and it is expected to rise to 80 percent during the next decade. In addition, in 2000 suppliers accounted for 33 percent of product development responsibility; by 2010 this is expected to top 50 percent. (Ziebart 2002). Indicative of the new responsibilities placed on suppliers, Chrysler is beginning to require that suppliers assume a certain portion of the costs associated with recalls and warranty repairs (Kurylko & Sherefkin, 2002).

On the **downstream of the automobile industry**, there were about 22,038 dealers in the U.S. by Jan 1, 2000 (Standard & Poor's Industry Survey, Oct. 2000). The U.S. auto dealership industry consolidated significantly during 1997-2001. In 1996, the leading 100 dealership groups accounted for 8.5 percent of light vehicle unit sales in the United States; by 2001, the top 100 accounted for 16.1 percent. Moreover, the top 10 dealership groups account for 50 percent of the new vehicle sales of the top 100. The two leading dealership groups in 2001 were AutoNation Inc., with 454,000 new retail sales, and UnitedAuto Group Inc., with 141,056 (Sawyers, 2002). While the acquisitions and consolidation into bigger dealerships reduce the total number of America dealerships, the import-only dealership count rose in 1999 (Standard and Poor's Industry Survey, Oct. 2000).

The retail segment of the automobile industry has traditionally been largely independent of automakers. Automakers typically devise production schedules on the basis of expected demand for their products, and then ship the vehicles in response to orders from dealers. In most cases, automakers hold only a very limited inventory of the finished product unless they are reluctant to make substantial reductions in production during severe sales declines. Automaker's efforts to consolidate dealer network and jointly own dealerships with independent dealers is not only opposed by independent dealers, such dealerships are banned in some States. GM was dissuaded from a plan to purchase up to 10 percent of its dealers after independent dealers strongly protested. Similarly, Ford, after purchasing 30 Ford dealers beginning in 1998, decided to sell them under extreme pressure from independent dealers (USITC Publication, 2002). On the other hand, automakers work closed with and share many costs with dealers in developing national, regional, and local marketing plans; they offer discounts to dealers as well as directly to retail customers. While automakers try to guide them in making their marketing and pricing decisions, dealers are free to set vehicle prices, and they may or may not offer customers the discounts that automakers provide.

Overall, the automobile supply chain follows a typical convergent assembly network pattern, where lots of unique component parts are assembled into a relatively small number of end items. Within this supply chain structure, Automakers perform the final assembly process to the final product. Because of high capital intensity of assembly equipment, the automaker sector naturally becomes highly concentrated to achieve high economics of scale. Tier 1 & 2 suppliers locate close to automakers to cooperate in a Just-in-Time (JIT) approach in order to reduce inventory costs. However, the auto parts sector keeps fragmenting due to the tremendous variety of auto parts manufacturing. It is thus not surprising that automakers have a stronger supply chain bargaining power over their suppliers. With the effort to reduce costs, improve shareholder value, and improve competitiveness, the U.S. automakers during the 1990s decreased supplier bases; increased automaker demands for lower prices from suppliers; and increased outsourcing of tasks once performed by automakers. These general trends delegated more supply chain management, including systems integration responsibilities and the coordination of module assembly, to suppliers, which helps suppliers' participation in the industry's convergent assembly supply network. Auto dealers, on the other hand, hold a relatively independent position on the downstream of industry supply chain. Both automakers and parts suppliers have no significant supply chain power against dealers.

6.1.2.3 Norm Structure

The norm structure of the automotive industry is characterized with inconsistent standards and slower change rate. Over time there have been many different attempts to address these problems with a multitude of format standards, often by individual companies.

Industry E-business standardization

The automotive industry has been a leader in the use of EDI and EDIFACT for over the past 20 years. EDI can reduce costs, workforce requirements, and errors associated with retyping orders, invoices, and other documents. EDI would help to minimize risks in the manufacturing process by enabling trading partners to receive timely information on changing situations in manufacturing cycles. Today, EDI based document interchange is the norm world-wide in the automobile industry for more efficient logistics between OEMs and component manufacturers.

Technologically, as of 2002, ANSI ASC X12 has been the major industry standard for EDI data format according to the automotive Industry Action Group (AIAG) (AIAG e-Business survey, 2002). This reflects an effort dating back to 1979 when the American National Standards Institute (ANSI) chartered the Accredited Standards Committee (ASC) X12 "to develop uniform standards for inter-industry electronic interchange of business transactions -- electronic data interchange (EDI)." The ANSI ASC X12 defines the data structure and content for business transactions transmitted between computer applications. The data is grouped to represent all the information required for a particular business function, such as a purchase order. ASC X12 specifies business forms by defining standard data elements with dictionaries that specify name, length of data field, description, data type, and meaning. Full X12 standard consists of: (i) x12.3 Data element dictionary; (ii) x12.5 Interchange structure-the envelope; (iii) x12.6 Application control structure-the formal description of the EDI architecture; (iv) x12.22 Directory of lists of related data elements, e.g. multiple lines of address(Pupik, 1997).

The drawback of a traditional value added network (VAN) based EDI was the high cost involved, which effectively blocked most small-to-medium sized Enterprises (SMEs) from taking advantage of EDI. In contrast, Extensible Markup Language (XML) developed recently, is proving to be a good technology for business information exchange without the constraints of traditional EDI (Kidwell & Richman, 1995). It is therefore not surpriseing that when the World Wide Web Consortium released XML in

1998, the AIAG started the XML/EDI Work Group and saw an opportunity to use XML to achieve the goals of its Manufacturing Assembly Pilot (MAP) project.

For XML schema development, AIAG recently has recommended the use of the non-profit Open Applications Group, Inc. (OAGI)'s business object documents (BODs) and e-business XML (ebXML) message routing for transporting the data (Handelman and Snack, 2002). AIAG is also spearheading an ebXML project, called Inventory Visibility and Interoperability, for improving inventory views within supply chains. More than 30 technology companies are involved, including BCE Emergis, ***Covisint***, IBM, Microsoft, QAD, SAP, Sterling Commerce, and SupplySolutions. The project will cost about $40 million and could save $255 million a year by reducing shipping and inventory costs; the group predicts (Sullivan, 2004).

Established in 2001, the ebXML specification is an XML-based standard in development that aims to facilitate the use of XML for e-business transactions, including messaging, data exchange, and registration of business processes. The ebXML strives to provide a smooth migration path from traditional EDI to XML-enabled e-business. By combining EDI and XML, the previously designed message formats and element dictionaries of EDI are carried into the XML realm, where file formats and schema exist to represent data and data structures. Data exchanged in ebXML is easy to search, decode, manipulate, and display in a consistent way.

Support for ebXML is growing throughout the automobile industry. The ***Covisint*** online exchange and parts supplier Delphi Corp. are among those backing ebXML, and Ford Motor Co. has said it wants the industry to ensure compatibility between ebXML and other Web-services technologies (Sullivan, 2004). With the support of ebXML, it is expected that future EDIs in the automobile industry by leading more to real-time interactive exchange of electronic data and the use of information technology based on open systems.

Industry clock speed—the change rate of standardization.

The U.S. automobile industry is considered a slower clockspeed industry, although there is no empirical study so far that documents this. On average, the automobile industry has a four to six years product and process technology clock speed, e.g. Honda introduces a new Accord sedan every 4 years, and 10-15 years organizational clock speed (Fine, 1998).

The clockspeed level of the automobile industry is set by two different set of forces. Traditionally, many automakers maintained a vertical/integral supply chain structure where products and systems exhibited closed, integral architectures. Each company maintained technological competencies across many elements in the chain. There was little or no interchangeability across different companies' systems. The forces that drive the traditional supply chain structure in automobile industry include: (1) Technical advances in one subsystem that can make that the scarce commodity in the chain, giving market power to its owner; (2) market power in one subsystem that encourages bundling with other subsystems to increase control and add more value; and, (3) market power in one subsystem that encourages engineering integration with other subsystems to develop proprietary integral solutions (Fine, 2000). Since the vertical/integral system is mostly enormous and very complex, the clockspeed of the industry avoidably is slow enough to satisfy the system's upgrading need.

On the other hand, recent industry trends in flexible manufacturing, modular assembly, platform sharing, and outsourcing are changing the automobile landscape. For example, modular assembly shifts a large portion of the supply chain management and component integration responsibility to Tier 1 suppliers, which deliver a complete module—e.g. a cabin cockpit fitted with instrument clusters, airbags, audio equipment, and wiring—to the automakers. Modularization and outsourcing not only significantly reduce the product development times for the automakers but eases the way for frequent and profitable upgrades. The outcome of this is a fierce, fast-moving, and commodity-like competition within individual niches, which improve the clockspeed of automobile industry with the cost of ease to reach industry consensus regarding product, process and information system standards (Fine, 2000).

6.1.2 How Can an E-marketplace Be Successful in the Industry?

Case 1: Covisint (www.Covisint.com)

Covisint was probably the most widely known exchange in the automobile industry. Founded by DaimlerChrysler, Ford, General Motors, Renault, Nissan, Commerce One and Oracle as well as PSA Peugeot Citroen, ***Covisint*** had a mission of integration and collaboration. It promised lower cost, easier business practices and a marked increase in efficiencies for the entire industry. The up and down experience of the automotive industry benchmark EM provided excellent lessons to the development of electronic marketplace in auto industry.

The origin and Governance

Initially in late 1999, Ford and GM announced plans to launch separate exchanges, but within months joined forces and invited DaimlerChrysler to join. On February 25, 2000, DaimlerChrysler, Ford Motor Company, and General Motors jointly announced plans to combine efforts and form a single global business-to-business supplier exchange. Each company brought together its individual e-business initiatives to avoid the burdens suppliers would endure if asked to interact with redundant proprietary systems. Nissan and Renault also signed on early in the exchange's development. By March 2001, Toyota, Honda, Mitsubishi, Mazda, and 19 Japanese partsmakers had announced their intention to join. In May 2001, Peugeot joined in too.

Table 6-1 *Covisint* Shareholders and Their Stakes

Owners	*Stake*	*Annual Purchasing($billion)*
General Motors	30.66%	$86.1
Ford Motor	30.66%	85
DaimlerChrysler	30.66%	80
Renault/Nissan	4.00%	50
Oracle	2.00%	N/A
Commerce One	2.00%	N/A
Peugeot	N/A	N/A
Industry's 8,000 largest suppliers	N/A	325
Potential ***Covisint*** market		626

(Source: http://misbridge.bus.utexas.edu/knowledge/topics/b2b/casestudies.asp)

Some automotive suppliers asked ***Covisint*** for an equity stake because it would have put them on the same footing with the automakers in deciding how ***Covisint*** was run. However, none of the suppliers were given an ownership stake in ***Covisint***. Instead, ***Covisint*** offered profit-sharing as an inducement for suppliers to be part of ***Covisint***.

Suppliers who had signed letters-of-intent to participate include: A.K. Steel, ArvinMeritor, Autoliv, BASF, Dana Corporation, Delphi Automotive, Denso International America, Dura, Ernie Green Corporation, Federal Mogul, Flex-n-Gate, Freudenberg NOK, Johnson Controls, Inc., Lear Corporation, Magna International, Plastech, Tower Automotive and Yazaki International. "We recognized the value of using e-business solutions to improve overall supply chain efficiency and speed for our new organization. ***Covisint*** could help align us more closely with our suppliers and allow us to provide added value to our customers," said Larry D. Yost, chairman and CEO of the newly-formed ArvinMeritor, Inc. (***Covisint*** Press Release, July 17, 2000).

Milestone

Year 2000

- February: General Motors, Ford Motor Co., DaimlerChrysler create online trade exchange.
- April: Nissan and Renault join as equity partners
- May: Exchange gets a name: ***Covisint***
- September: FCC, German government approve ***Covisint***'s operation
- August: The ***Covisint*** Customer Council is formed
- October: ArvinMeritor becomes first supplier to participate in auction
- November: Auto-Xchange and GM TradeXchange begin their integration into ***Covisint*** in November 2000.

Year 2001

- January: ***Covisint*** announces the election of the first 12 members of its 17 member Board of Directors
- March: European office opens
- April: Kevin English named CEO, effective May 1
- July: Japan office opens
- August: Jacqueline Dedo resigns as head of sales
- September: Ford Motor becomes first automaker to require suppliers to use ***Covisint***
- November: Daron Gifford named head of sales

Year 2002

- January: English promises profits by the fourth quarter
- February: The newly formed Global Customer Council (GCAC) replaces the original Covisint Customer Council. The GCAC meets quarterly and includes suppliers and OEMs from around the world.
- April: Major restructuring; about 50 people lose jobs
- June: Gifford resigns as head of sales
- June 28: English resigns; Harold Kutner becomes CEO; Bruce R. Swift named President and COO. 100 more layoffs
- December: Covisint has best sales quarter ever.

Year 2003

- January: ***Covisint*** membership surpasses 76,000.
- March: ***Covisint*** establishes Latin America sales and service office.
- April: ***Covisint*** moves to a new facility; Bruce Swift named Chairman.
- June: Bob Paul named President and CEO.
- October: discontinue electronic catalog and switch to data messaging service
- December: sold its auction component to Freemarkets

Year 2004

- March: Acquired by software company CompuWare (Nasdaq: CPWR) but continue the same business

Business Model Evolution

Covisint's initial suite of tools included products for auctions, catalogs, quote management and collaboration. At the core of its business was three products: ***Covisint*** Auctions, ***Covisint*** AQP (Advanced Quality Planner, currently marketed as Powerway.com) and ***Covisint*** Catalogue. ***Covisint*** Auctions were on-line bidding events that provide rapid, real time, Web-based negotiations in a secure environment. They fostered competition for the purpose of supporting the sourcing of parts and components. ***Covisint*** AQP was an Internet-enabled application to manage the Advanced Product Quality Planning (APQP) process. Developed by Powerway, it provided an environment for collaboration, reporting, routing and visibility of information important to develop the highest quality standards for components being designed for vehicle production. ***Covisint*** Catalogues were electronic purchasing environments for indirect and Maintenance, Repair and Operations (MRO) material. It allowed users to shop on-line and provides a system to automate approvals and to create necessary documentation such as purchase orders. It assisted decentralized organizations to better control spending across the enterprise.

Before 2003, about 70 percent of ***Covisint***'s revenue was from reverse auction. However, ***Covisint***'s biggest revenue generator didn't help its struggle for industry acceptance at all. Suppliers were nervous about what data ***Covisint*** might share with their customers. They had criticized the reverse auction through ***Covisint*** as a way for automakers to squeeze price cuts out of them. Suppliers also complained few auctions resulted in new business. Because of the consolidation trend in the supplier community, "the ones that remained would have a very significant relationship with OEM customers. There wouldn't even be a quoting process. The focus would be on cost reduction, and they would work close together with open books." according to Neil De Koker, president of the Original Equipment Suppliers Association in Troy, Mich. (Truett, 2004). Therefore, although as of 2002 more than 5000 suppliers used ***Covisint***, many participated in reverse auctions only because their customers demand it. Among the Tier 1 suppliers, only Delphi Corp. used ***Covisint***'s other services. The others believed that they could reject automakers' requests because of their bigger supply chain power than Tier 2 or Tier N suppliers.

Auctions and other procurement activities could not make ***Covisint*** profitable either. Initially, the automakers had no formal agreement with ***Covisint*** on auction fees. Each automaker paid whatever ***Covisint*** charged. Then each of the major US automakers independently negotiated big reductions in the fee per auction. "The impact on ***Covisint*** was a big hit," a former ***Covisint*** manager said (Automotive News, July 29, 2002). Later on, the Big 3 had agreed to pay an annual subscription fee for auctions, which only restrained ***Covisint***'s profitability through this revenue source. Funding from the Big 3 ended in March 2002. Due to the pressure of making profit, by the end of 2002, ***Covisint*** was forced to reduce its workforce by 35 percent and is relocating to smaller and cheaper office space. Kevin English, former CEO, was replaced in June, 2002 by long-time General Motors purchasing head Harold Kutner. Two other high-ranking officers were laid off in the same year. It seemed ***Covisint*** would not be able to sustain itself by being an auction house.

Realizing the problems it faced, ***Covisint*** examined all of its software applications to determine whether a third party could do it better — or whether the service was needed. "We built products that were supposed to be commonly used. So we had what I called the Field of Dreams: Build it and they will come. Well, we built it, and guess what? They didn't come. There was a fundamental error in the beginning." says Bruce Swift, prior CEO of ***Covisint*** (Automotive News, March 2003). The examination let ***Covisint*** realize that it had been distracted too far from its original mission—"the vehicle to connect the auto industry in a virtual environment to enable speed in decision making, waste elimination and cost reduction while supporting common business processes between manufacturers and their supply chain"(Automotive News, March 24, 2003). "We should be building ***Covisint*** to create a greater link to the industry, and then we all benefit from that." Swift added (Automotive News, March 2003)."

With a better understanding of its mission, ***Covisint*** dumped its electronic catalogs in October, 2003 and sold its auction business two months later to rival FreeMarkets, an auction site turned electronic supply-chain service provider. "The sale of our auction services to FreeMarkets was a logical and evolutionary step as we continued to focus our strategy on the Automotive Industry Operating System and delivering supplier management portals and data messaging services." "We began building our auction service business when the technology was in its infancy and it was now time to turn it over to someone that has sourcing technology and expertise as a core competency," Bob Paul, CEO of ***Covisint***, explained (Automotive News, 2002).

Currently, ***Covisint***'s portfolio includes three different products: ***Covisint*** Connect, ***Covisint*** Communicateis, and ***Covisint*** Collaborate. The fastest growth of its new business comes from ***Covisint*** Connect, a data messaging service that provides a single connection for a company's computers to exchange data with the computers of its partners. For years, the auto industry has relied on complex and antiquated EDI technologies for intercompany communications, which companies have been hesitant to abandon because of past investments. ***Covisint*** Connect provides an attractive XML alternative to traditional EDI transmission methods by reducing the complexity and cost of trading partner maintenance. It provides a single connection with sophisticated any-to-any translation capability that can handle both EDI and XML technologies in one environment. With expected savings ranging between 30% and 50%, the new XML-based system would mean cheaper and more efficient ways for automakers to communicate directly with vendors about parts availability, engineering concerns and other issues. By concentrating on its messaging service, ***Covisint*** would drive cost out of the supply chain by centralizing the sending and receiving of information. "This is still evolving, but their messaging tools and some of their system will become very effective. We have to communicate with each other." Neil De Koker says (Automotive News, Jan. 5, 2004).

In May of 2003, ***Covisint*** achieved a positive cash flow for the first time and "will reach profitability on an EBITDA (earnings before interest, taxes, depreciation and amortization) basis by the end of the second quarter (Automotive News, June 9, 2003)." "***Covisint*** is alive and very well," Bob Paul says, "***Covisint*** is as healthy as it's ever been. We couldn't have found a better steward" (Ward's Auto World, Mar, 2004).

Covisint continues its operation of the same business after its acquisition by Compuware in March 2004. By that time, ***Covisint*** had more than 135,000 users in more than 96 countries. "Combining Compuware's productivity solutions and skilled professionals with ***Covisint***'s messaging, portal and web services offerings will present a compelling package that can significantly extend cost-savings for OEMs and suppliers." according to Compuware Chairman and CEO Peter Karmanos, Jr. (Compuware Corporation website Press Release, Feb. 5, 2004). It is believed that "Compuware's financial stability, global presence and mature services and development organizations will only enhance the value ***Covisint*** is able to deliver to the automotive industry." (Compuware Corporation website Press Release, Feb. 5, 2004).

Success Assessment

Since May of 2003, ***Covisint*** has been financially self-sustainable. Although it started slowly, ***Covisint*** is now getting closer to its goal -- to promote industry integration and collaboration to lower cost and increase efficiencies for the entire industry. As of January 2002, there were 5,000 automotive companies registered on ***Covisint***, with 2,000 of those using the marketplace on a regular basis (Automotive News, Jan. 21, 2002). On January, 2003, ***Covisint*** membership surpassed 76,000. By the mid of 2004, over 29,000 registered customer organizations and 146,000 active users in 96 countries were connected with ***Covisint*** (***Covisint*** Website, 2004). In addition to increasing industry-wide participation base, ***Covisint***'s success also lied in its achievement on industry standardization. ***Covisint*** has been actively working on establish a common infrastructure for the automotive industry to connect, communicate and collaborate. ***Covisint***'s selection of ebXML transport standards and OAGIS content standards provided the predictability needed to achieve interoperability today and a strong foundation for the ongoing development necessary to meet new and changing business requirements. Visibility deep into multiple tiers of the supply chain, coupled with real-time communication will fundamentally change the way the industry structures and operates before products are brought to market. As a result, 39% OEMs and 46% Tier 1 suppliers indicated ***Covisint*** as the electronic marketplace they currently use, are requested to use, or will use (AIAG E-business Survey, 2002). It seems that ***Covisint*** is being welcomed by the entire industry as standards.

Keys to Success

Although ***Covisint*** initially was very optimistic about its potential growth, it didn't grow as smoothly and quickly as expected in its first few years. It has been in a struggle from day one due to its complexity, and the politics, speed, and cultural issues involved. Like a lost child, ***Covisint*** has been trying to find out where it belongs in the industry. It tried peddling software, but discovered that plenty of other companies do that. It tried reverse auctions — where vendors bid against one another online for the right to sell a specified part to an automaker, with the lowest bid winning — but found suppliers didn't like that either. It is only after refocusing on industry data messaging service in 2003 that ***Covisint*** started to became a success. What can people learn from ***Covisint***'s experience?

First of all, the traditional game still works. The concentrated buying power of the automakers has made it much easier for ***Covisint*** to build the first giant Internet exchange than it would be for other less concentrated industries. While new technology will certainly have an impact, e-business is still business. The critical factor for the success of e-marketplace is still relationships -- between OEMs, suppliers, and end-customers. Here, technology is irrelevant.

Second, industry integration and collaboration need cooperation among industry players. Simply applying supply chain power won't help the business. In its earlier years, ***Covisint*** has been too focused on pleasing the parent companies (the Big Three, Renault SA, Nissan Motor Co. Ltd. and PSA Peugeot Citroen), while not fostering enough trust among the rest of the 7,500 companies using its products. It needs to become more supplier-centric for its success.

Third, a consortium is an effective governance mechanism to support e-marketplace aim at industry integration and collaboration. However, the most critical assets that a consortium provides to this type of e-marketplace are not their funding but the industry connection and direction the consortium advised. Before the Big Three ended their funding, ***Covisint*** had the money but was not very successful. After their funding ended, ***Covisint*** was moving into success by following the vision the consortium carried from the automakers and their continuing connection.

Fourth, as the number of investors increase, consortiums will face the problem of trust, which will take time to build if there existed no industry cooperation norm previously. In aerospace, it's common for Boeing to take the lead on a project and get help from Raytheon or Lockheed Martin. But GM, Ford and Chrysler rarely made a car together. Politics had been a pain for ***Covisint*** from day one. The automakers had found that developing products and reaching agreements was difficult with multiple investors. It cost ***Covisint*** a few months to come up with a corporate name and more than a year to appoint a chief executive. Meanwhile, two technology providers on the board, Oracle and Commerce One, remained rivals. Commerce One had delivered the software for online auctions and parts catalogs. Oracle had organized ***Covisint***'s databases and provided online security. Each wanted to win the coveted contract to supply software for ***Covisint***'s supply-chain management. Later in 2003, ***Covisint*** sued Commerce One for breach of contract.

Fifth, stay focused. According to Bob Paul, CEO of ***Covisint***, "the founding vision of ***Covisint*** was pretty accurate. By having a single entity deploying process and technologies to improve the auto industry's supply chain, member companies could gain efficiencies for far less investment than they would on their own. The problem was that ***Covisint*** got a lot of funding. And with all that money, we tried to solve too many problems. We launched many partnerships and built infrastructure without considering exactly what the business problem was" (Underwood, Mar, 2003).

At last, the e-marketplaces should not expect that they create a product and customers will come. An always better strategy is to solve well-defined problems that customers need solved. In its first couple of years, ***Covisint*** didn't do that. The whole boom around the Internet and the dot.com hype intuitively made a lot of sense. But it was impossible to win a very quick return on investment -- because technology itself does not solve problems.

Case 2: SupplyOn (www.SupplyOn.com)

The Origin and Governance

SupplyOn owes its existence to Bosch's e-business pioneering in the late 1990s. Robert Bosch GmbH (www.bosch.de) was among the first suppliers to identify the potential benefits of web-based communications with its own suppliers. Beginning in 1998, Bosch introduced catalog buying; electronic data interchange; and e-purchasing in its own operations. At the same time, other major German suppliers, notably Continental AG (www.conti-online.com, INA Werk Schaeffler oHG (www.ina.de), and ZF Friedrichshafen AG (www.zf.com), were experimenting with their own e-business initiatives. In April 2000, Five Germany companies: Bosch, Continental AG, INA Werk Schaeffler oHG, ZF Friedrichshafen AG, and SAP AG (www.sap.de) came together and signed a Letter of Intent that endorses the creation of an electronic market place for

European automotive suppliers. On August 22, 2000, ***SupplyOn*** was formally founded in Stuttgart, Germany.

The initial intent of these founders was to create an electronic marketplace for European automotive suppliers to develop applications for purchasing, engineering and supply chain management. In February 2001 ***SupplyOn*** relocated to its new offices in Hallbergmoos near Munich and very soon, due to ***SupplyOn***s' fast growth, an enlargement of the headquarters was decided. After the successful completion of the comprehensive pilot phase, the first commercial transactions took place in June 2001. Less than one year later, ***SupplyOn*** was expending into the U.S. and opened up an office in Detroit, Michigan in February, 2002.

SupplyOn is another major industry consortium EM running in the U.S. automotive industry. Except the software provider SAP AG, the rest of ***SupplyOn*** founders are all leading Tier 1 suppliers that rank among the world's 20 largest. For example, Bosch's major business includes gasoline systems, diesel systems, chassis systems, energy, body systems, car multimedia, automotive electronic, etc. With approximately 143,000 employees, it generated sales of 23.6 billion euros in 2003. For over a century the name "Bosch" has been associated with forward-looking technology and trailblazing inventions that have made history. Another founder, the Continental Corporation has also done business in the automotive industry for over a century. It manufactures tires for many kinds of vehicles, hydraulic and electronic brake systems, electronic air suspension systems, power transmission systems and suspension as well as products for other industries (e.g. machine engineering & mining industry and furniture and print industry, etc.). In 2003, the Continental was a company with 68,829 employees and 11.5 billions euros in sales. The third founder, INA, belongs to Schaeffler Group, the leading supplier of the rolling bearings industry worldwide and a recognized partner of nearly all automobile manufacturers. The INA currently employs about 28,000 people worldwide and is involved in development, manufacturing and sales of auto parts. In 2003, INA achieved sales totaling 3.2 billion euros. At last, ZF is a leading worldwide automotive supplier for Driveline and Chassis Technology. It develops and produces transmissions, steering systems, axles, and chassis components as well as complete systems for passenger cars, commercial vehicles, and off-road machinery. ZF is also an important transmission specialist for special and rail vehicles, marine craft, and helicopters.

In November 2001 ***SupplyOn*** welcomed Siemens VDO as a new shareholder. This further expanded the number of equity shareholders with the addition of a major global automotive supplier. The next table displays the stakes of ***SupplyOn***'s shareholders:

Table 6-2 ***SupplyOn*** shareholders and their stakes

Owners	Stakes
Robert Bosch	30.4%
Continental	15.3%
INA-Holding Schaeffler	15.3%
Siemens VDO Automotive	15.3%
ZF Friedrichshafen	15.3%
SAP	8.4%

***data are from Kisiel (2004).

Milestones

Year 2000

- April, Five companies, Robert Bosch GmbH, Continental AG, INA Werk Schaeffler oHG, SAP AG and ZF Friedrichshafen AG, signed a letter of intent to form an e-marketplace for European automotive suppliers.
- August, ***SupplyOn*** is founded in Stuttgart.

Year 2001

- February, relocates to Hallbergmoos.
- June, first commercial transactions take place.
- July, presents integrated logistics capabilities
- November, welcomes Siemens VDO as a new shareholder. Harmonize exchange of Internet data with suppliers with Volkswagen.
- December, presents a complete solution for WebEDI

Year 2002

- February, start its first office in the US; Launch ***SupplyOn*** Sourcing --new Version 1.3.
- March, implements "CAD conversion" jointly with PROSTEP OpenDESC.
- May, expands its offer in the engineering sector: Change management simplifies collaboration.
- June, become a member of the European Association of Automotive Suppliers, CLEPA.
- July, introduces an expanded sourcing solution and a newly designed pricing structure.
- August, ZF Friedrichshafen AG links all suppliers electronically by ***SupplyOn***'s WebEDI.
- September, Easier cross-company management of company standards and specifications with the ***SupplyOn*** Standards Manager.
- October, More than 1,000 automotive industry suppliers now use the electronic marketplace in day-to-day operations.
- December, launches first seamless procurement process: direct downloading and further processing of VW offer requests.

Year 2003

- January, the ***SupplyOn*** Business Directory is rapidly advancing as a standard in the automotive supplier industry.
- May, simplifies and speeds-up purchasing processes: RfQ Adapter for SAP R/3 systems implemented with first customers; launches the new WebEDI release 2.3:Improved ease of use through new functionalities.
- August, presents comprehensive Document Management System.
- October, Management Board reorganization.

- November, presents the Performance Monitor: Efficient communication of quality and supplier rating data.

Year 2004

- January, meets the most stringent security standards: first automotive Internet platform worldwide to obtain BS 7799 certificate.
- March, presents functionally enhanced version of its procurement solution for the automotive industry
- April, presents new WebEDI function: electronic order confirmation saves time and averts media discontinuity.
- June, presents project folders: virtual project rooms reduce error rates and shorten development periods.
- July, offering new WebEDI process for prototype parts: the BMW Group is the first client.

Business Model Evolution

SupplyOn started its services primarily by supporting the sale and purchase of direct materials. It provided the opportunity to identify new business partners on line, to request and submit quotations electronically and to take part in an on-line bidding process. Logistics was another area ***SupplyOn*** worked on in its early days. By having ten logistics service providers joining its cooperation projects, ***SupplyOn*** continued to expand its Internet platform to automate and optimize logistics processes. Typical logistics services ***SupplyOn*** offered included delivery call notices, delivery and shipping data or stock movements etc. WebEDI, a solution presented first in December 2001, for instance, replaced costly and time-consuming processes, such as delivery instructions, by fax or letter and was really valuable where no classic EDI connection exists nor was planned. “With WebEDI, we were, above all, optimising the processes in the goods received department and in accounting," confirmed ZF's WebEDI project co-ordinator, Joachim Schmidt (ZF website Press Release, Aug.23 2002). The delivery and transport data, which ZF now received from their suppliers electronically, no longer had to be keyed in manually, but instead was entered automatically into in-house systems. The credit note eliminated invoicing for the supplier and the verification and processing of invoices for ZF: the supplier simply received a credit note with the arrival of the goods. (ZF website Press Release, Aug.23 2002)

Since its beginning, ***SupplyOn*** had made very clear that it would be positioned between Tier 1 and lower-tier suppliers. It's mission "really focused on the integration of the Tier 1 suppliers--the system suppliers -- and the chain behind that the Tier 2, 3s and so on," according to John Sobeck, vice president global eBusiness and total quality management for ZF Friedrichshafen AG, one of ***SupplyOn***'s founding members and equity holders (Wielgat, 2002). This value proposition was to create a marketplace where all buyers had access to information from their suppliers in one place instead of having to deal with these suppliers individually through emails and phone calls. At the end of the day, all Tier 1 suppliers would have the same requirements and processes so that process cost could be reduced and the speed of data transfer could be increased, (Hannon, 2004) "The goal was to build up an industry-wide procurement platform and to set common standards," said Wolfgang Colberg, senior vice president for corporate purchasing and logistics at Bosch (Whitbread, July. 30 2001).

However, unlike ***Covisint*** who took on too much in the beginning, ***SupplyOn*** had taken a progressive strategy to achieve its value proposition and stayed profitable all its way. By offering a portfolio of solutions step by step, ***SupplyOn*** had progressively developed into an extensive platform for the entire automotive industry that enabled significant efficiency improvements in inter-company business processes, including purchasing, sales, logistics, product development and quality management.

SupplyOn's first Collaborative Engineering functionality was not introduced till March 2002. This collaborative tool gave customers the ability to convert 2D- and 3D-CAD data into standard formats readable by off-the-shelf Data systems. In September 2002, ***SupplyOn*** advanced its Collaborative Engineering offerings and developed together with SAP an Internet-based Standards Manager. The ***SupplyOn*** Standards Manager simplified cross-company management, distribution of company standards, technical specifications, and resulted in huge cut-off on time-consuming procedures such as copying and manually sending standards. In the summer of 2003, ***SupplyOn*** further expanded the existing standards management to an innovative document management system, Document Manager, which allowed design drawings as well as other documents in addition to factory standards, to be provided beyond company limits. This way, suppliers could access current and relevant documents of the customers at any time. "We saw a big growth potential," said Markus Quicken, a member of the ***SupplyOn*** management board in charge of global sales and marketing. "We (would) cover the whole product life cycle in the automotive industry, starting from engineering to sourcing, logistics and quality management. There were no other vendors with this broad functionality of services available."(Kisiel, 2004)

Successful collaboration and cooperation enabled by ***SuppyOn*** had enhanced trust among suppliers in the marketplace. Standard development had EM members well ready for further integration. Starting from 2003, ***SupplyOn*** offered business directory that was supplemented by a solution for efficient warehouse disposition in the Supply Chain Management sector, Vendor Managed Inventory (VMI). VMI enabled a company to transfer the responsibility for the stock of a particular component to its suppliers. By using VMI, suppliers could optimize production planning – they were able to act instead of react. The essential planning tool that made this possible was a monitor available to both sides in the marketplace, allowing stocks, goods in transit and planned deliveries to be displayed in various colors. The purchasing company input projected demand for the coming weeks or months. The supplier could then use these provisional figures to plan its own production more accurately, while taking account of agreed minimum and maximum stocks to be held by the client. As a result, both partners were able to achieve significant improvements on cost control and quality. (***SupplyOn*** Press Release)

Quality management was the next step on ***SupplyOn***'s business model evolvement. At the end of 2003, ***SupplyOn*** offered Performance Monitor to enable automation and standardization of the complex and frequently unstructured processes of communicating supplier rating data such as information and data on schedule efficiency and quality of the supplied components. In this suite of tools, various options were made available to suppliers for condensing and detailing data to be analyzed - from corporate levels all the way down to components. As it was possible to display both current and historic data, users were able to map out the development trends. With this transparent, prompt and efficient communication of supplier ratings, problematic areas could be identified earlier and the corresponding measures could be quickly initiated. (***SupplyOn*** Press Release)

The latest development of ***SupplyOn*** business model was at the end of March 2004. ***SupplyOn*** not only presented a new, functionally expanded version of its Sourcing solution that supported a strong, process oriented utilization and considered international alignment, but also merged the three services "Sourcing", "Performance Monitor", and

"Document Manager" into one joint user management for the first time. The introduction of ***SupplyOn***'s new portal infrastructure meant considerable improvement of the process for the user, which would further enhance the connectivity of ***SupplyOn***. Owners of SuppyOn even planned to allow suppliers to use ***SupplyOn*** to connect directly to their internal systems next year. Siemens VDO, for instance, said "this level of connectivity was already in place at General Motors...We as a supplier liked that because you could get updated data and be prepared for meetings. We as a tier 1 supplier couldn't afford a system like theirs so we were doing it collaboratively through ***SupplyOn***'s connectivity." (Hannon, 2004)

In addition to its continuing improvement of its service portfolio, ***SupplyOn*** applied a tiered system for different suppliers. This system would allow smaller suppliers to pay less than bigger suppliers. For example, a supplier with annual sales below €5 million paid only €220 a month at 2002 but suppliers with more than €10 million in revenue paid €667 a month. The tiered system was an improvement on ***SupplyOn***'s initial flat-fee structure. According to CEO Michael Klemm, "(***SupplyOn***) pricing structure was OK for the large companies but with very small suppliers, we felt we were too expensive...This has proven to be very supportive for all our processes." (Whitbread, 2002)

Success Assessment

The success of ***SupplyOn*** can be clearly seen in October 2002. At that time, ***SupplyOn*** recorded its 1000th automotive supplier in the Business Directory, its 5,000th sourcing request for quotation and almost 50, 000 logistic transactions. By the beginning of 2004, ***SupplyOn*** had become an extensive platform for the entire automotive industry:

4,600 customers from 30 countries with more than 16,500 active users are using ***SupplyOn's*** platform. About 1,200 electronic inquiry processes were transacted and 110,000 Web EDI messages were sent per month (***SupplyOn*** website). In addition to be used daily in the operative business of numerous companies in order to efficiently transact processes with suppliers and customers, ***SupplyOn*** also delivered common standards, shared costs, and pooled know-how. ***SupplyOn*** had begun working with automakers and other industry EMs to standardize business-to-business protocols. ***SupplyOn*** and Volkswagen's private EM (VWGroupSupply.com), for instance, planed a series of initiatives to harmonize data formats so that the two platforms could swap information electronically (Automotive News, Dec.16 2002). Since the beginning of 2003, Members of CLEPA, the European automotive supplier industry association, could access partial sections of the ***SupplyOn*** Business Directory to obtain base information about potential business partners (***SupplyOn*** Press Release, January 13, 2003), which further confirmed the coming standard role of ***SupplyOn*** business directory in the automotive industry.

Keys to Success

The governance structure has played a critical role in ***SupplyOn's*** success. The e-marketplace was dominated by German suppliers. The founders, along with German software specialist SAP, were supported by another 12 associate members, all German suppliers. The group recently grew to 14 as Sachs Automotive and Karmann joined the exchange. Like all the other B2B e-marketplace start-up, ***SupplyOn***'s early development had been hampered by a few technical problems and the need for industry members to familiarize themselves with the system. In addition to huge capital financed from founders (just for the first three years of its life, the trading platform was founded by initial investment of DM100 milllion (€51 million) (Whitbread, 2001)), the consortium governance structure granted the essential industry connectivity needed for the critical mass and ensured the use of ***SupplyOn*** smoothly. For example, Siemens VDO Automotive, one of the ***SupplyOn*** owners, used the marketplace daily. In North America, Siemens VDO issued up to 95 % of its requests for quotes through ***SupplyOn***. "We made it very clear that suppliers had to be on ***SupplyOn*** to communicate with us," said Frank Homann, Siemens VDO's vice president of purchasing in North America. "We were sending out about 6,000 requests for quotes every year through the system. We have basically all suppliers we are dealing with on ***SupplyOn***" (Ralph, 2004). In many cases suppliers already had portal projects for e-business under evaluation or in place but decided to shift lower-tier suppliers to ***SupplyOn*** because of the exchange's better connectivity. It also helped suppliers avoid making large IT investments to keep up with advancing technology. For instance, Bosch saw the use of ***SupplyOn's*** tools as a more effective way of communicating with its suppliers, and a means of strengthening relationships. Therefore, Bosch had moved its entire annual RFQ round with sub-suppliers to the exchange; and following in ZF, Continental and INA, Boshch adopted ***SupplyOn***'s WebEDI for its suppliers in early 2002 rather than continuing its own pilot (Bosch website).

Due to its supplier ownership, ***SupplyOn*** had always stressed its roots as an exchange "for suppliers, by suppliers". Johann Löttner, member of the management board of Siemens VDO Automotive AG, couldn't agree with any more: "The supplier-specific functionality of ***SupplyOn*** was an outstanding complement to Siemens' e-business applications. Our interest in ***SupplyOn*** gave us the opportunity to actively influence the design of the infrastructure of the supplier platform in the future (***SupplyOn*** Website)". Unlike ***Covisint***, ***SupplyOn*** was not bundling volume or driving down prices. "We were really not driving the marketplace on our own," John Sobeck, vice president, global eBusiness and total quality management for ZF Friedrichshafen AG, explained. Instead ***SupplyOn*** focused on the quotation process and helped suppliers increase business. "For the Tier 2 or Tier 3 they had a better opportunity to present their capability," Sobeck said. This alone would reduce the angst that gripped suppliers (Wielgat, 2002).

The consortium governance was also the driver of ***SupplyOn***'s higher level business model which required more integration based on industry consent and standardization. Bernd Bremicker, head of Purchasing and Logistics at Siemens VDO Automotive, expressed ***SupplyOn*** stakeholders' interest on further integration and standardization: "We were looking forward to intensifying both process and data integration - and to a correspondingly more transparent supply chain. We also intended to develop the application jointly with ***SupplyOn*** in order to create a standardized solution for the supply industry". Given that the purchasing volume represented by ***SupplyOn*** with its partners and associate members now amounted to DM 70 billion and this corresponded to a share of 75 percent within the European automotive supply industry, ***SupplyOn*** had wide industry representation in its governance to facilitate industry standardization (***SupplyOn*** website).

SupplyOn's consortium ownership also helped it to take a different strategy to delivery its advanced business model. Rather than ram best-in-class software into the supply chain, ***SupplyOn*** first sought from suppliers their recommendations on what the industry needed to improve existing processes and software applications. Software was developed to augment what existed or to address an unmet need. For instance, a part of the Document Manager System, the Standards Manager that handled company standards, had already been in use for some months at ZF Friedrichshafen AG and Robert Bosch GmbH (***SupplyOn*** website). This way, the chance of successful implementation of advanced business model was enhanced. As Dr. Claus-Dieter Hoffmann, the Chairman of the Supervisory Board of ***SupplyOn*** AG commented: "The establishment of SupplyOn was a strategic decision for all of the shareholders. We were convinced that if it was to reduce process costs in the long-term, the automotive supply industry needed a standardized marketplace solution. The continued progress being made by ***SupplyOn*** in such a difficult environment had shown us that we were on the right track" (***SupplyOn*** website).

Case 3 RubberNetwork (www.RubberNetwork.com)

The origin and Governance

RubberNetwork is a global marketplace developed by six of the largest companies in the tire and rubber sector, including Continental AG, Cooper Tire & Rubber Company, The Goodyear Tire & Rubber Company, Groupe Michelin, Pirelli SpA, and Sumitomo Rubber Industries in April, 2000. Japan's Bridgestone Corporation became its seventh member company in May 2000 but decided to exit shortly after. In March, 2001, two other Japanese Companies, Toyo Tire & Rubber Co., Ltd. and the Yokohama Rubber Co., Ltd., joined in the consortium. One month later, a Korean company, Hankook Tire Co., Ltd. became the ninth member. By that time, total purchases for the tire and rubber sector were estimated at more than $50 billion a year on raw materials, equipment, machinery, goods, and services. Together ***RubberNetwork***'s members represented 60 percent of all tire sales and more than half of the global tire manufacturing capacity. With the exception of Bridgestone and Kumho, all of the top 11 tire makers in the world were members of the exchange (Shaw & Kisiel, 2001).

While the owners' stake in the consortium is not available to this research, ***RubberNetwork*** now exists as a legal entity based in Atlanta, Georgia. In order to serve the owner companies, ***RubberNetwork*** has set up offices in Tokyo, Singapore and Amsterdam, in addition to the Atlanta headquarters. The exchange is positioned far upstream of the value chain in the auto industry. It primarily serves the needs of tires from the auto industry but is open to all manufacturers and suppliers related to the tire & rubber industry. "We were already at work building the network marketplace and filling key staff positions. Additionally, we were actively seeking other companies in the tire and rubber industry to join ***RubberNetwork***," said Bob Webster, vice president of operations at ***RubberNetwork*** (RubberNetwork PR Newswire, February 8, 2001).

Milestones

Year 2000

- April, Six of the largest companies in the tire and rubber industry announced their intention to develop a global purchasing and procurement market place.
- May, Japan's Bridgestone Corp. has become its seventh member company.
- July, selected the IBM-i2-Ariba alliance as its technology provider
- Aug, Bridgestone Corp quit from ***RubberNetwork***.com

Year 2001

- February, received approval from the German Federal Cartel Office (Bundeskartellamt); Board of Managers has named Bob Webster as vice president of operations.
- March, Toyo Tire & Rubber Co., Ltd. (Japan) and the Yokohama Rubber Co., Ltd. (Japan) become the seventh and eighth members.
- April, announces a ninth Member, Hankook Tire Co., Ltd.;
- May, Names Ron Wells as Vice President of Business Development
- June, Names Philip J. Ringo Chief Executive Officer and a Member of the company's Board of Managers and John Garrison its new Chief Technology Officer.
- July, first European launch in Amsterdam
- September, first Asian launch in Tokyo
- December, ***RubberNetwork*** Board meets in Vancouver and adopts new ***RubberNetwork*** strategic plan. Members commit to a subscription fee for services.

Year 2002

- April, selected CoreHarbor to host their sourcing solution as part of its business services offering
- June, form a link from its own e-business hub to that of Elemica; Second ***RubberNetwork*** Board Meeting is held in Tokyo; Entered a partnership with Portum AG, Europe's leading provider of strategic sourcing solutions.

Year 2003

- ***RubberNetwork*** released upgraded version, Enterprise Sourcing 4.0.

Business Model Evolution

As the other e-marketplaces in auto industry, ***RubberNetwork*** initially focused on the purchasing services of the founding companies and other industry participants. Its online procurement solutions included: aggregated buys, electronic catalog purchases, forward and reverse auctions, eRFQs/eRFPs, contracts and spot buys, etc.. These services tended to provide price reductions in goods and services as well as automation of transactions. Among them, aggregation of orders was one unique feature

RubberNetwork provides. By acting together, members of ***RubberNetwork*** could work to save on transportation, for instance, space on a ship, and bring shipping costs down.

"Our vision...is to create a business environment that will not only drive significant value and efficiencies back to the founding companies, but will, through procurement, process and logistics optimization, drive value to their customers and suppliers, as well as to other participating companies," said a spokesman for ***RubberNetwork***.com (RubberNetwork PR Newswire, August 24, 2000). Under such a vision, ***RubberNetwork***'s strategy in its early days was to demonstrate its value to its nine members and then let that demonstration of value be the catalyst that leads to additional members and further development of industry supplier relationships. Since its nine members had more than half the capacity of tire industry, the winning of consortium members would win the industry.

RubberNetwork certainly had higher goals to achieve than procurement. The e-marketplace was evolving its business model quickly. In a partnership with Ariba, ***RubberNetwork*** developed its eProcurement solution, the ability to integrate with diverse purchasing and financial systems. Buying organizations were thus given the benefits of reduction in costs as well as greater reporting visibility, and lower inventory costs with minimal investment in custom technology. The company planned to offer a full range of facilities on its site focusing on management of the industry supply chain. Most radical of these was a so-called "forecasting collaboration" and "capacity collaboration" in which suppliers would be able to see their customers' demand on-line in real time; and large purchasers would be able to see aggregate capacity from all participating suppliers. Thus, each seller had accurate, up-to date information on the expected demand for his product, and could plan maintenance shut-downs and other activities, on the basis of reliable information about the likely demand. On the other side of the table, the purchasing managers in the tire companies would have a very clear idea of the total amount of material in production and in stock (Shaw, Dec. 2000).

RubberNetwork further utilized a 'hub and spoke' architecture to build itself as an industry integration hub that allowed Tire & Rubber trading partners to significantly reduce the integration costs associated with peer-to-peer integration. By doing so, ***RubberNetwork*** provided standardized processes and transactions to support the order to invoice and vendor managed inventory business functions. Direct browser-based ERP to ERP connectivity between ***RubberNetwork*** member companies and their major direct material trading partners were forming the industry sector's future standards. By allowing buyers and sellers to connect with the e-marketplace this way, ***RubberNetwork*** let them both make more accurate forecasts and highlight potential areas of difficulty as early as possible, which became a real logical industry collaboration. "This would provide a basis for change within the tire and rubber industry from classical business practices to advanced means of doing business," according to the ***RubberNetwork***.com spokesman (***RubberNetwork***.com Lexis-Nexis Newswire, August 24, 2000).

To become the central hub connecting the entire industry, ***RubberNetwork*** tried every effort to be open to all tire and rubber manufacturers and suppliers. Its agenda planned to bring value and new opportunities to all aspects of the supply chain of tire and rubber manufacturing and sales. "We were after the tire and rubber industry. Not just the tire industry." Bob Webster, VP of Operations, noted, "Our buy-side marketplace model encouraged sellers to derive value by actively utilizing all of the ***RubberNetwork*** service offerings."

The marketplace also welcomed the opportunity to work closely with other existing and future exchanges, especially those associated with the auto industry. On June, 2002, ***RubberNetwork*** took another strategic step to form a link from its own e-business hub to that of Elemica, another giant e-marketplace found by the rubber manufacturers. The hub-to-hub interoperability agreement facilitated cross-industry transactions between members of Elemica and ***RubberNetwork***. Through the ***RubberNetwork***-Elemica hub-to-hub connection, members of ***RubberNetwork*** would be able to place orders through that hub intended for one or more of their chemical suppliers in the Elemica trading network. "We wanted to move quickly to get the necessary transaction connections in place for our members and suppliers, and saw our partnership with Elemica as a means to do that more efficiently," said Phil Ringo, chairman and chief executive officer of ***RubberNetwork*** (Shaw, July-Aug., 2002).

While industry connection and innovation was set as its core value, ***RubberNetwork*** also balanced individual members' need very carefully. Service offerings by the e-marketplace were tailored to the needs of individual companies through a full range of specific consulting offerings. Each transaction was protected by appropriate firewalls to ensure the confidentiality of each company's individual business activities. Participating members were convinced that the initiative would achieve significant savings and efficiencies in the purchasing and procurement end of the value chain. These actions had helped ***RubberNetwork*** a lot on its success afterwards.

Success Assessment

RubberNetwork was one of the last hubs to be established in the rubber sector, but is now the only remaining active hub devoted to the global rubber manufacturing and marketing. "Since the beginning of 2002 RubberNetwork had facilitated sourcing transaction and events with an aggregate value in excess of $35 million with estimated total savings in excess of $5 million," according to Phil Ringo, president and CEO of the company. It was expected that those numbers to grow significantly during the remainder of 2002 and beyond (Shaw, May 2002). The only other serious contender, Elastomer Solutions was now fully integrated with the vast Elemica portal, a major portal serving the global chemicals business, and rubber was only a small part of what they do. The other independent companies were either not doing significant business, or defunct.

Keys to Success

The formation and success of RubberNetwork.com is another evidence of the critical need for value-added marketplaces in auto industry as many of them strive to cut costs and increase shareholder value. ***RubberNetwork*** enabled manufacturers to improve planning, communication, performance and visibility with their key direct material suppliers in a safe and secure collaborative environment. Real time, accurate information reduced costs incurred from excess inventory, stock outs, and late or expedited shipments. By fostering innovation and contribute to its future in ways never imagined, ***RubberNetwork*** became the premier e-marketplace in the tire and rubber sector of auto industry.

Once again, industry consortium played critical roles in the development of ***RubberNetwork***. Other e-marketplaces in the early days didn't get the same industry support, which in most parts determined their later dysfunctions. Compared to ***Covisint***, ***RubberNetwork*** seems to have even wider industry support in its consortium. While ***Covisint*** had only the Big Three and Nissan in its initial board, nine out of 11 top world tire companies were ***RubberNetwork*** members. Relative to ***Covisint*** excluding suppliers from the exchange governance, ***RubberNetwork*** was more open to the whole supply chain from day one.

On the strategy side, ***RubberNetwork*** didn't try to develop as many new technological innovations as ***Covisint*** did in its beginning. Instead, ***RubberNetwork*** outsourced all its technology solution development to IBM-i2-Ariba alliance. The alliance set up an open marketplace platform for RubberNetwork with services for procurement, supply chain management and sourcing. It connected individual member companies' enterprise software systems to ***RubberNetwork***.com, and link ***RubberNetwork***.com to other exchanges. Therefore, ***RubberNetwork*** could focus more on the business side in its early days, which helped to avoid unnecessary politics regarding technology and create faster speed onto the market.

At last, ***RubberNetwork*** had been emphasized on a fair and vigorous competition since its beginning and successfully conducted competition laws in the marketplace. ***RubberNetwork*** established legitimate business criteria to control access and participation in a non-discriminatory manner. It clearly promised not to sell, publish, or otherwise disseminate or provide access to such information to any person, including members, board managers, buyers, and sellers. Appropriate business policy and technology firewalls were in place to provide a secure, private environment designed for maximum confidentiality and adherence to applicable laws. In addition, the marketplace encouraged both auction and reverse auction and excluded itself from any possible monopoly power manipulation. The controled application of these fair competition guidelines convinced participating members and users that they, regardless of their roles in the industry supply chain, would benefit from significant savings and efficiencies provided by ***RubberNetwork*** initiatives, which had helped ***RubberNetwork*** a lot on its success afterwards.

6.1.3 Analysis of Cases within the Automotive Industry

Section 6.1.2 studied three industry level e-marketplace cases: ***Covisint, SupplyOn*** and ***RubberNetwork***. Although the three EMs started in different sectors of the automotive industry, the evolvement of the three EMs has been influenced by automotive industry structure in a very consistent pattern. The next table compares findings from the three cases:

Table 6-3 automotive industry EM cases comparison

EM cases	*Covisint*	*SupplyOn*	*RubberNetwork*
Founding Year	Feb. 2000	Aug. 2000	April, 2000
Industry Location	Auto manufacturers and Tier 1 & 2 suppliers	Tier 1 suppliers and Tier 2 suppliers	Rubber suppliers and tier manufacturers
Major Founders	The big 3 and Nissan	Top European Tier 1 suppliers	Top Tire suppliers
Governance Model (industry linkages)	Consortium	Consortium	Consortium
Mission Statement (Value Proposition)	"***Covisint*** establishes a common infrastructure for the automotive industry to Connect, Communicate and Collaborate(***Covisint*** Homepage)" "(being) the vehicle to connect the auto industry in a virtual environment to enable speed in decision making, waste elimination and cost reduction while supporting common business processes between manufacturers and their supply chain (Automotive News, March 31, 2003)"	"***SupplyOn***'s aim is to instantiate efficient and standardized working processes along the entire value supply chain (***SupplyOn*** homepage)" "Focuses on the integration of the Tier One suppliers--the system suppliers -- and the chain behind that The Tier 2.3s and so on. (Wielgat, 2002)"	"***RubberNetwork*** was formed to provide its Members best in class e-Sourcing, Managed Sourcing, and Procurement Services. These services are enabled by a global staff of sourcing and e-Business professionals and enhanced by web based technologies which focus on e-Procurement/Catalog access, Demand Collaboration, Supply Chain, and Supplier connectivity… (And) allow Members to streamline and extend these vital sourcing processes and to facilitate their business relationships with Suppliers." (***RubberNetwork*** homepage)
Early Services (value adding process)	Reverse Auction & other procurement	Sourcing & procurement (bi-way auction)	Procurement, bi-way auction, catalog content management
Early Revenue (value appropriation)	Auction & other transaction fee	Flat rate monthly fee	Subscription fee for services
Current Services (value adding Process)	• Web service (***Covisint*** collaborate) • Portal service (***Covisint*** Communicate), • Data Message Services (***Covisint*** Connect)	• Sourcing & Procurement, • Collaborative Engineering; • Vendor-managed inventory, • Quality/Performance management	• Procurement (aggregated buys, e-catalog purchases, bi-way auctions, eRFQs/eRFPs, contracts and spot buys) • Collaborative Supply Chain Management (integration hub & supplier relationship portal)
Current Revenue (value appropriation)	Service fee & & subscription fee	Tiered monthly fee (structure depending on supplier annual sales)	Subscription fee for services & membership fee
Business Model Evolvement	Transaction facilitator → Collaboration Enabler	Transaction facilitator→ Collaboration Enabler	Transaction facilitator→ Collaboration Enabler
EM bias	Buyer	Buyer	Buyer
EM Evaluation	Success	Success	Success

First, the three EMs all reached their success in the end by implementing higher level business model that enable industrial collaboration. The missions of the three EMs are similar--all propose connectivity and integration at the industry level as their core value. ***Covisint*** fulfilled this mission by providing data messaging services and a web services environment to enable application interoperability for the entire industry. ***SupplyOn*** offered an industry collaboration platform for CAD conversion, inter-company document management, product development, and quality control between Tier 1 and Tier 2 suppliers. ***RubberNetwork*** utilized a 'hub and spoke' architecture to integrate the Tire and Rubber sector and facilitate a collaborative buyer and seller relationship such as collaborative demand forecasting. Regardless of the difference on specific services, all the EMs were enabling and enhancing inter-organization network cooperation and collaboration in the automotive industry. The values from their business models were appropriated through their revenues from connectivity and collaboration services, typically, service fee, subscription fee, or membership fee.

Furthermore, all three EMs have taken industry consortium as ownership governance model. ***Covisint*** was founded by auto manufacturers including the Big Three and Nissan. ***SupplyOn*** was backed by the top European Tier 1 suppliers. ***RubberNetwork*** had the majority of tire and rubber producers behind it. Regardless of their different industry sectors, all the EM founders are major participants in their sectors and enjoy great market and supply chain power due to high consolidation in their industry sectors. The advantages of involving these big players in EM governance lies in many aspects: scale of transaction and market, shared cost, know-how, and common standard, etc.

Those founders bring in strong industry linkages that have given ***Covisint***, ***SupplyOn*** and ***RubberNetwork*** the ability to integrate industrial supply chain and lead inter-organization cooperation. At the same time, they enjoy the benefits by connecting to a single EM. The founders of ***Covisint***, for instance, are auto manufacturers who stay in outstanding positions in the U.S. automotive supply chain. They have developed a tight relationship with their own Tier 1 & 2 suppliers in the past. Key suppliers are able to contribute in the earlier design phases of new products or processes and help to cut component costs. The auto manufacturers themselves also have cooperated together on some shared technological and environmental concerns. With these auto manufacturers coming together into one EM, everyone benefits from network cooperation. Having them on its board, ***Covisint*** won industry acceptance in the first place and its job to integrate diversified information systems in automotive industry has become much easier than the others.

Second, all three EMs in this research were founded by the downstream party of the supply chain. Automakers in ***Covisint***, Tier 1 suppliers in ***SupplyOn*** and Tire suppliers in ***RubberNetwork*** are primarily buyers in the focal marketplace. They used the EMs to connect and integrate upstream suppliers. They are able to do so because they have the supply chain advantage towards their suppliers who are outnumbered and mostly smaller in terms of their size and product niche. Although the EMs provide tools for both sides, their information sharing and process standards applied appeared to be biased towards buyers. For instance, ***Covisint*** is a community of several portals leading to major automakers and Tier 1 suppliers. Using a common framework and interface, these portals will globally integrate online applications and provide suppliers with a single point of access and contact with major automakers. The connectivity services provided by ***Covisint*** are based on the specifications of the consortium members that are dominated by a few automakers' supply chain network. The majority of ***Covisint*** members joined the exchange via only invitation by a currently existing business partner including Ford, Daimler-Chrysler, GM, Delphi, Johnson Controls, and Lear Automotive etc. (***Covisint*** Website). Compared to ***Covisint***, ***SupplyOn*** offers more balanced buy-side and sell-side functionalities. This is probably due to the fact that ***SupplyOn*** is a joint venture of well-known Tier 1 auto parts suppliers who are buying from Tier 2 suppliers and selling to automakers. However, the automotive component-specific expertise of these Tier 1 suppliers flows into the development of ***SupplyOn***. The stockholders of ***SupplyOn*** have agreed on clear ground rules during electronic purchasing over the e-marketplace for automotive suppliers. They jointly define rules for the trusting and constructive cooperation of the marketplace participants and ensure that buying as well as selling companies will profit from using the ***SupplyOn*** (***SupplyOn*** website).

Third, by building a single industry level platform, ***Covisint***, ***SupplyOn*** and ***RubberNetwork*** all provide common standards for continuous dialogue between the sellers and the buyers in the industry. Their development of business & technology standards reduces redundant processes and infrastructure costs; advocates fair business relationships between the suppliers and buyers from the industry and trade sectors, and improve the collaboration across industrial inter-organizational network. ***Covisint***, for instance, is both following and developing the standards for industry integration options and protocols. Working with groups such as AIAG, Odette, JAMA, UN/CEFACT, and many others; ***Covisint*** has become a defacto leader in the ebXML arena. ***Covisint*** is also following emerging standards such as Web Services for additional integration options. With the standards it developed, ***Covisint*** advocates an automotive industry operating system, which could have many specialty applications plugged in and quickly implement new customers in a turn-key like manner (***Covisint*** Website). ***RubberNetwork***, at the same time, provides standardized processes and transactions to support the order to invoice and vendor managed inventory business functions. It facilitates direct ERP to ERP connectivity between RNC Member companies and their major direct material trading partners with the latest messaging technology. By converting transactions between RNC member Companies and the RNC standards, ***RubberNetwork*** enables consolidation of all customers regardless of their unique requirements or mandates (***RubberNetwork*** website).

Fourth, although the three EMs become very similar at the end, they have gone through different path during their evolutiont in the auto industry.

Covisint's consortium is composed of major automakers that are powerful and stay at one end of the auto manufacturing value chain. This background helped ***Covisint*** become the most visible EM in the automotive industry; but may also lead ***Covisint*** to be too eager to please its founders in its early days. However, ***Covisint*** ran unsuccessfully as a comprehensive reverse auction house. Suppliers were so worried about being over-exploited by auto manufacturers that they hesitated to jump in. Auto manufacturers didn't turn over all their business to the EM either. They kept relying on existing supply chain relationships and wanted to wait until the industry was ready. ***Covisint*** faced challenges from both sides when it acted as a transaction facilitator in the automotive industrial network. The difficulties ***Covisint*** had with its transaction facilitator business model not only indicated this lower level model didn't match the needs of automotive industry, it also suggested that the long supply chain distance from automakers to Tier N suppliers can cause lots of mistrust and lack of knowledge sharing.

Unlike ***Covisint***, which was founded by OEMs and thrust upon suppliers, ***SupplyOn*** was founded by suppliers regardless of their size. Due to its supplier roots, ***SupplyOn*** knows the need of suppliers better and thus serve them better. The tools offered by ***SupplyOn*** are more balanced for both buyers and sellers. Learning from ***Covisint***, ***SupplyOn*** did not take on too much in the beginning, but took it step by step and stayed profitable. In terms of connectivity, ***SupplyOn*** has less industry coverage than ***Covisint***. The marketplace is clearly positioned between Tier 1 and Tier 2 suppliers. Participants of ***SupplyOn*** will need to go through platforms such as ***Covisint*** or VW's ESL to transact business with OEM customers.

RubberNetwork, on the other hand, is a consortium consisting of the world's leading tire suppliers. Due to the industry sector where its founders come from, ***RubberNetwork*** is specifically oriented to the buy side of the tire and rubber industry. Because the global tire and rubber industry is dependant on growth and development in the auto manufacturing industry, tire companies typically have contracts with auto makers for the supply of tires as original equipment (OE), whereas for the replacement market, the impact of mass marketing for tires retailing is an important factor. Therefore, the collaborative engineering offered by ***Covisint*** and ***SupplyOn*** is not a focus for the tire and rubber sector. Instead, demand collaboration becomes a unique feature offered by ***RubberNetwork***. Since its coverage appears to be shorter than both ***Covisint*** and ***SupplyOn*** in the entire industry value chain, ***RubberNetwork*** has not tried to take care of the entire automotive supply chain and provide a comprehensive package as the others did. This strategy and its strong industry consortium background have helped ***RubberNetwork*** succeed as the only survivor in its sector.

In summary, ***Covisint***, ***SupplyOn,*** and ***RubberNetwork*** are all highly visible EMs at the industry level. The similarity on their strategies reflects the impact of the automotive industry structure. In the end, all three took the collaboration enabler business model and consortium governance. Their choices of higher level business models represent the expectation of the automotive industry on the network role of EMs. The three EMs' consortium governance model supports their higher level business model with the industry linkages that major industry players bring in. Since these big players are all active buyers in the automotive industry supply chain, their role in the marketplace let all three EMs biased towards buyers in the market. The auto industry norm structure affects all three EMs on their standards leadership in the entire industry or their sectors. These leaderships are indicators of their collaboration enabler roles in the network. The different evolvement paths of the three EMs have gone through can be traced back to the unique impact of their own industry sector. These impacts fine-tune the business model and governance model of the three EMs and further confirmed the importance of industry structure on the formation and development of EMs. Overall, the successes of these three EMs have provided consistent evidence for the role of automotive industry structure in the formation of EMs business and governance model in the industry.

6.2 Analysis of Semiconductor Industry EMs

6.2.1 Semiconductor Industry Profile:

Semiconductor and other electronic components refer to printed circuit boards, semiconductors, electron tubes and parts, capacitors, resistors, coils, transformers, connectors, and related devices. These components are the fundamental building blocks used to create an increasing variety of electronic products and systems. In 2003, U.S. semiconductor industry sales reach $80 billion, nearly 48% of worldwide sales (SIA STATS, 2004). As measured by economic contribution—that is, the industry's sales revenues minus the industry's expenditures on intermediate products and services provided by other industries—chipmakers created $41.6 billion of value for the U.S. economy in 1996. This figure was 20% higher than that of the automotive parts and accessories industry (Standard and Poor's, 2000). Overall, the U.S. semiconductor industry is characterized by proliferating product variety, capital, R&D intensity, short product life cycles, unpredictable demand, long and variable manufacturing cycle times, cross industry dependencies, increasing firm-level collaboration, globally distributed logistics, and considerable supply chain complexity.

6.2.1.1 Competitive Structure:

Concentration

The U.S. semiconductor industry is a broad industry sector including several subgroups by product type. The size of firms within this industry is quite varied. There are large manufacturers, such as Intel, Motorola, and Texas Instruments, with annual shipments of over $1 billion and interests in a wide range of commodity and niche markets. Middle-sized companies, with sales between $200 million and $1 billion, maintain advanced design and fabrication capability but are focused on a limited set of product markets and process technologies. Then there are hundreds of small companies with a very narrow product focus and shipments of less than $200 million. Many are design houses that contract out actual fabrication and assembly. Small firms account for only 10 percent of industry shipments but have been extremely important in extending technological advances to new products.

In 1997, the U.S. Census of Bureau identified some 5,652 companies under NACIS 33441, with the majority in NACIS 334412 (Bare printed circuit board mfg) and NACIS 334413 (semiconductor & related device mfg). Despite the different concentration ratios among 6 digits NACIS sub sectors, the semiconductor industry at the five digits NACIS code level is not a high concentrated industry. The Top 4 firms' concentration ratio of NACIS 33441 is only 34.3%. The next table displays the distribution of firms within different sectors of U.S. semiconductor industry.

Table 6-4 U.S. semiconductor industry firms distribution

NACIS	Industry Groups	Companies	Value of Shipments ($1000)	Percent of value of shipments accounted for by top companies	
				4 largest	8 largest
33441	Semiconductor & other electronic component mfg	5,652	139,083,873	34.3%	42.8%
334411	Electron tube mfg	147	3,789,948	57.3%	80.2%
334412	Bare printed circuit board mfg.	1,319	8,507,125	16.3%	24.7%
334413	semiconductor & other electronic component mfg	993	78,479,496	52.5%	64.0%
334414	Electronic capacitor mfg	112	2,560,984	61.1%	74.9%
334415	Electronic resistor mfg	90	1,240,008	42.6%	59.1%
334416	Electronic coil, transformer, & other inductor mfg	426	1,524,064	13.5%	21.8%
334417	Electronic connector mfg.	281	5,550,540	50.7%	62.0%
334418	Printed circuit assembly(electronic assembly) mfg	673	27,103,573	40.6%	53.0%
334419	Other electronic component mfg.	1,781	10,328,135	7.8%	13.6%

(Source: Census Bureau, 1997 Economic Census website, www.census.gov)

The U.S. semiconductor industry is truly international, with major competitors located in Japan, Korea, Taiwan and Europe. Leading U.S. semiconductor companies include Intel, Motorola, Texas Instruments, IBM, AMD, National Semiconductor, Micron Technology, and Lucent Technologies, each of which is active in semiconductor design, manufacturing, and marketing (See the following table). Geographically, the semiconductor industry is concentrated in the West, Southwest, and Northeast. The two dominant States, California (27.6 percent), and Texas (28.7 percent), had a combined share of 46 percent of semiconductor jobs in 1997. However, their share of industry value added was smaller, at 35.3 percent. Arizona, with only one third as many semiconductor workers as California, recorded an added value of $9.7 billion, only 12 percent less than California's total. Oregon and Washington also had shares of value added much greater than their share of employment (U.S. Census Bureau, 1997).

Table 6-5 Key Companies within Semiconductor Industry

Chip Makers(Ranked By Sales)	Chip Equipment Makers (Ranked By Sales)
1. Intel	1 Applied Materials
2. Samsung Electronics	2. Tokyo Electron
3. Renesas	3. ASML
4. Texas Instruments	4. Nikon
5. Toshiba	5. KLA-Tencor
6. STMicroelectronics	6. Canon
7. Infineon Technologies	7. Advantest
8. NEC	8. Dai Nippon Printing
9. Freescale Semiconductor	9. Novellus
10. Philips Semiconductors	10. Hitachi

Source: iSuppli Corporation and VLSI Research Inc website.

Product differentiation

The semiconductor industry is comprised of several broad product segments that, in turn, contain hundreds of different product sub-segments. Broadly speaking, the semiconductor industry is segmented into four main product categories: Analog semiconductors including amplifiers, voltage regulators, interface circuits, and data converters; digital semiconductors including microprocessors, memory chips (DRAMs and SRAMs and Flash memory), and logic devices (CPLDs & FPGAs and ASICs) (Standard & Poor's Industry Survey, 2000). These products cover a wide range, from those that are sold in the millions of units and are very price sensitive, to those whose annual sales number are in the hundreds, and for which price is secondary to performance. Many commodity-like semiconductors are similar from one manufacturer to another in terms of function, design, quality, and process technology. They are often purchased in large quantities, with razor thin profit margins. Other products, such as integrated circuit boards used for supercomputers, cost million dollars but their sale is contingent on the overall level of performance of the product. The process technologies, levels of integration, design specificity, functional technologies, and applications for different semiconductor products vary significantly. As differences in these characteristics have increased, the semiconductor market has become highly diversified as well as subject to constant and rapid change.

The U.S. semiconductor industry invests heavily in new equipment, facilities, research, and development to support growth. According to the Semiconductor Industry Association (SIA), the combined investment in capital expenditures and R&D by U.S. companies exceeded 30 percent of sales revenues in the period 1994-1996. In 2000, the U.S. semiconductor industry invested approximately $14 billion, or 17 percent of sales, in research and development. That's a higher percentage than any other American industry, and several times the industrial average (SIA Annual Report, 2004).

Barriers to Entry

Starting from the invention of solid-state transistor from Bell Laboratories in 1948, the U.S. semiconductor industry was still relatively young. However, it was one of the fastest growing industries in the U.S. economy between 1987 and 1996 according to Gale Research Group (Manufacturing USA, 2003). The semiconductor industry was distinguished from many other growth industries by its extreme emphasis on technology, an emphasis that served as a major entry barrier to potential competitors. Companies that concentrated on proprietary technology had to risk massive capital investments to drive the research and development machines to generate new semiconductor designs. Likewise, entities and nations that concentrated on the production or commodity side of the industry needed to invest heavily to develop sophisticated, and complex manufacturing operations. However, rapid innovation and technological change characterize the semiconductor industry and also lead to a high degree of mobility among the industry's scientists and engineers and unstable market leadership, which results in continual entry of new firms. During the late 1990s and early 2000s, the number of firms and employees in the semiconductor industry increased. For example, in 1992 the industry was comprised of 3087 firms. By 1997, however, the number of firms had risen to 5652 (Census Bureau, 2001). Compared to that of the U.S. automobile industry, the entry barrier of the semiconductor industry is relatively low. The entry of new firms is further enhanced during the industry structural shift that occurred in the 1990s. The emerging "horizontal" industry structure encourages specialization and results in the entry of two new groupings of firms: fabless companies concentrating on design, marketing and sales and foundries that only manufacture products. The period from 1995-1999 showed a marked increase in the number of fabless companies. Foundry sales have also showed a compounded annual growth rate (CAGR) of 30% from 1994 to 1997, compared to the 10% average CAGR for the whole semiconductor industry over the same period. This confirms that companies are embracing this "horizontal" trend.

6.2.1.2 Supply Chain Structure:

The semiconductor industry is made up of firms that design, manufacture, and sell semiconductors. Along the supply chain of semiconductor industry are wafer fabrication/foundries, fabless device manufacturers, assembly and test services houses, integrated device manufacturers, and original equipment manufacturers. In the last 20 years, the semiconductor industry has been transformed from a few highly vertical, fully integrated companies (i.e., Motorola, Texas Instruments and Intel) to a very large number of specialized companies and a disintegrated or modular value chain. Companies that make semiconductor devices vary widely in character and can be involved in different and multiple positions of the supply chain. Some (e.g., IBM, Delco, Digital Equipment) make devices entirely for their own internal purposes and can take positions along the entire supply chain. These are "captive" semiconductor-device manufacturers. Others (e.g., AT&T, Motorola, Texas Instruments, most Japanese firms, Siemens, Philips) make devices both for internal use and external sale. They are thus captive and merchant manufacturers at the same time and usually take fewer positions along the supply chain. The remainder (e.g., Intel, National) are almost totally merchant device manufacturers. This group also includes dozens of small companies that mostly are the product of the entrepreneurial approach and occupy single positions in the supply chain. Undoubtedly, focal companies' varying coverage of supply chain positions increased supply chain complexity of the semiconductor industry. The next figure displays overall structure of semiconductor industry.

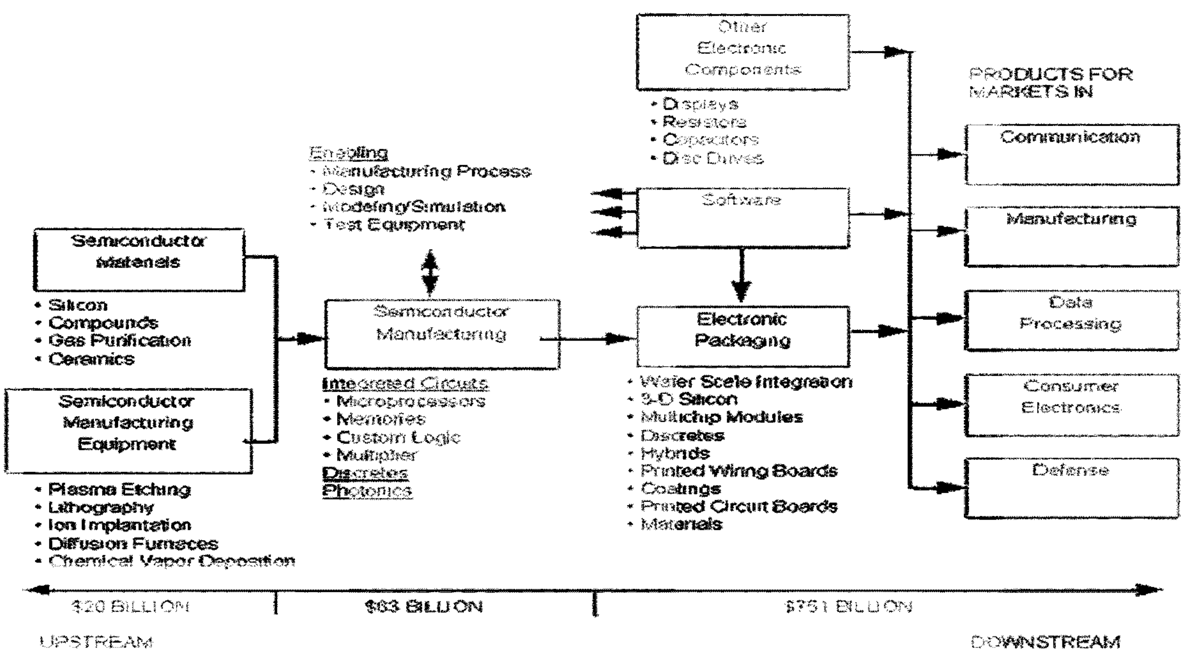

Fig. 6.2 Semiconductor Industry Supply Chain structure

(Source: WTEC Report, 1995)

Towards the downstream of semiconductor industry, semiconductors are integral to electronic products in many industries. The largest sources of direct demand are the computer, telecommunications, instrumentation, medical equipment, and transportation markets. Except a small proportion of purchase from individual end users, most purchase is made by original equipment manufacturers (OEM) or distributors (Manufactures USA, 2003). Many semiconductor industry's key product segments are dominated by a small number of large players. In microprocessors, for instance, Intel possesses a virtual monopoly. OEMs have little bargaining power. However, this is not to say that OEMs/distributors have no power. Actually, Intel has faced customer backlashes associated with not being able to keep up with demand. Blaming Intel for a $250 million loss due to a shortage of chips, PC-maker Gateway turned to the niche market player AMD for processing power. In addition, the semiconductor manufacturers and OEMs/distributors are strongly interconnected. Over time, the coupling of the two is increased and the know-how and value-added within an electronic product are more and more embedded inside the semiconductor components.

Towards the upstream of the semiconductor industry, semiconductor materials, gas, and chemical suppliers tended to be divisions of large chemical companies. Some specialty gas and chemical suppliers are small, providing specially purified and packaged products solely for semiconductor manufacturing purposes. Equipment manufacturers are mostly small companies. There are a few medium-sized ones, most of which are mini-conglomerates formed by acquisition of small companies (Brown, 1993). For the large semiconductor companies, those suppliers have little power. Texas Instruments, for instance, has hundreds of suppliers. This diffusion of risk over many companies allows the chip giant to keep the bargaining power of any one supplier to a minimum. However, with production getting hugely expensive, many smaller chip makers are becoming increasingly dependent on a handful of large foundries. The suppliers of cutting-edge equipment and production skills, merchant foundries enjoy considerable industry bargaining power. For example, the largest US-based foundry belongs to none other than IBM – which is also a top chip maker in its own right.

From semiconductor material and preparation to shipment of the finished and packaged goods, the manufacturing process for semiconductors undergoes literally hundreds of highly sophisticated batch production steps. While there are similarities in the production of different kinds of semiconductors, the specific techniques and production methods used to differ for each kind. However, overall, the manufacturing processes in the semiconductor industry, following the fabrication and assembly sequence, belong to the divergent approach, where the component parts are common to many different product models and can be combined into a large number of different models of end products. The assembly of semiconductor and other electronic components is performed at two stages (i.e., complex assembly processes for generic semi-products are executed at factory sites; and simple assembly processes for customized models are executed at distribution sites). Since the semiconductor manufacturers (sellers) and OEMs/distributors (buyers) depend on each other to finish the manufacturing process, they both have critical assets and thus share power in driving supply chain. At the same time, the evolution of semiconductor technology affects the device manufacturers and the materials and equipment companies alike. All must work together. The semiconductor industry is more likely to enjoy a balanced power structure across its value chain.

6.2.1.3 Norm Structure

Industry E-business standardization

The dynamics of the semiconductor industry show four structural trends: the disaggregation of vertically integrated businesses; the increasing focus on chip design; the polarization of the sizes of companies and the consumerization of market drivers. These structural trends have created never-ending pressure for semiconductor companies and service providers to improve process and test yield, cycle time, on-time delivery, new product time-to-market and profitability. Historically, proprietary EDI has been used in semiconductor industry to improve poor availability of manufacturing data from the supply chain. With 600+ semiconductor companies and 2000+ semiconductor manufacturing entities, this point-to-point approach is not a viable solution for the industry. Initially, the Semiconductor Manufacturing Data eXchange (SMDX) was proposed for adoption. The SMDX standard provides a standards-based solution for effective and timely system-to-system communication of manufacturing data between companies and factories throughout the semiconductor supply chain. SMDX uses standardized intermediary data elements and standard messages, in an approach similar to that used for EDI (N-Able Group, 2004). But, SMDX never took hold because no one wanted to pay for the licensing. A need to define a set of e-business standards and protocols for companies to trade information within the supply chain in a more efficient manner remained.

RosettaNet, a consortium of more than 400 firms from the semiconductor manufacturing, electronic components and information technology industry, then was formed in 1998 to address this issue. Unlike the ***Covisint*** venture in the automobile industry, ***RosettaNet*** is not an "electronic marketplace" for the sale of components by supplier firms to large assemblers or systems firms. Instead, ***RosettaNet*** has the arguably less ambitious goal of simply defining the "rules" for electronic commerce in this industrial sector, with no intention of creating a unified market that links all of its members. There are three portions of ***RosettaNet***: PIPs, Framework, and Dictionaries. PIPs are Partner Interface Processes that define the way in which companies do business. PIPs cover most of the business processes between trading partners and define three areas; when in the process communication is required, what will be "said" during the communication, and the rules for the conversation. ***RosettaNet*** is an interface between trading partners only. The framework is the underlying structure on which the PIPs operate. This framework defines both rules for packaging and transmitting ***RosettaNet*** messages as well as providing design guidelines for the PIPs. Dictionaries help define both business properties and technical product descriptions. The business properties are generated from the workshops that create the PIPs while the technical properties dictionary is maintained by input from the industry. Companies utilizing ***RosettaNet*** standards can decrease manufacturing costs, increase reliability and productivity, and access global markets. On an individual basis, participation helps to reduce design work, provides access to evolving technology and technical developments, and aides personal development.

However, ***RosettaNet*** has encountered a number of significant obstacles in its standard-setting work. For example, the creation of a uniform standard for identifying component parts has proven to be extremely contentious and difficult. Yet without some universal product code, duplication in purchasing systems and parts inventories will remain a serious obstacle to automating electronic transactions. Furthermore, ***RosettaNet*** standards may "commoditize" some portion of the value chain within these industries, and thereby facilitate entry by new firms and the accompanying loss of profits. For many participating firms, especially suppliers, the standardization activities of ***RosettaNet*** have considerable potential to reduce their firm-specific competitive advantage and the rents associated with maintaining idiosyncratic capabilities. The large number of firms and diverse industrial sectors that are linked through ***RosettaNet*** also complicates standardization activities. Implementing ***RosettaNet***'s standards also requires an extensive suite of e-Business software, and the consortium has thus far failed to create the sort of "bandwagon" that is typically needed to attract the efforts and investments of developers of such complementary software. Finally, smaller firms within ***RosettaNet*** have found it difficult to sustain their participation (Macher et al., 2002).

Like the automotive industry, the standardization of e-business in the semiconductor industry is backed by several industry associations. For example, two of the most prestigious industry associations: Semiconductor Industry Association (SIA) and Semiconductor Equipment and Material International (SEMI), continuing provides the framework and procedures for industry experts to meet, discuss, and develop essential standards and guidelines. Of them, the SIA is the leading voice for the U.S. semiconductor industry and has represented American-headquartered manufacturers since 1977. SIA member companies have produced approximately 85% of U.S.-based semiconductor product. In addition, several cross industry associations are also relevant. For instance, the Supply Chain Council (SCC) enables a "next generation" of supplychain management by testing and evaluating supply chain products. The Electronic Industry Data Exchange (EIDX) is working with the Standards and Business Models for the Electronics Industry. Both of these groups can provide more information on e-commerce and the supply chain for Electronics Industry. The Electronic Commerce Code Management Association (ECCMA) is a standards association solely devoted to providing code management, distribution and resolution services over the Internet.

Industry clock speed—the change rate of standardization

The semiconductor industry enjoys a fast clockspeed according to the latest empirical study (Mendelson & Pillai, 1999; Nadkarni, 2000). On average, the semiconductor industry has a one-two years product clock speed, a two-three years process technology clock speed, and three to ten years organization clock speed (Fine, 1998). The requirement for significant and continuous technological innovation is clearly a cause of this fast industry clockspeed. For example, the average product life cycle for DRAM dropped from five years in the 1970s to less than two years in 1989 and to three months in 1997 (Linden et al. 2001). The fast clockspeed within the semiconductor industry can be explained from market pressure on product and process technology innovation and structural features of the industry supply chain.

First, the semiconductor industry is a highly volatile and competitive industry. Technology leadership determines the future market share. Productivity relies on scale economies and dynamic increasing returns. There is always pressure on semiconductor manufacturers to come up with something better than what redefined the state of the art a few months, or a few minutes ago. That pressure extends to semiconductor equipment makers, foundries, design labs, distributors -- everyone responsible for bringing chips from the minds of engineers into cell phones and car airbag systems, the PCs or PDAs, and so on. The result is that semiconductor products experience an escalation in R&D spending and the industry steadily produces gee-whiz technology while riding an oh-mercy business roller coaster.

Second, successful design wins are critical for semiconductor companies, since they lead to the use of that company's device in prototyping, and thus potential volume production of an electronic product. Once a chip company's product becomes entrenched in an important customer's end product, it is often difficult for a rival firm to unseat it. With the ever increasing complexity of sales and design win process, success in the semiconductor industry depends on the manufacturer's ability to gain early visibility into end-customer projects to ensure the manufacturer's parts get designed into those projects. To obtain business and promote the use of their chips, semiconductor manufacturers approach prospective customers early in the design process of a product; they then work closely with their customers, to who they provide a range of services. As the whole industry is very close to the end user of its supply chain, the clockspeed becomes faster according to Fine (1998).

Finally, the industry supply chain is undergoing numerous and substantial change simultaneously. Increased outsourcing of manufacturing by both semiconductor manufacturers and their OEM customers has made the industry supply chain more disintegrated, or modular. For example, many chip makers, including big ones such as Broadcom and Xilinx, are completely "fabless" -- that is, they don't physically produce chips at all, focusing their efforts instead on design and marketing. These companies increasingly rely on foundries, dedicated contract manufacturers whose focus on the physical production of chips allows them to sustain the massive investments needed to keep up with the latest in manufacturing technology. The disintegration of the supply chain increases the flexibility of manufacturing and reduces the lead time. It is expected that future clockspeed of semiconductor industry can be faster.

6.2.2 How can an e-marketplace be successful in the industry?

Case 1: E2open (www.E2open.com)

The Origin and Governance

E2open.com was created on June 7, 2000 when eight semiconductor industry leaders -Hitachi, IBM, LG Electronics, Matsushita Electric (Panasonic), Nortel Networks, Seagate Technology, Solectron, and Toshiba signed a letter of intent for this independent, global B2B e-marketplace for the semiconductor industry. Technology partners Ariba and i2 as well as the prominent investors Crosspoint Venture Partners and Morgan Stanley Dean Witter became involved in the initiative. Ever since then, ***E2open*** attracted a number of heavy-hitters in the semiconductor industry including Lucent Technologies and Acer who both joined in before its formal debut on September 2000. The company is still headquartered in the Silicon Valley, California till today.

Running on technology provided by Ariba, IBM and i2, ***E2open*** started with $200 million in initial funding. Founders of ***E2open***.com contributed up to $125 million in equity capital to the e-marketplace. Half of the e-marketplace's equity was shared equally among the founders. Going forward, each founding partner's equity in ***E2open***.com is conditioned on the transaction volume generated by the founders for ***E2open***.com. Crosspoint Venture Partners and Morgan Stanley Dean Witter, as the financial partners in

E2open.com, committed $80 million to finance the startup operations of the e-marketplace and own 20 percent of the new business. A significant share of the equity in the e-marketplace has been reserved for management. Additional equity is available for issuance to future e-marketplace users and will be contingent upon their usage of the e-marketplace (Gold, June 2000).

"The foundation of the ***E2open***.com is expected to contribute to further development of the ... industry. The participating companies' value chains, consisting of a number of their customers and business partners, will be tied up with the worldwide value chain of ***E2open***. This will create business opportunities based on the new e-marketplace," said Hiromi Kuwahara, managing officer and deputy general manager, Information & Telecommunications System Group" (Business Wire, June 6, 2000). For buyers, benefits will include: reduced infrastructure costs, reduction of unauthorized buying, lower working capital requirements through lower inventory, and transportation and logistics efficiencies. For sellers, benefits will include: enhanced ability to service smaller customers, direct access to customers, lower customer acquisition costs, increased access to global trading partners, reduced transaction handling and processing costs.

Milestones

Year 2000

- June-- Hitachi, IBM, LG Electronics, Matsushita Electric (Panasonic), Nortel Networks, Seagate Technology, Solectron, and Toshiba, along with technology partners Ariba and i2 announced the creation of ***E2open***.com.
- July-- Lucent Technologies (NYSE: LU) signed a letter of intent to become a founding member.
- September--
    - Named Mark Holman as Chief Executive Officer, Paul Sterne as Chief

Financial Officer, and elected John Mumford as Chairman of the Board of Directors

  - Acer, the world's third largest producer of PCs, joined as its 10th founding partner.

- November--Named Nevan Elam vice president, corporate development; B.D. Goel, Vice president, Development and operations.

Year 2001

- January--
  - delivered new collaborative product design and commerce services to its broad member community, leveraging leading technology from MatrixOne and Ariba;
  - Appointed Tom Linton as vice president, general manager of South Asia and managing director of Singapore;
  - Opened Greater China office and appoint Ivy Hsu as vice president, general manager for Greater China.
- April--
  - auctioned Seagate Barracuda 180 disc drives;
  - Named Yong-Hwan 'John' Chung as vice president and general manager of its Korean operations, Toshikazu Yosumi as vice president and general manager of ***E2open***'s operations in Japan;
  - Omron, Ricoh, Sanyo and Sharp Joined ***E2open***.
- May-- Joined ***RosettaNet*** as a Solution Provider member.
- July--
  - Mitsubishi Electric Corporation join ***E2open***'s Strategic Member program;
  - Successfully implement enterprise-ready reliable platform with state-of-the-art integration technology from Vitria (Nasdaq: VITR)
  - Bhagwan "B.D." Goel was appointed chairman of RosettaNet's newly formed Solution Provider Board.
- August--
  - Launched Integration Server Program with three inaugural members: IBM,

Vitria and webMethods;

  - i2 licensed key ***E2open*** technology for use in an open, scalable common architecture to power newly available RosettaNet-enabled collaboration solutions.

- September--
  - Acer deployed ***E2open***'s collaboration suite to manage its global flow of supply chain information with trading partners and proactively identified and resolved demand and supply discrepancies;
  - Hitachi, Ltd. (NYSE:HIT), the largest electrical/electronics manufacturer in Japan, deploy ***E2open***'s Collaboration Manager suite among its regional cross-enterprise product development teams.
- October--
  - Introduced the ***E2open*** Process Directory (E2PD);
  - Selected IBM Global Services for Web hosting and network management services
- November—
  - Greg Clark was promoted to chief operating officer (COO)
  - Lorenzo Martinelli joined ***E2open*** as vice president of marketing and strategy

Year 2002

- January--
  - Enhanced Collaboration Manager service, a hosted solution based on MatrixOne (NASDAQ: MONE) technology
  - Seagate used ***E2open***'s Collaboration Manager Service to tie together disparate applications and facilitate communication across both internal and external team members.
- April--
  - Enhanced Sourcing Service, a hosted technology platform with associated applications
  - Hitachi deployed the Sourcing Service for contract negotiations of approximately five billion yen ($38 million U.S.) worth of materials, targeting 20 percent-plus reductions in its procurement costs.
- May--Expanded agreement with i2 Technologies, Inc. to offer web services-based deployment and integration of i2 solutions on ***E2open***'s network.
- June--Agreed with Hitachi, Ltd. (NYSE:HIT) to jointly offer Sourcing Service to members of the TWX-21 e-marketplace, the largest e-marketplace in Japan.
- July--Working with IBM to outline requirements for providing Web services-

based solutions for facilitating business partner integration in the electronics industry.

Year 2003

- March--Offered a new joint solution with IBM for high technology and electronics manufacturers that integrates multi-company business processes with customers, suppliers and partners
- June--
    - Delivered software on demand for Multi-Company Process Management to enable Wistron, a global electronic manufacturing services (EMS) provider, to deliver best-in-class supply chain collaboration and service levels to multiple customer sites
    - LG Electronics' PC and monitor division deployed ***E2open***'s software on demand for Multi-Company Process Management to enable multi-tier forecast collaboration with a key OEM customer;
    - Matsushita Electric (Panasonic) deployed ***E2open***'s software on demand for Multi-Company Process Management across three of its business units.
- July,--Announce general distribution of its software on demand for Multi-Company Process Management.
- October--Fiber optics vendor ExceLight Communications, a division of Sumitomo Electric Industries (SEI), is using ***E2open***'s B2B Integration Solution for ***RosettaNet***-based process integration with the supply chain hub of one of its largest customers.
- October--
    - Announced the general availability of B2B Integration Solution,
    - IBM extended its relationship with ***E2open*** by adopting ***E2open***'s Business-to-Business (B2B) Integration Solution to streamline IBM's B2B order-management processes.

Year 2004

- March--
    - Worked with IBM to improve the way IBM works with its top manufacturing suppliers;
    - Announced the general availability of the ***E2open*** Supply Chain Coordination Solution.
    - Announced new capabilities for B2B Integration Solution.
    - Introduced the ***E2open*** B2B Client, an easy to install and use B2B integration software.
    - Announced a strategic agreement with Singapore Computer Systems (SCS) to provide a cost-effective B2B application.

Business Model Evolution

In the year 2000, ***E2open*** started with a functional and comprehensive B2B site intending to provide a broad range of services including membership services (registration, supplier directory, digital certificates, access control), spot transactions (auctions, reverse auctions, requests for quotations/bids), MRO procurement services, supply-chain services (including fulfillment and logistics planning), design collaboration services, strategic sourcing services and asset recovery services for excess-and-surplus inventory, value-added services, including payment, credit, logistics and insurance services, etc.(E2open Business Wire, June 6, 2000).

E2open's first year was highlighted by significant progress on delivering technology infrastructure, adding key management expertise, announcing key customer deployments across all business lines, and entering into corporate partnerships. Two major initiatives during that time were product design collaboration and supply-chain collaboration. ***E2open*** defined collaboration tools, conducted pilot evaluations, and selected software vendors, developed architecture, and engaged in multiple pilots with founding members and their supply chain partners (E2open Press Release, 2000).

Through these initiatives, ***E2open's*** company executives and founding members quickly realized that procurement was not the main problem. Much of ***E2open***'s development is then focused on creating collaborative connectivity of trading partners. In late 2000, ***E2open*** partnered with New York-based ***PartMiner*** Inc., another e-marketplace in the industry. This partnership allowed ***E2open*** to use ***PartMiner***'s technology and world's largest catalog of electronic component for sourcing, auction or negotiated-pricing tools. ***E2open's*** strategy is to concentrate on the high trophies of supply chain management and design collaboration, but leave spot markets and excess inventory to existing player such as ***PartMiner*** (E2open Business Wire, October 9, 2000).

In May 2001, ***E2open*** first made its real mission clear in a press release of five key requirements for global collaboration including security management, any-to-any interoperability, enterprise-ready reliability, global, scalable networking, and support for industry standards (E2open PR Newswire, May 30, 2001). The collective vision of ***E2open*** and its founders at that point was that private collaboration based on a shared-services network is more pragmatic for the electronic/semiconductor industry (E2open PR Newswire, May 30, 2001). This understanding of inter-organization collaboration in the semiconductor industry was essential for ***E2open*** to successfully lower the cost of supply chain management and bring visibility to the entire product lifecycle. In such a private collaboration network, ***E2open*** intended to provide design, supply chain and commerce services in a close and secure environment so that network participants, i.e. suppliers, OEMs, contract manufacturers and distributors, could all benefit from the scale and power of many-to-many interactions at every step of the product lifecycle. The revenue EM planed to collect was from reasonable membership and subscription fees that depended on the level and type of usage by a participating company. Companies could choose to use any number of services, each of which would be priced to provide value over current processes. "Our objective is to create a collaboration network for connecting up our suppliers, but not be in the physical-parts moving business," said Holman, CEO of ***E2open***, "many of the suppliers that formed ***E2open*** found it was getting expensive to connect to their supply community through EDI. They wanted a more modern, Internet-based network that was scalable across the industry" (Spiegel, Feb, 2001).

In its press release, ***E2open*** outlined its future efforts toward a global private collaboration platform. These efforts involved in five aspects of key requirements for global semiconductor industry collaboration:

> "*Security management*: ***E2open*** is deploying best-of-breed security hardware and software. To enable secure collaboration over the Internet, including encryption, perimeter defense, cross-company single sign-on, roles-based authentication and authorization, as well as load balancing to ensure high reliability for many-to-many connections.
>
> *Any-to-any interoperability*: ***E2open*** is providing the data translation and transformation capabilities plus adapters and associated services to enable information integration, from browser-based integration to deep integration into enterprise applications, across the extended enterprise.
>
> *Enterprise-ready reliability*: ***E2open*** provides high performance, scalable and robust data centers and IT operations with redundancy, storage and backup, disaster recovery services, replication to remove single points of failure and a reliable software platform for high-volume throughput and network management and monitoring capabilities. In addition, ***E2open*** has developed quality R&D, change management, and ongoing vendor management processes.
>
> *Global, scalable networking*: ***E2open*** is partnering with service providers to offer secure and scalable networking with a variety of connectivity options around the world.
>
> *Support for electronics industry standards*: ***E2open*** is currently driving many-to-many business collaborations among electronics companies through the development and promotion of ***RosettaNet*** industry-standard Partner Interface Processes (PIPs(TM)), shared business processes and extensive B2B integration. In addition, ***E2open*** supports and participates in multiple standards and standards bodies, including ebXML, OAG, Accredited Standards Committee X12, UDDI and UN/CEFACT" (E2open PR Newswire, May 30, 2001).

Most of ***E2open***'s work in 2001 was on the above five aspects. In June, ***E2open*** met two of these requirements, security and standards. In July, ***E2open*** delivered enterprise-ready reliability with Vitria and obtained additional standards leadership with ***RosettaNet***. To enable any-to-any interoperability for partners, ***E2open*** launched Integration Server Program in August with three inaugural members: IBM, Vitria and Webmethods. In October, ***E2open*** introduced the ***E2open*** Process Directory (E2PD). The E2PD was a private, secure clearinghouse, and data storage repository for administration of IP addresses, security registration, authorization procedures, legal documentation and high-level business process information (e.g. ***RosettaNet*** Partner Interface Process (PIP) maps). By providing a centralized repository of process integration information, the E2PD solution let the industry migrate from individual, "point-to-point" connections to a more cost efficient, "many-to-many" network (E2open PR Newswire, October 16, 2001).

When 2002 began, ***E2open*** further enhanced its Product Collaboration service with new process management and workflow capabilities that significantly improved team collaboration. ***E2open's*** Product Collaboration also had concurrent multi-language support for effective communications throughout the global electronics industry (PR Newswire, January 29, 2002). Another enhancements offered by ***E2open*** in 2002 was its Sourcing Service, a hosted technology platform with associated applications that provided buyers with tools to standardize the negotiation process with suppliers in private, secure events. ***E2open***'s Sourcing Service "delivered an immediate benefit to buyers by making negotiation with qualified suppliers fast and easy to both launch and manage. Also, since ***E2open*** made it easy to include participants across multiple regions, it broadened the pool of potential trading partners for many companies" (E2open PR Newswire, April 9, 2002).

During 2001-2002, "(***E2open***) was in stealth mode for ... (these) two years, quietly developing technology and winning support from founding members" (Shah, July 2002). Since ***E2open*** had quite a few industry giants on its board, ***E2open***'s strategy was to win these founders first and then let the founders' experience demonstrate its value to the rest of semiconductor industry. Only after proving itself across seven early adopter customers, mostly founding members, and more than 1500 of their trading partners worldwide, did ***E2open*** make a further step on its private collaboration mission.

In June 2003, ***E2open*** offered Multi-Company Process Management for general distribution. "Now they have tangible evidence that the technology works and is being used by some of the more powerful companies in the ...industry. They are taking valuable lessons from the exchange model and making it available to the rest of the world" (Shah, July 2002).

Key characteristics of the Multi-Company Process Management include:

- Support for the full range of inter-company process areas, spanning multiple companies across multiple tiers of the supply chain.
- The enablement of a closed-loop, positive response process between companies, including exception management and resolution management;
- A flexible integrated architecture -- secure, based on open standards and globally available--enabling rapid deployment in response to dynamic changes
- Deployable by all trading partners, regardless of their size and technology capabilities, with a low entry cost and fast time-to-value for all companies involved in the end-to-end process (PR Newswire, June 17, 2003).

These characteristics let ***E2open***'s Multi-Company Process Management become the core of the company's B2B integration solution.

In early 2004, ***E2open*** further developed Multi-Company Process Management into Supply Chain Coordination Solution and 'Intelligent Supply Network' (E2open PR Newswire, March 1 and April 20, 2004). At this time, ***E2open***'s business included all of the software, hardware, hosting, operations, services and support needed to establish and manage customers; and channel partner's integration within their private collaborative network. For its integration solution, ***E2open*** offered a licensing model aligned with customers' budgetary requirement; which has annual production licenses starting at $4,500 per trading partner integration and includes unique features such as unlimited transaction volume and size regardless of protocols and formats used. This on demand licensing model minimizes the required up-front investment and allows for a capacity-based model that can scale up and down depending on business needs, which could change the economics of B2B integration (E2open PR Newswire, October 6, 2003).

Currently, the complete ***E2open*** software solution includes the following components: ***E2open*** Process Managers, ***E2open*** Collaboration Manager, ***E2open*** Information Manager, ***E2open*** Integration Platform, ***E2open*** B2B Client, ***E2open*** Application Manager, and On Demand Delivery. All these components serve one value proposition which is to help companies participating in complex, outsourced supply chains manage inter-company processes that extend between enterprises and across multiple partner tiers. Undoubtedly, ***E2open*** will continue to broaden the e-marketplace's reach and will expand services content.

Success Assessment

E2open is "a clear example of how the high-performance Internet can help companies better forecast and meet customer demand, improving collaboration between a buyer and its suppliers, communication and commerce. (E2open Business Wire, June 6, 2000)" The e-marketplace enables effective collaboration among OEMs, contract manufacturers, distributors, and suppliers, and supports the entire product lifecycle, including design, manufacturing, procurement, and asset recovery for computing, networking and consumer electronics products. In its single year of exisitence, the company claims that roughly 50 percent of Japan's electronics companies are hooked into

E2open. Other company statistics show ***E2open***'s industry representation: Nearly 20 percent of the global electronics industry is represented in ***E2open***; over 30 percent of the global industry direct material spending is represented; and over 50,000 suppliers and manufacturers are connected through ***E2open*** (Spiegel, August 6, 2001). Today, ***E2open*** has become the leading secure collaboration network for the semiconductor industry. Leading industry players such as Hitachi, IBM, LG Electronics, Matsushita Electric (Panasonic), Seagate, Solectron, and Wistron are all ***E2open***'s customers. One of the premier founders, IBM, for instance, decided in early 2004 to use ***E2open***'s Multi-Company Process Management application software to manage its supply and demand collaboration processes with these suppliers. The processes together represent more than 85 percent of IBM's annual manufacturing procurement expenditures (E2open Business Wire, March 1, 2004). It seems that "***E2open***.com will revolutionize the way business is done," according to Charles Childers, chief marketing officer, Nortel Networks (E2open Business Wire, June 6, 2000).

Keys to Success

An appropriate business model has been responsible for the success of ***E2open***. Since outsourcing has distributed the industry across the world, the need for communication and connection is robust within the semiconductor industry. As an early mover in the B2B space, the industry has tended to consolidate its business standards. Among all the efforts, ***RosettaNet*** is one big step. However, the semiconductor industry traditionally is fragmented and has balanced supply chain power along its value chain. Due to the fierce competition and fast technology change in the industry, building an industry-wise standard and connectivity is beyond any single e-marketplace's capability.

In response to such an industry environment, ***E2open*** has quickly found a strong, viable business model with focus on design collaboration and supply chain management after its inauguration, that is, to build a private collaborative network for its founders and then for the rest of the industry. Built from the ground up, the ***E2open*** solutions enable multi-tier supply chain process visibility, synchronization, rapid partner on-boarding, fast time to value, and flexible change management. These capabilities allow companies to better manage inventory liabilities, reduce operational costs, and respond to new revenue opportunities. It is very desirable to the semiconductor industry. To develop these capabilities, ***E2open*** participated in industry standards bodies such as ***RosettaNet*** instead of developing a new industry standard. With its collaborative network, ***E2open*** tended to let its customers securely share highly confidential design drawings, approved vendor lists, and planning information with the confidence that ***E2open*** will ensure that only the right individuals at the right companies will be given access to the right information at the right time. Its collaboration network is therefore an important platform for the development and implementation of ***RosettaNet*** standards.

The governance model ***E2open*** *built upon has been very supportive to its business model.* Beginning its life as a small internal initiative of IBM Corp, ***E2open*** eventually came to an industry consortium including Acer, Lucent Technologies, Panasonic, Solectron, Hitachi, LG Electronics, Nortel Networks, Seagate, Toshiba, and IBM. Combined with its financial backers, the consortium not only provided ***E2open*** with both credibility and funding in excess of $100 million and the promise of another $200 million if needed when ***E2open*** started (Spiegel, August 6, 2001). It also brought critical mass to ***E2open***, which account for approximately $700 billion of goods and services bought and sold in the worldwide electronics industry's supply chain (Gold, 2000). ***E2open*** continued to engage each of these founding members with product pilot programs and borrowed the founders' common vision to shape its business model (E2open PR Newswire, June 17, 2003).

The uniqueness of ***E2open***'s governance model lies in that its founders' equity stake is limited to less than 50%, and it offered other participants equity. Going forward, each founding partner's equity in ***E2open***.com is conditioned on the transaction volume generated by the founders for ***E2open***.com. This certainly made it more market-driven rather than focusing on aligning with the interests of its corporate founders. The involvement of two financial backers, Crosspoint Venture Partners and Morgan Stanley Dean Witter, both with deep experience with Internet-based initiatives, enhances the neutrality of ***E2open*** as well. As Mark Holman, CEO of ***E2open***, said "We have the support of industry and they're working with us so we can build up capabilities to serve the broad market," "but we're backed strongly by Crosspoint Venture Partners (and Morgan Stanley dean Witter) to become an independent company that serves the customer and market needs" (Spiegel, Feb.19, 2001).

Moreover, several B2B leaders have sat on ***E2open***'s founder board or became ***E2open***'s partners who ***E2open*** can rely on for technology enhancement. "In the design collaboration the primary underlying software tool is MatrixOne. Our supply chain partner is i2. For the open market area it's Ariba. Our catalog partners are ***PartMiner*** and i2. (Spiegel, Feb.19, 2001)" These founders and partners are highly respected technology leaders in today's semiconductor industry. By defining a technology platform at the outset, ***E2open***.com avoids the time-consuming and sometimes-contentious process of selecting vendors to build the exchange. In addition, the exchange starts with two already-functioning operations: IBM's Virtual Component Exchange and i2's TradeMatrix. They combined to handle $100 million transactions per month. This provides ***E2open*** with a six to 12 month lead in operating experience (Harbert, Sept. 2000).

Case 2: Converge (www.converge.com)

The Origin and Governance

Converge was founded in May 2000 by 15 high-tech manufacturers and distributors with an initial name of eHitex. Industry leaders investing in ***Converge*** included: Agilent Technologies, AMD, Canon, Compaq, Gateway, Hitachi, Hewlett-Packard, Maxtor, NEC, Samsung Electronics, Sanmina-SCI, Solectron, Sumitomo, Synnex, Tatung, and Western Digital (Converge Business Wire, Dec.19 2000). It was expected that ***Converge*** would create supply chain efficiencies using the Web with its industry backed consortium ownership structure.

One of the major milestones in the ownership evolution of ***Converge*** occurred at the end of 2000 when ***Converge*** (formerly named eHitex) acquired NECX, a subsidiary of VerticalNet, which operated a global trading exchange for electronic components and computer systems. The acquisition fundamentally affected the operation of eHitex. It not only changed the company's name to ***Converge*** but also moved its corporate headquarters from Cupertino, California, to Peabody, Massachusetts, home of NECX.com LLC.. Due to this deal, VerticalNet received $60 million in cash, a 19.9 percent equity interest in ***Converge***, and a seat on ***Converge***'s board of directors. While the details of each owner's stake in ***Converge*** remained unknown after the acquisition, it was said that VerticalNet took a major investor role in ***Converge***'s ownership (Quan, 2000).

However, the honeymoon of the two companies did not last long. In October, 2001, VerticalNet wrote off its $215 million equity investment in ***Converge*** and amended its software licensing agreement after ***Converge***'s strategic restructuring decision. Although VerticalNet remained ***Converge***'s largest shareholder, it seemed that VerticalNet was pulling itself out of ***Converge*** (Shah, Oct. 2001). Later, Pharos Capital Partners, a ***Converge*** shareholder, invested more than $7 million in ***Converge*** for restructuring and regrouping the EM. It was said that Pharos would become the majority shareholder in ***Converge***. The new ***Converge*** would transform into PCG Trading LLC after the restructuring plan (Sullivan, Apr. 2003).

Today, ***Converge*** is a leading global independent distributor of electronic components, computer products and networking equipment. It has operations in North America, Asia-Pacific, and Europe. Through its comprehensive services, e.g. production procurement, inventory management, finished goods remarketing, trading, financial settlement, global logistics, and quality assurance, ***Converge*** provides a high degree of market liquidity by aggregating supply and demand from thousands of component manufacturers, original equipment manufacturers, contract manufacturers, distributors, and resellers(***Converge*** Website).

Milestones

Year 2000

- May--Founded as eHITEX by a consortium of IT leaders that included Agilent Technologies, AMD, Canon, Compaq, Gateway, Hitachi, Hewlett-Packard, NEC, Quantum, Samsung Electronics, SCI Systems, Solectron, Sumimoto, Synnex/Mitac, Tatung and Western Digital.

- September--
  - Selected Commerce One to Power E-Marketplace Pilot;
  - Successfully processed ***RosettaNet*** transactions with Compaq Corp.
- November-- Bob Lewis named as Chief Executive Officer
- December--
  - Changed its name to ***Converge***, Inc and signed an agreement with VerticalNet Inc. to acquire NECX, a subsidiary of VerticalNet. NECX operated a global trading exchange for electronic components and computer systems.
  - Selected webMethods Inc. as the integration technology for its RosettaNet-enabled e-marketplace pilot program.

Year 2001

- January-- moved its corporate headquarters from Cupertino, Calif., to Peabody--Mass.
- February--George Devlin named as Chief Operating Officer
- March--Chose Celarix to provide high tech industry with end-to-end collaborative logistics solution
- April--Opened Taiwan office to offer end-to-end supply chain management services within the Greater China IT industry and to the worldwide market.
- May-- Appointed Sally Conkright as vice president of human resources
- June, Fujitsu's Procurement Division selected Converge's Trade Services for Open Market Procurement
- July--
  - Introduced ***Converge***Knowledge - A content and information service for the High-Tech industry
  - Selected Manugistics to Power ***Converge***Plan(SM), a Core Offering in ***Converge***'s Integrated Supply Chain Management Suite
  - Agreed to provide Bloomberg, the world's financial news leader, with daily commodity pricing and supply and demand forecasts for the electronics industry
- August--Launched global marketplace, ***Converge***Trade, offering a full range of

online trading methods

- October--Shut its supply chain service operations to focus on developing its online component exchange business.

Year 2002

- April--Partnered with HP's Customer Support group to handle parts replacement, sourcing, light assembly, returns testing, and fulfillment of desktop and mobile PC microprocessors
- June--
  - Selected for Surplus Inventory Management and Procurement Services at Palm, Inc
  - Obtained a $50 million senior credit facility with Foothill Capital Corporation, a wholly-owned subsidiary of Wells Fargo & Company (NYSE: WFC).
  - Announced that its subsidiary, TeleWrx Inc., has signed an agreement with a subsidiary of Covista Communications Inc. to provide TeleWrx with a broad range of telecommunications services for the domestic and international markets.
- December, expanded into China with an office in Shanghai to serve the country's Free Trade Zone and similar markets in Beijing and Shenzen.

Year 2003

- January--Introduced the Consignment Visibility System--a new, profit enhancing solution for seamlessly managing consigned inventory across multiple locations globally
- March, expanded global network of third party logistics providers in Mexico and the U.S. through an agreement with SPAN International, a leading provider of value added logistics and manufacturing services to the electronics industry worldwide

Year 2004

- June,--Expanded European presence into Germany and Hungary by opening office in Cologne, Germany and Budapest, Hungary

Business Model Evolution

Converge received its $100 million start-up funding in June 2000 from 15 leading high tech OEMs, contract manufacturers, component manufacturers and distributors to deliver supply-chain efficiencies using Internet technology. At that time, it was believed that the semiconductor industry depended on the collaboration of hundreds of companies to bring high-value products to the market. ***Converge***'s goal therefore was to "reduce its founders' $200 billion annual cost of direct materials by five to ten percent over the next three years, using a straightforward approach -- build liquid markets for direct goods and services, offer new collaboration tools to improve efficiency, and operate in a confidential, trusted environment"(Converge Business Wire, Dec. 19 2000).

Like ***E2open***, its major industry competitor, ***Converge*** initially was planning to offer collaboration services along its industry supply chain. However, ***Converge*** adopted a different strategy to deal with the complexity of collaboration in the semiconductor supply chain. While ***E2open*** agreed in October 2000 to use the buy-sell transaction technology from Part-Miner Inc. without taking an ownership position, ***Converge*** acquired NECX.com LLC from VerticalNet Inc. for $60 million in cash and gave out a 19.9% equity stake to VerticalNet at the end of 2000. This deal marked the first significant acquisition by a consortium-led exchange in the industry (The Online Reporter, 2000).

Based in Peabody, Mass., NECX was an open-market trading exchange for components, OEM, and contract manufacturers that had more than 28,500 trading partners worldwide. It had pricing and availability information on 10 billion items in 180 categories and 18 electronic commodity families. NECX had over 200 channel and product experts out of its 700 employee and facilities in Hong Kong, Ireland, the Netherlands, Singapore, Sweden, and the United States. One year before the acquisition, NECX had generated $634 million in trading (Spiegel, Feb. 2001).

What ***Converge*** gained from this acquisition was primarily the industry expertise from NECX and an established customer base, as well as a technology platform built from a direct-materials perspective. ***Converge*** expected this acquisition to help more efficiently deliver purchasing and supply-chain coordination capabilities to its founding members (Shah, Jan 1, 2001). At that stage, the management team at ***Converge*** hoped that the e-marketplace would be able to concentrate on developing its collaboration services now that the purchasing transaction platform was in place. The company expected to focus on tools that allow supply-chain partners to more easily access information about orders, quotes, product road maps, global logistics, forecasts, and other supply and demand data (Shah, Jan 1, 2001).

Based on such an understanding of their business model, in June 2001, half a year later after this acquisition was announced, ***Converge*** started to offer an integrated array of collaboration and trading services which included:

- ***Converge***Plan -- A collaborative service that coupled inventory visibility across multiple supply chain partners with real-time monitoring and alerts, enabled members to centrally aggregate, accurately interpret and intelligently respond to supply and demand signals.
- ***Converge***Trade -- A global marketplace offered a full range of trading services designed to help pre-qualified buyers and suppliers connect, negotiate competitive pricing and optimize delivery schedules.
- ***Converge***Order -- Enabled members to collaborate electronically on price, quantity and delivery date with all trading partners in their supply chain.
- ***Converge***Move --A collaborative logistics solution that enabled end-to-end, real-time logistics monitoring and alerting, workflow automation, and global trade compliance.
- ***Converge***Connect -- A professional service and technology offering that integrates supply chain partners' systems to enable the translation of data from multiple sources, platforms, and formats into cross-referenceable, functional, and actionable information.
- ***Converge***Knowledge -- A robust and unique source of real-time global trading, transaction data, and leading industry experts (Business Wire, June 25, 2001).

These services were available on a subscription basis and covered nearly all the fundamental elements of collaborative supply chain management, from planning, logistics and order management collaboration to trading, connectivity and information services. The targeted customers were top-tier OEMs. ***Converge*** planned to enhance new-product design and development between OEMs and contract manufacturers through online product collaboration, and also leverage assets from NECX to provide spot-market buying opportunities for its members at the same time. With all these efforts, ***Converge*** clearly positioned itself in the business of improving supply chain productivity and efficiency.

At that point in time, it looked like the collaborative model of ***Converge*** would run well. In June 2001, Agilent, a founding member of ***Converge*** Inc., become the first to use ***Converge***'s logistics platform -- ***Converge***Move solution. Several other founding members also became engaged in pilot projects (Shah, June 25, 2001). However, the adoption rate of the heavily promoted collaboration tool suits wasn't as fast as ***Converge*** had hoped for. Three months later, only Agilent Technologies Inc., Murray Hill, N.J., and SCI Systems Inc., Huntsville, Ala., had disclosed that they were using ***Converge***'s logistics offering. "We needed four to five OEMs to commit to large-scale implementation projects for their supply webs," according to Robert Lewis, CEO of ***Converge*** (Shah, Oct.8, 2001).

Although ***Converge*** had an advantage on liquidity because of its NECX acquisition, getting OEMs to participate in the collaboration service was not easy in the semiconductor industry. Both founding and non-founding members were concerned with their privacy and would have greater amount of control over many of the critical supply chain functions through a private exchange. They were also under pressure to focus on their core businesses and may not see a short-term return by investing in exchanges. A combination of poor market conditions and failures in management to address cultural differences between ***Converge*** and NECX following the merger made the problems even worse. All In all, ***Converge*** spent about $55 million developing its service programs and the exchange platform, but was never able to generate the critical mass required to support its various supply chain tools (Shah, Oct.8 2001).

In October 2001, ***Converge*** decided to shut its supply chain collaboration services and focus on developing its online component trading and auction businesses. This decision undoubtedly surprised many industry analysts who believed that without collaboration services ***Converge*** couldn't distinguish itself from dozens of other existing private exchanges in the semiconductor industry. Some executives at founding-member companies of ***Converge*** also felt that the decision to forgo supply chain services was a departure from ***Converge***'s launching agreements (Shah, Oct.8 2001).

However, ***Converge*** was more concerned with the revenue or the profit that it could make. According to John O'Connor, executive vice president of product strategy and development at ***Converge***, "Revenue is like oxygen, and we need oxygen to survive." "Today's e-business models have started off on the wrong foot...the key performance metrics...haven't been geared around revenue or profits, and that's fundamentally a flawed model,"(Shah, Jan. 8, 2001) ***Converge*** was driving toward quantifiable evaluations of its business operation. "The way we've structured ourselves requires all of our lines of business to have P&L accountability," O'Connor said. "We've set up an ROI cost structure and pricing model. The key question for us is if we aren't achieving a 3:1 return on everything we're doing, why are we doing it?"(Shah, Jan. 8, 2001)

In contrast to collaboration services, spot-market trading, and establishing a transaction base seem to be more like low-hanging fruit. Spot market trading, or open market trading, can help to resolve inventory imbalances caused by overstocking or shortages among the manufacturers and distributors. It is estimated that up to one-third of all procurement occurs outside of pre-arranged contracts (***Converge*** Website, www.converge.com). With the acquisition of NECX, ***Converge*** has a fully functional, liquid trading exchange already in place. More importantly, NECX with more than 23 years distributor experience in the industry, gave ***Converge*** experienced sales and support resources and a robust trading community that included a detailed database of over 20 years of transactional information with over 6,500 trading partners from more than 139 countries and unique access to and deep knowledge of direct supply and demand channels(***Converge*** Website, www.converge.com). Recognizing the competitive advantages that it had, ***Converge*** returned from a multifaceted exchange to its roots as an independent distributor.

Eight months later, the acceptance of ***Converge***'s new business model starts to show up among ***Converge***'s founding members and analysts. Hewlett-Packard Co., one of ***Converge*** founding member, agreed to enhance its tie with ***Converge*** by allowing ***Converge*** to assume responsibility for microprocessor inventory for the division's post-manufacturing requirements (Shah, Apr.15, 2002). Palm Inc, one of the major PDA manufacturers, designated ***Converge*** as its preferred surplus inventory management and open market procurement exchange (Shah, June 3, 2002). According to ***Converge***, net revenue had grown about 12% sequentially for the two quarters after its business model shift and was expected to hold on that pace for the next couple of quarters (Shah, Apr.15 2002).

Today, ***Converge*** centers its business around a combination of procurement brokering for spot and contracted buys as well as market intelligence. With the spot market services line, ***Converge*** offers an auto-match system and online Request for Quote (eRFQ) system for procurement cost savings and shortage fulfillments in the spot market. Its Global Visibility System (GVS) could quickly identify potential customers for excess inventory – or potential sources for components in short supply. This is done by mapping it to the extensive market supply and demand data captured on ***Converge***'s global trading floors. ***Converge*** has also used Site Market Analyst (SMA) and Asset Recovery Services group (ARS) to support customers' transactions, delivery, fulfillment, and logistics. SMA work within the customer's purchasing team at the customer's site and capitalize on both open and spot market opportunity purchasing. ARS group offered customized excess inventory management solutions. With the market intelligence services, ***Converge*** had the advantage of first hand access to trading transaction data of some of the leading OEMs trading in its sport market. ***Converge*** used different channels such as industry news, trading floor news, monthly online newsletter, detailed historical "spot" market pricing, etc. to provide insight and visibility into industry trends and spot market pricing data. These services together have now positioned ***Converge*** as a neutral e-marketplace that serves distributor role on the industry supply chain. Today, ***Converge***'s mission is to operate the world's most highly valued independent distribution network of electronic components, computer products and networking equipment.

Success Assessment

With the acquisition of NECX, ***Converge***'s spot trading platform allowed buyers and sellers to secure or liquidate inventory across 180 different families of electronic components using auctions, negotiations, or quotes. It is reported that within just one year from its inception in May 2000, ***Converge*** conducted more than 230 successful online auctions; moving more than $16.4 million in inventory. ***Converge***'s reverse auctions also secured suppliers $14.3 millions worth of market share (Converge Business Wire, Aug.13, 2001). After its business model shift, ***Converge*** continued to invest in key locations, e.g. Singapore and Shanghai, and systems and infrastructure, e.g. consignment visibility systems, to enable customers to fully leverage its spot market services on a global basis. Fujitsu, for instance, connected its own ProcureMART's order EDI system with ***Converge***'s automatic supply and demand matching system and its integrated online and offline global trading platform. Now Fujitsu will not only have 24-hour assess into supply status, including quantity, price and delivery terms of specific electronic products, but can also route orders through ***Converge***'s hub directly to ***Converge***'s network of more than 300 traders worldwide (Converge Business Wire, June 4, 2001). The adoption of ***Converge***'s platform is also enhanced by ***Converge***'s support for developing a sound selling strategy, and maximizing resale prices, and its strategic market intelligence overview of pricing or availability trends for informed sell vs. hold decisions. As one of ***Converge***'s customer, Palm, confirmed: "***Converge*** has helped…(Palm) manage surplus inventory levels by providing excellent market intelligence, a liquid marketplace, and solid global logistics….In addition to ***Converge***'s surplus inventory services, we also plan to use its reverse auction and shortage purchasing services to lower procurement costs and increase productivity globally"(Shah, June 3, 2002) .

Overall, ***Converge*** has differentiated itself as a spot market exchange leader by quickly developing a liquid spot market platform through the acquisition of NECX. ***Converge***'s industry leading combination of online and offline trading services, as well as its market intelligence of product liquidity and pricing trends gives the company a solid competitive advantage in the future.

Keys to Success

Even with industry backed consortium governance, supply chain collaboration can still be difficult for the semiconductor industry. **Converge** is one of the two major industry-backed consortiums in the semiconductor industry. It started operations at almost the same time as its primary competitor, ***E2open***. Starting with an ambitious goal—improving industry supply chain efficiency with collaboration, ***Converge*** aggressively acquired the NECX exchange platform and expertise. However, it decided to concentrate on its role as a spot market exchange rather than upgrade into a collaborative platform.

Industry structure is crucial to understanding the success of ***Converge***'s business model. The industry backed consortium has 15 leading OEMs, contract manufacturers, component manufacturers, and distributors as founding members. However, none of them has the monopolistic power to force collaboration with partners in the semiconductor supply chain. Due to the dynamic nature of the semiconductor industry, interoperability between systems and software is such a difficult task that even the application of ***RosettaNet*** standards won't ensure partners' confidence. Contradary to ***Converges***' initial thought that industry collaboration is only a matter of liquidity and technology, both of which could be bought through ***Converge***'s acquisition of NECX (Shah, Jan 1, 2001), it proved that the semiconductor industry is not ready for supply chain collaboration yet. Even ***Converge***'s founding members are hesitated to move away from their private exchange. ***Converge*** therefore cannot see a profit in near future with its expensive collaboration services.

Spot market trading on the other hand is easy to implement and can be a very successful business model for the semiconductor industry. Recognizing the difficulties of semiconductor supply chain collaboration, some e-marketplaces, like ***E2open*** and Need2Buy (now RiverOne), have veered away from the public exchange model to focus on helping customers set up private exchanges and other e-business programs. ***Converge*** and others, notably ***PartMiner***, have largely returned to their roots as independent distributors. In comparison to ***Converge***'s deliberate supply chain collaboration package, spot market procurement is more like a technology that ***Converge*** simply bought from the market. Spot or open market procurement services at ***Converge*** meet small order, shortage, and quick-turn manufacturing requirements of OEMs, contract manufacturers, and electronic manufacturing services. It helps to avoid the risk of exposure to price declines and obsolescence faced by conventional distributors. OEMs and contract manufacturers, e.g. Fujitsu, have found out that ***Converge*** can serve as secondary sourcing sites that complement their own network of customers and suppliers. With the connection to ***Converge***, they can better support its international procurement and manufacturing operations and improve efficiencies associated with buying parts that exceed contracted volumes. It is such a "new" perception of ***Converge*** that was eventually able to increase its adoption among members. Here, it seemed that the consortium governance of ***Converge*** didn't help very much with the success of a spot market exchange model.

Offline distribution support is important to the success of online transaction. It is worthwhile to note that the success of a spot market exchange model isn't based on just the platform. Other marketplaces probably can build up the same technology. However, ***Converge***'s competitive advantage came from NECX and its more than 23 years industry services. The acquisition of NECX brought ***Converge*** unique access to and deep knowledge of direct supply and demand channels and a comprehensive broker network including over 6,500 trading partners from more than 139 countries, a supply network with detailed, up-to-the-minute market and product liquidity data and the most experienced sales and support resources(***Converge*** Website). These competitive resources are further compiled with a ***Converge***-trained site market analyst and ARA group to strengthen ***Converge***'s distribution service. Without these offline supports, it was hardly believable that ***Converge*** will be as competitive as they are today.

Case 3: PartMiner (www.freetraderzone.com)

The Origin and Governance

PartMiner Inc. started with a New-York-based electronic components distributor, Microcom Technologies, in 1997. ***PartMiner*** was originally developed by Microcom as an internal part-sourcing web software tool. It was not until 1999 that ***PartMiner*** was repositioned as an electronic marketplace initiative. In early 1999, Microcom Technologies collected $20.2 million from venture capital financing to enhance its

PartMiner Web-enabled solution for sourcing and procurement. Investment in the first-round financing came from Boston Ventures Management Inc., Information Handling Services (IHS) Group Inc., and Sea Coast Capital (Trommer, April 1999). With the money in hand, Microcom transferred ***PartMiner*** to an independent electronic-commerce company designed to improve the way OEMs source and procure components on the Internet. Microcosm Technologies later joined with ***PartMiner*** as a unit of the bigger trading system and changed name to ***PartMiner Direct***.

Late in 1999, Cahners Business Information, a member of the Reed Elsevier plc group (NYSE: RUK and ENL) and the owner of Electronic News, took a 15 percent minority equity stake in ***PartMiner*** Inc. By this investment, Cahners wanted to add ***PartMiner***'s exclusive services of electronic components on its e-inSite (Business Wire, Sept. 27 1999). The following February, Agile Software also made an equity investment of $7 million dollars in ***PartMiner*** as part of its strategy alliance agreement with ***PartMiner***. Both investments helped ***PartMiner*** to build infrastructure, develop technology, and increase sales and marketing efforts. They accelerated ***PartMiner***'s adoption within the industry (Elliott, February 28, 2000).

By the year 2000, the company's investors included: Agile Software, Boston Ventures, Broadview Capital Partners, Cahners Business Information, Generation Capital Partners, Goldman Sachs, IHS Group, Impact Ventures Partners, Integral Capital Partners, Onex Corporation, Seacoast Capital, and Vulcan Securities Limited (Business Wire, Oct 30 2000). In total, ***PartMiner*** raised $115 million in private equity with $37.5 million in equity from Cahners Business Information, IHS Group, and Onex Corporation.

Unlike ***E2open*** and ***Converge***, there aren't major semiconductor suppliers, OEMs or contract manufacturers in ownership of ***PartMiner***. Most of ***PartMiner***'s investors are venture capitals and are not directly involved in the semiconductor products supply chain. One of the major OEMs, Dell Company, had made an investment in ***PartMiner*** in January 2001 in order to integrate a customized ***PartMiner*** exchange into Dell's existing supply-chain systems for shortages and surplus inventory management. However, ***PartMiner*** made it very clear that Dell's investment "represents a significant amount of capital relative to the capital we've raised in the past....But it doesn't represent a significant ownership (in ***PartMiner***)" (Lewis, January 15, 2001). In November 2001, ***PartMiner*** signed a similar equity deal with Celestica Inc., a $5.3 billion electronics supplier in North America. While the investment amount was not revealed, Celestica indicated that the company had no intentions of acquiring a big stake in ***PartMiner*** because the company "want(ed) ***PartMiner*** to remain independent, since it is a very advantageous attribute" (Demers, 11/20/2001).

Today, ***PartMiner*** Inc. provides marketplace technology and procurement services to the global electronic components industry. The company's online marketplace, the Electronic Commerce Free Trade Zone(TM), located at www.freetradezone.com, allows buyers and sellers to communicate and interact more effectively. Located at Melville, New York, ***PartMiner***, Inc. has offices in many countries of Asia, Europe, North America, and the Middle East. It is "a leading global supplier of electronic components. It is also a cutting-edge online provider of component information needed by engineers and purchasers in the electronics industry. In addition, ***PartMiner*** is a world-class provider of excess inventory management services and enterprise solutions" (***PartMiner*** Website).

Milestones

Year 1999

- May-- Independent distributor Microcom Technologies transformed its small part-sourcing Web software tool, ***PartMiner--*** into a separate electronic-commerce company.
- June-- Michael Manley named vice president and general counsel and Kim Hibler vice president of strategic alliances
- August, IBM Helped ***PartMiner*** establish an Electronic Commerce Free Trade Zone
- September-- Cahners Business Information, a member of Reed Elsevier plc group (NYSE: RUK and ENL), purchased a 15 percent equity stake in ***PartMiner***(tm) Inc.
- November--
    - MATCO Electronics Group, Inc., a $ 400 million contract manufacturer—deployed ***PartMiner***(R) Inc.'s online sourcing tool to research part availability and pricing free of charge
    - Roger Davies named as vice president of information systems
    - Acquired Accurate Components, a market maker for electronic components, to increase infrastructure and ISO Certification as well as fulfillment capabilities
- December-- Acquired IQXPERT company and its CAPSXpert, the world's largest electronic component database,

Year 2000

- January--
    - Opened an office in U.K and added three key executives from U.K. distributors to meet growing demands of international customer base
    - Former Arrow Electronics executive Guy Hayden named as vice president of operations.
- Feberary--
    - Gerhard Schulmeyer-- President and CEO of Siemens Corporation, joined ***PartMiner***'s Board of Directors
    - Formed strategic partnership with Agile Software Corporation (Nasdaq: AGIL), a leading provider of collaborative manufacturing commerce solutions

- Filed a registration statement for Initial Public Offering (IPO)

- March,
  - Outsourced the entire IT and networking function to Intira Corp, a Netsourcing service provider
  - Formed strategic partnership with TechOnLine, Inc., an informational site for electronics engineers.
- May--
  - Expanded into a new, 62,000 sq. foot facility in Melville, NY.
  - Partnered with Electronics Workbench, provider of the world's most widely used electronic design automation tools,
- June--The Electronic Commerce Free Trade Zone(TM) lunched
- July-- Named as Forbes.com's first annual "Best of the Web: B2B"
- August,
  - Opened office in Stuttgart, Germany--
  - Mort Topfer-- Director-- Counselor to the CEO and Former Vice Chairman of Dell, joined ***PartMiner***'s Board of Directors
- September-- Launched new service, the Excess Trade Zone(TM) (XTZ), for excess inventory management and asset recovery.
- October--
  - Joined ***E2open*** as a Technology Partner-- providing technology-- industry content and hard-to-find parts services
  - Raised $37.5 million in equity from Cahners Business Information, IHS Group and Onex Corporation
- November--
  - Awarded Ernst & Young LLP's CyberProcess Certification(sm) for security and confidentiality of the Free Trade Zone
  - Entered into a strategic alliance with Celestica Inc. (NYSE, TSE: CLS), a world leader in electronics manufacturing services (EMS),

Year 2001

- January--
  - Renamed IQxpert subsidiary as ***PartMiner*** CSD(TM) to emphasize the complementary fit of its enterprise-level collaborative sourcing and design management (CSD) solutions with ***PartMiner--*** Inc's Free Trade Zone online marketplace.
  - Announced a three-year agreement with Dell for content technology and hart-to-find parts services. Dell had equity investment in ***PartMiner***.
  - Hired Linda Goodspeed from General Electric Company (NYSE:GE) as new president in charge of the day-to-day operations reporting directly to director of board, Dan Nissanoff.

- Selected ExactOne's Dynamic Data Access (TM) for real-time search and data compilation.

- March--***PartMiner***'s Design Center content and market making services from its
  - Free Trade Zone are now available to users of Yahoo! Electronics Marketplace
- April--Integrated ***PartMiner***'s Design Center component information content
  - technology and market making services from its Free Trade Zone into Cahners e-inSITE.net, a network site for professionals in the Electronic Original Equipment Manufacturing (EOEM) industry.
- May-- Opened new sales office in Sweden
- June, Sold enterprise-level design, sourcing and procurement software business to Manugistics (NASDAQ: MANU)
- July-- Rated the most valuable component supplier site by Electronic Buyers' News (EBN)
- August,
  - Won court order victory against MTI halts unauthorized use of component information.
  - CEO Linda Goodspeed quit.
- October-- Chose both EasyLink Desktop Fax and Broadcast Messaging services to streamline various document delivery applications, gaining increased efficiency though lower costs and increased employee productivity.
- December--
  - Teamed up with IHS Engineering to offer, an electronics decision support tool
  - Introduced premium component research products based on ***PartMiner***(R) CAPS iContent(TM),
  - Named L. Christopher Meyer-- formerly of IHS Group, Inc., as chief executive officer
  - Created three president positions to oversee the ***PartMiner*** Information Services and ***PartMiner*** Direct domestic and international business units
  - Implemented a subscription fee model for access to some of its services and information, i.e. CAPS Advisor and CAPS Expert database

Year 2002

- February-- Started to charge subscription fee, released a new subscription service, CAPS Discover(TM), and enhanced existing CAPS Advisor(TM) and CAPS Expert(TM) component research products

- July-- Introduced CAPS Discover --a component information service offered on a subscription basis

Year 2003

- February-- Launched ***PartMiner*** CAPS(TM) DMS with Mentor Graphics Corporation (NASDAQ: MENT), a world leader in electronic hardware and software design solutions, to allow Mentor Graphics(R) customers to access ***PartMiner*** database and pin data directly from within the Mentor Graphics' DMS Xchange(TM) solution.
- August-- Announced a new partnership with Precience, Inc. to deliver component supplier management solutions that leveraged the ***PartMiner***(R) CAPS(TM) parametric reference database of 22 Million electrical and electro-mechanical components.
- November-- Added lifecycle forecasting and Bill of Materials management to ***PartMiner***'s CAPS (computer aided product search) component database.

Year 2004

- August-- Joined forces with Total Parts Plus, Inc. to offer an integrated solution that provides a real-time "Open Market" view of electronic component availability in the marketplace.
- October--
  - Announced unique electronic component data optimization solution with PartLogic company
  - Launched ***PartMiner*** Procure that provides engineers and procurement professionals with relevant market pricing and availability data.

Business Model Evolution

PartMiner was launched as an in-house data-mining solution of Microcom Technology, a New York-based distributing company starting from 1993. Microcom wanted to map the database content of dozens of distribution and broker Web sites with a software solution so that procurement professionals, design engineers, components brokers, and distributors could search electronic component information easily. In 1998, International Handling Services Group Inc. (IHS), a leading international publisher of information databases, began a joint marketing program with Microcom Technology to link ***PartMiner*** with its CAPSXpert-- the electronics industry's most comprehensive database of component information (PartMiner Business Wire, November 20, 1998). The following year, the two companies expanded their existing relationship and successfully collected $20.2 million to further develop the ***PartMiner*** technology. This amount was less than that of ***E2open*** ($125 million) and ***Converge*** ($100 million) in their first round financing and was primarily obtained from venture capital. However, for Dan Nissanoff, the president of Microcom, the money was enough to switch ***PartMiner*** into a separate e-commerce company specializing in electronics locating and procurement (PartMiner Business Wire, April 19, 1999).

Soon after its incorporation, ***PartMiner*** Inc. launched electronic commerce Free Trade Zones (FTZ) whose core was the HIS component database that held information on as many as 15 million parts (PartMiner Business Wire, June 1, 1999). Around that database, ***PartMiner*** created a system that would accept bills of materials and supplier list from an OEM. The system could also automatically generate and send requests for quotes, purchase orders and invoices to suppliers, as well as route the suppliers' responses back to the OEM (Merritt, 1999). Though not giving an equity investment, IBM contributed to both staff and R&D subsidies to the development of the FTZ (Baljko, August 9, 1999).

Initially, ***PartMiner*** offered its trading service to OEMs and distributors for free. ***PartMiner*** gained revenue only from hard-to-find parts orders—the former Microcom Technologies would sell parts when OEM's preferred suppliers couldn't (Trommer, May 1999). The major competitors of ***PartMiner***s were: Digital Market, QuestLink Technology, Fairmarket, NECX Direct, NetBuy, and Chipcenter etc. They generally offered myriad services such as online component data sheets, cross-referencing, parts-procurement, pricing, inventory availability, and the ability to make purchases online. In contrast to these competitors, ***PartMiner*** did not participate in transaction and moved existing business relationships online without displacing anyone's position in the value chain. This approach is very helpful for the FTZ to garner widespread industry acceptance. More than 200,000 buyers and engineers at electronic equipment manufacturers -- 15% of the buying market – were using software tools provided by ***PartMiner*** to support web commerce (PartMiner Business Wire, June.1 1999).

PartMiner's independent governance and unique business model was very appealing to the semiconductor industry. However, the competition was just as intense as it was everywhere else. The formation of *e*-marketplaces owned by a consortium of industry leaders and the industry's widespread adoption of private exchanges were two major challenges for non-participant owned EMs such as ***PartMiner***s. Both could dry up the liquidity on smaller and independent EMs. The strategy ***PartMiner*** took to address these challenges was partnership.

In October 2000, ***PartMiner*** joined ***E2open*** as a technology partner (Business Wire, Oct.9 2000). This move gave ***PartMiner*** instant access to ***E2open***'s 10 industry heavyweight owners like Acer, IBM, Hitachi, LG Electronics, Lucent Technologies, Panasonic, Nortel Networks, Seagate Technology, Solectron, and Toshiba. In return for access to a broader customer base, ***PartMiner*** sourced hard-to-find electronic parts for ***E2open*** and provided content and transaction-based technology to ***E2open. E2open*** could deploy ***PartMiner*** on a stand-alone basis or integrate it with other trading applications. The three year cooperative partnership benefited both players and, ultimately, the buyers and sellers in their respective marketplaces. ***E2open*** could be free to concentrate on the high trophies of supply chain management and develop more esoteric collaboration tools. ***PartMiner***, on the other hand, had itself included in a very substantial and ambitious effort by the semiconductor industry (Spiegel, Sept.3 2001).

As for the challenge of avoiding irrelevancy by private exchanges, ***PartMiner*** partnered with major private exchanges and offered its parts database as a component within a company's private exchange. Companies like Celestica, Dell Computer, and Yahoo are representative strategic partners of ***PartMiner***. For instance, Dell company integrated customized ***PartMiner*** exchange into ***Dell's*** existing supply-chain systems and let ***PartMiner*** provide procurement services for shortages or surplus inventory in a three year agreement in 2001 (PartMiner Business Wire, Jan.15 2001). These partnerships helped the private exchanges to fulfill spot-market requirements and adapt to market conditions in providing excess inventory management services. At the same time, they expanded the scope of ***PartMiner*** business and integrated ***PartMiner*** deeply into old-world brick-and-mortar companies.

Forming partnerships with various industry sponsored or private exchanges has shifted ***PartMiner's*** focus from a stand-alone marketplace to an aggressive collaborator. ***PartMiner***'s ambition is to "become the central solution to provide the clearinghouse for excess inventory in the industry and to be the market leader" (Lewis, Jan.15 2001). ***PartMiner***'s key services have been continuously expanding. By the year 2001, PareMiner offered three major business lines on its website:

1. Excess Trade Zone--Provides a platform to buy and sell excess inventory
2. Free Trade Zone including:
    - Marketplace -- Allows for buyer-controlled interactive RFQs and the creation of

online purchase orders from the RFQs

- Design Center -- A searchable database of 12 million component parts
- Shopping Agent -- Searches for price and availability
- ***PartMiner*** Direct -- Fulfils orders when a buyer's suppliers cannot
- Community -- Allows buyers to manage approved-vendor lists and select supplier members from the Free Trade Zone

3. ***PartMiner*** Collaborative Sourcing and Design including:

- eIQ -- An online bidding tool
- IQSource -- Provides strategic sourcing analysis capabilities to enterprises and exchanges
- IQDesign -- Creates a single view of technical and commercial parts data across multiple databases in the enterprise (Lewis, Jan.15 2001)

The existence of ***PartMiner*** Collaborative Sourcing and Design (CSD) in the EM 2001 services package marked ***PartMiner's*** strategic intention to go further from its procurement and information services to inter-organization collaboration services. The CSD business was acquired in December 1999 from IHS Group, Inc. (ParMiner Business Wire, Dec. 13 1999). ***PartMiner*** changed the name of its IQxpert subsidiary to ***PartMiner*** CSD later to emphasize the complementary fit of its enterprise-level CSD solutions with its FTZ online marketplace (PartMiner Business Wire, Jan.8 2001). ***PartMiner*** CSD did attract some customers for ***PartMiner***. For instance, two companies, Israel Aircraft Industries Ltd. (Israel's largest employer and a significant contributor to the world's aerospace and defense industries), and Smiths Industries (another major aerospace and defense manufacturer based in England), deployed ***PartMiner*** in Dec. 2000 (PartMiner Business Wire, Jan.8 2001). ***PartMiner*** wanted its CSD services to help maximize companies' internal processes to communicate with suppliers and improve their competitive edge by leveraging their own internal resources and processes.

However, ***PartMiner*** with its limited capability could not take care of a full spectrum of supply chain services. When market conditions got worse after the internet bubble burst, the expense and time required to develop design and sourcing software did not seem worth the effort. "We were looking at the market and our business model carefully and decided that CSD was not a strategic asset.....To fully exploit the business, we would have to turn ourselves into a software company. We don't want to be in the software sales business. We are in the business of facilitating procurement" said the president of ***PartMiner*** Nissanoff (Baljko, July. 2, 2001).

After withdrawing its registration with the Securities and Exchange Commission in February 2001 (Baljko, March.12 2001), ***PartMiner*** decided to sell its ***PartMiner*** CSD software business to Manugistics Group, Inc. (NASDAQ: MANU). The sale of the CSD business to Manugistics allowed ***PartMiner*** to focus on its primary capabilities as a global supplier of electronic components, an online provider of component information, and a provider of excess management services. ***PartMiner*** not only bolstered its balance sheet but also "gained by narrowing its focus to businesses in which we have the most expertise" (PartMiner Business wire, June 27 2001).

Due to tough economic environments, ***PartMiner*** was pressured into adjusting its business model to eliminate non-core businesses. It segmented data from ***PartMiner*** CAPs iContent database into free of charge and subscription-based. ***PartMiner*** CAPS Selector, which provided free access to part-number searches to all registered users of the ***PartMiner***, was still free. ***PartMiner*** CAPS Advisor, which provided end-of-life and part-change notices as well as obsolescence information, was available at $2,995 annually per user. ***PartMiner*** CAPS Expert, which provided advanced search capabilities such as parametric search, manufacturer information, pin label data, detail package drawings and more, was sold at $4,275 annually per user (PartMiner Business Wire, December 10, 2002). In June 2002, ***PartMiner*** released a new subscription service, CAPS Discover(TM), which primarily targeted the New Parts Introduction (NPI) process and cost $1500 annually. ***PartMiner*** CAPS Discover(TM) contained valuable functionality for engineers who needed to find and approve parts for both new designs and design changes that often occur due to component obsolescence issues (Business Wire, June 24, 2002).

While ***PartMiner*** initially was afraid of what the reaction would be in moving from a free model to a pay-for-service model, revenue at ***PartMiner***'s Information Services business unit had kept growing so far. ***PartMiner*** reported that it has already grossed about $1 million in subscriptions even before its formal announcement of this business model shift. While ***PartMiner***'s brokerage business still accounted for most of its sales, the subscription fees were projected to contribute around 20% revenue in 2002 (Spiegel, Sept.3 2001) and continue to grow in next few years. It seems that ***PartMiner*** had found out a correct business model for itself and gone along the right direction for the future.

Success Assessment

The success of ***PartMiner*** can be shown through its significant support from the industry. According to ***PartMiner***, more than 200,000 buyers and engineers at electronic equipment manufacturing companies--15% of the buying market--used sourcing and search software, as well as, a part information database provided by ***PartMiner*** to support web commerce (Purchasing, Sept. 1999). By 2000, one year after its debut, ***PartMiner*** had more than 110,000 registered users and over 5,000 customers in 52 countries (Business Wire, July 7 2000). Today, the Melville, New York based EM has expanded into Asia, Europe, North America, and the Middle East. The Company's Web site currently has over 225,000 registered users, and offers online access to the industry-leading CAPS(TM) Database, and user-friendly RFQ submission and management tools (Business Wire, Oct.25 2004). While critical mass has been the biggest challenge for most EMs during their initial stage, ***PartMiner*** was able to garner a sufficient number of users by its unique business model and non-participant governance model in the beginning. ***PartMiner***'s partnership strategy and subscription pricing of data further brought the EM continuing revenue and led to sustainable strategy advantage in the days following its debut. Due to the success of ***PartMiner***'s Free Trade Zone, Forbes.com named ***PartMiner*** to the "Best of the Web: B2B". In a separate study, AMR Research also ranked ***PartMiner*** among the top 20 independent trading exchanges across all industries (Business Wire, July 7 2000).

Keys to Success

An independent e-marketplace can be very successful in the semiconductor industry. Since its beginning, ***PartMiner*** has purposely kept its ownership by market non-participants. Venture capital funds are the major investment source ***PartMiner*** used for transferring its software tools into an e-commerce company and improving its market functionalities. The industry know-how necessary to develop and manage an appropriate business model is based on ***PartMiner***'s previous distributor experience but not from the investors. Although both Dell and Celestica had involvement in ***PartMiner*** later on, none of them were given significant stakes in ***PartMiner***'s ownership due to ***PartMiner***'s need to keep its neutrality. This neutral position in the industry supply chain guranteed users of ***PartMiner*** that they don't need to worry about being exploited by or lose their privacy to their trading partner, which is very helpful for ***PartMiner*** to achieve the critical mass. Three years after the internet bubble burst, ***PartMiner*** is still running well. The survival of ***PartMiner*** under tough economic conditions demonstrates that independent EM can be as competitive as industry-sponsored EMs.

A unique business model has been the key for the success of ***PartMiner***. *However, value chain coordination and collaboration business model are not supported by non-participant ownership governance.* A unique business model has been the key for the success of ***PartMiner***. The EM gave out its trading services free of charge at Free Trade Zone, but made money primarily by sourcing and procuring hard-to-find or excess parts for the trading partners on its market. This "click and mortar" model can make money because about 20 percent of the time, purchasers cann't find what they needed in the market, which would give ***PartMiner*** the opportunity to step in and perform an extensive search through its own relationships and collect a fee for that service (Galea & Brewer, 2000).

As an independent marketplace within the semiconductor industry, ***PartMiner*** understands that it doesn't have the business network or the industry power to push its business model. The EM tends to augment rather than replace traditional distribution channels. Its service is concentrating on shortage and excess electronic parts. Its market platform can be easily integrated into partners' supply chain as a component. This way, ***PartMiner*** appears more like a cooperator than a rival to other industry sponsored and private EMs. ***PartMiner*** therefore can build strategic partnerships with big players such as ***E2open*** and Dell.com and make use of the industry network that those giants have.

In the early days of ***PartMiner***, the EM had Collaborative Sourcing and Design (CSD) in its package as many others did. Fortunately, ***PartMiner*** knows its business very well due to its distributor origin. The sale of its CSD business to Manugistics turned ***PartMiner*** back to its real competence. ***PartMiner***'s acquisition of CAPSXpert database, the largest electronic component database, has also proved to be a very prudent strategic move for the success of its business model.

6.2.3 Analysis of Cases with the Semiconductor Industry

The three cases studied in section 6.2.2 are all reputable e-marketplaces in the semiconductor industry. ***E2open*** and ***Converge*** are both industry consortium-backed EM. ***PartMiner*** is one of the very successful independent EMs in the industry. Their stories display the patterns of EM evolution in the semiconductor industry and the underlying effects of industry structure. The next table compares and contrast research findings from the three cases:

Table 6-6 Semiconductor industry EM cases comparison

EM cases	E2open	Converge	PartMiner
Founding Year	June 2000	May, 2000	April, 1999
Industry Location	OEMs and suppliers	OEMs and Suppliers	Multiple sections
Major Founders	8 semiconductor industry leaders, 2 technology partner & 2 financial partner	15 high-tech OEMs, contract manufacturers, component manufacturers and distributors	3 venture capital investors.
Governance Model	Consortium	Consortium	Independent
Mission Statement (Value Proposition)	"*E2open* was founded with the mission to simplify & fundamentally change the economics of multi-company process management platform." (*E2open* Website)	"Converge's mission is to operate the world's most highly valued independent distribution network of electronic components, computer products & networking equipment." (Converge Website)	"PartMiner want to become the central solution to provide the clearinghouse for excess inventory in the industry and to be the market leader."(Lewis, Jan.15 2001)
Early Services (value adding process)	Comprehensive services: • Content management, • Spot transactions (two way auctions, RFQ) & MRO procurement services, • Supply-chain fulfillment and logistics planning • Design collaboration • Strategic sourcing & asset recovery for excess- and-surplus inventory • Value-added services etc.	Comprehensive services: • Trading and price negotiation • Logistics and workflow management • Supply chain integration & collaboration • Knowledge sharing	Comprehensive services: • Excess inventory Trading • Free Trade Zone including • Interactive RFQs & orders placement, design center, shopping Agent, order fulfillment, community • Collaborative Sourcing and Design including strategic sourcing analysis, cross company data standardization
Early Revenue (value appropriation)	Membership fee and varying subscription fee	Subscription fee	Service fee for hard-to-find components supply
Current Services (value adding Process)	Private Network collaboration: • Multi-company process management • Collaboration support (document management and event management) • Information services • Any-to-any and many-to-many partner integration • Application configuration management & automated testing	Spot and contract trading & market intelligence including: • Buyers and sellers auto match & online RFQ • Global visibility system • on-site market analyst for purchasing • Excess asset recovery • Market intelligence	Procurement & fulfillment: • Procurement Services (vender consolidation, global supplier connection, just in time delivery, etc.) • Information Services (customized and XML standardized data for design, supply chain value) • Excess Inventory Management Services e.g. logistics, market intelligence, inventory marketing
Current Revenue (value appropriation)	Varying membership fee & subscription fee, on demand license fee	Subscription fee	Service fee for hard-to-find components supply, subscription fee to data usage, membership fee
Business Model Evolvement	Comprehensive collaboration →Private network collaboration	Collaboration Enabler →Transaction facilitator	Collaboration Enabler →Transaction facilitator
EM bias	Neutral	Neutral	Neutral
EM Evaluation	Success	Success	Success

First, generally speaking, the three representative EMs of the semiconductor industry all chose to be a specialist in the industry value chain. ***E2open*** tended to simplify and fundamentally change the economics of multi-company process management platform. ***Converge*** "operated the world's most highly valued independent distribution network of electronic components, computer products & networking equipment" (***Converge*** Website). "***PartMiner*** wanted to become the central solution to provide the clearinghouse for excess inventory in the industry and to be the market leader."(Lewis, Jan.15 2001) These missions were similar in that they are related to the connectivity of inter-organization network in the semiconductor industry. However, each of them focused on one aspect of semiconductor value chain activity only. ***E2open*** was interested in multi-companies' process management. ***Converge*** emphasized on value added services related to semiconductor trading and distribution. ***PartMiner*** focused on excess inventory management and delivery. While ***Converge*** and ***PartMiner*** were helping transactions with different types of competences, only ***E2open*** was enabling inter-organization network collaboration. However, the network ***E2open*** served was very limited in its scope and mostly private in access. None of the three EMs grew into an industry-wide hub that had the potential to connect and integrate the entire electronic industry. In terms of value appropriation, all three EMs collected service fees and subscription fees for their specialized network roles.

Second, while these EMs are all successful in the industry, their governance models are different. ***E2open*** and ***Converge*** both are owned by industry consortium. Their owners' industry linkages helped them gain public visibility in the industry in the beginning. However, major industry player participation on their boards didn't lead to success of their initial ambition. In the beginning, ***E2open*** and ***Converge*** both wanted to grow into an industry hub. But the obstacles they have met on their way are so huge that both had to compromise. Both changed their goals soon after their incorporation. ***E2open*** outsourced its trading functions to ***PartMiner*** and limited its services only to building a private network for its primary sponsors. ***Converge*** went further by completely quitting its collaboration efforts and concentrating on trading and market intelligence only. Without well developed industry linkages to borrow from its board, ***PartMiner***, a non-participant EM, dropped its collaboration services too. However, ***PartMiner*** turned out to be a very successful transaction facilitator. It seems that as long as non-participant EMs developed appropriate expertise, they could compete with consortium giants in the semiconductor industry. The key is to develop appropriate expertise.

Second, all three EMs have appeared to be neutral towards both buyers and sellers on the market. For instance, ***E2open***'s private collaborative network was deployed by IBM to help manage its supply and demand collaboration with top manufacturing suppliers. ***E2open***'s platform allows for the participation of IBM's multi-tiers suppliers and supports server-to-server integration with any-to-any translation. The enhanced communication of planning and replenishment transactions gave IBM increased visibility into its suppliers' inventory and supply operations, allowing the company to quickly respond to changes in customer demand by aligning forecasts with procurement activities (Shah, March 3, 2004). At the same time, ***E2open*** got involved into the "sell-side" of IBM's operations. ***E2open***'s platform provided the B2B gateway through which all of IBM's enterprise customers can exchange order information with IBM. ***E2open*** will charge IBM a fixed fee depending on the number of customers it channels for IBM. The new e-business capabilities, enabled by ***E2open***'s B2B Integration Solution, is expected to save IBM 50% of the cost of deploying and operating sell-side B2B integration functionality, while also making it significantly easier for customers to do business with IBM. (McDougall, Oct.3, 2003). Serving a distributor role on the industry supply chain, Convege, another major semiconductor EM, has also taken care of the needs of both buyers and sellers. On the buy side, ***Converge*** helps companies to manage surplus inventory levels by providing excellent market intelligence, a liquid marketplace, and solid global logistics. Its reverse auction and shortage purchasing services can lower procurement costs and increase productivity for companies (Shah, June 3, 2002). On the sell side, ***Converge*** provides asset recovery services with customized excess inventory management solutions. ***Converge***'s global visibility system can quickly identify potential customers for seller's excess inventory and improves both the efficiency and success of selling transactions. Similarly, based on its roots in the independent distribution business, ***PartMiner*** has its Free Trade Zone being a vendor-neutral marketplace that provides purchasing tools, product information, and editorial content free of charge. Buyers and sellers both can access ***PartMiner***'s CAPS database through subscription. ***PartMiner*** itself sources components from over 6,000 suppliers around the globe and maintains relationships with manufacturers and distributors in a global community. It only gets into the transaction when there is a shortage.

Third, none of the three EMs has taken the role of an e-business standardization leader in the industry. Instead, they act as the followers and promoters of existing industry standards. For instance, both E2open and ***Converge*** followed the standards of ***RosettaNet***, a non-profit consortium that is primarily in the electronics industry and dedicated to the collaborative development and rapid deployment of open, Internet-based business standards. ***E2open*** supports many-to-many business collaborations among electronics companies through the development and promotion of the ***RosettaNet*** industry-standard Partner Interface Processes (PIPs(TM)), shared business processes and extensive B2B integration. In addition, ***E2open*** actively participates in multiple standards and standards bodies, including Electronics Supply Chain Association (ESCA), The National Electronics Manufacturing Initiative (NEMI), Organization for the Advancement of Structured Information Standards (OASIS), Universal Description Discovery, and Integration (UDDI), etc. ***Converge*** also aligned it with many proven industry standards to ensure maximum industry interoperability. It used ***RosettaNet*** process interface standards to enable companies to integrate more closely with partners and successfully processed ***RosettaNet*** transactions with companies such as Compaq. Due to its non-participant governance background, ***PartMiner*** has an even weaker role in the industry e-business standardization. ***PartMiner*** turned out to outsource its standards development to Agile Software Corporation (Nasdaq: AGIL) so that it could be seamlessly linked to Agile's Internet-based Agile Buyer(TM) and Agile Anywhere(TM) products through open Internet XML standards.

Fourth, the impact of industry characteristics on the development of the three EM can also be shown in the unique business that ***Converge*** and ***PartMiner*** are targeting. Unlike ***E2open*** who is focusing on private network building, both ***Converge*** and ***PartMiner*** chose excess component trading as their revenue sources. This choice is a deliberate consideration on the highly cyclical characteristic of the semiconductor industry. Semiconductor companies usually face constant booms and busts in demand for products. Demand typically tracks end-market demand for personal computers, cell phones, and other electronic equipment. When times are good, companies like Intel and Toshiba can't produce enough microchips quickly enough to meet demand. When times are tough, they can be downright brutal. It is therefore not surprising that one of the most costly problems facing the semiconductor industry is excess inventory. Much of the inventory glut in the semiconductor industry has been blamed on incorrect forecasts by manufacturers and supply chain inefficiencies. However, it usually take many months, or even years, after a major development project for companies to find out whether they have hit the jackpot – or blown it all. The intertwined but fragmented structure of the semiconductor industry only let the problem get worse. Different sectors peak and bottom out at different times. For instance, the low point for foundries frequently arrives much sooner than that of chip designers. This characteristic of semiconductor industry let the selling process for semiconductor component suppliers become increasingly complex in a multi-tier, multi-party, and global ecosystem. The successes of ***Converge*** and ***PartMiner*** are based on their acknowledgement of these industry characteristics. Both of them provide visibility of inventories, forecasts, orders, plans, and engineering changes and promote responsiveness to reduce time and detect demand.

6.3 Analysis of Cases across Industries

The automotive industry is a highly consolidated industry in the U.S. Automobile production is concentrated in the hands of a few automakers. The Big Three have been able to take the majority market share of auto parts supply demand in U.S. automobile manufacturing sector. Their economy of scale in the industry and market power provides huge capital and R&D resources for explorative innovation, as well as a formidable barrier for new entrants into the industry. Automakers compete with significant product differentiation in the market. However, they are less driven by conventional competition than by rent-seeking - that is, by surpluses which come from manipulation of market segments, national laws, and tacit agreements. There are many technological concerns shared by automakers. The rhetoric of competition and rivalry are used but the basic dynamic is cooperation.

In addition to automotive manufacturing, the other sectors of the automotive industry (except rubber manufacturing) are much less consolidated. Most Tier 1 & 2 suppliers are smaller size and supply narrow niche auto parts for assembly. The segregation of Auto dealers from the auto manufacturing due to historical and legal factors further strengthens the supply chain power of auto manufacturers. Most of them are able to develop convergent assembly supply chain networks (SCN) for their manufacturing needs, which allows automakers to manage and influence their suppliers' production and parts delivery.

The norm structure of the automotive industry is characterized by inconsistent standards and slower change rates. Traditionally, the U.S. automotive industry has used a large number of legacy computer systems, communication networks with multiple protocols, multiple links and inconsistent service and security levels. These networks often support only one application, such as Electronic Data Interchange (EDI) transactions, email or computer aided design (CAD) file exchange, which means two trading partners may have several different electronic links with associated duplication of costs and infrastructure. The inconsistent standards of the automotive industry also evolve in a relatively static industry circumstance. Slower clockspeed allows the industry to have stable power structure and great inertia on standards change. The updating of product and process technology in auto industry usually takes a few years. Organizational and standards changes are even longer. For the past 20 years, the industry has been in the using of ASC X12 EDI standards. Only in recent years has it started to move toward ebXML based e-business standards.

In compared to the automotive industry, the semiconductor industry is a less consolidated industry in the U.S. The large number and diverse size of companies in the industry result in relatively lower concentration. Broader product types and international competition bring into the industry higher product differentiation. Constant and rapid technology innovation strengthens the diversification trends of products and creates opportunities for the entry of new firms. Increasingly, firms in the semiconductor industry rely on partners for design and manufacturing activities. This trend combined with global sourcing, allows for integration of end-to-end processes across companies and collaboration across multiple tiers of the supply chain, desirable in the industry. However, at the same time, due to the tremendous differences and intensive competition among semiconductor firms, inter-organization collaboration in the industry is very difficult to achieve, if at all possible.

The supply chain structure of the semiconductor industry is very complex too. The assembly of semiconductor components itself usually takes separate stages to complete. Traditionally, a few highly vertical, fully integrated companies (i.e., Motorola, Texas Instruments and Intel) controlled the whole manufacturing process. However, in the last 20 years, the semiconductor industry has been transformed into a more disintegrated or modular value chain consisting of a very large number of specialized companies. Although there are still many firms in the industry taking multiple positions along the supply chain, the power structure in the industry has become very diversified. Both downstream OEMs and upstream semiconductor material and equipments suppliers are able to influence the manufacturing of semiconductor devices. Many semiconductor firms thus have taken a divergent late assembly supply chain network approach to match information sharing needs of the industry supply chains.

Standardization of technology and process started very early in the semiconductor industry. ***RosettaNet*** in 1998 is a representation of industry effort on standards collaboration. While making significant progress on forming consistent industry standards, ***RosettaNet*** encountered a large number of unsolvable obstacles. Most of these obstacles are because of the nature of semiconductor industry competitive structure. The fast clockspeed of the semiconductor industry only left the industry more volatile and competitive. On one hand, this means firms in the semiconductor industry don't have as much inertia as those in the other industry. On the other hand, the dynamic nature of industry norm structure challenges inter-organization cooperation in the semiconductor industry because of its lack of both technological and organizational proximity.

In contrast, the auto industry and the semiconductor industry went in very different directions on their competitive structure, supply chain structure, and norm structure. The next table summarizes the structural difference of the two industries.

Table 6-7 Comparison of automotive and semiconductor industry structures

Industry	Automobile	Electronic
Concentration	H	L
Product differentiation	L	H
Entry Barriers	H	L
Assembly approach- Product Differentiation	Convergent	Divergent-late differentiation
E-business Standards Status	Relative inconsistent	Relatively consistent
Industry Clock Speed	Slower	Faster

According to the theory framework proposed in chapter 3, the industry structure has impacts on the formation and development of an inter-organization network in the industry, and thus the evolvement of the e-marketplaces in each industry. The next discussion will analyze these effects of industry structure.

The effect of Industry Competitive Structure:

Proposition 1 (including P1a, P1b, and P1c): the more consolidated the industry, the more likely that higher-level EM business models will be applied for success.

The significant difference between three auto industry cases and three semiconductor industry cases supports proposition 1.

As reviewed in chapters 2 and 3, industrial cooperation in an inter-organization network can be improved with the increase of industry consolidation marked by high market concentration, lower product differentiation, and high entry barrier. The improved network cooperation allows tightly integration between network participants' information systems, which creates the necessity and feasibility for EMs to play more collaborative roles. The auto industry is one of the most consolidated industry in the U.S. The expectation of the auto industry for the EM network roles is to increase industry collaboration and integration. Correspondingly, all three highly visible EM cases evolved to become collaboration enabler eventually. Their value propositions are all connectivity and integration at industry level. Their network role as collaboration enablers fits with the integration needs of highly consolidated automotive industry well.

On the contrary, the semiconductor industry has lower concentration, high product differentiation, and lower entry barriers. In this industry, it is very difficult for any player to accumulate enough market and supply chain power to push industry wise inter-organization cooperation. Intensive competition and huge product difference only increase the troubles for the industry to develop trust and form the same data standards for their information systems integration. The network roles expected in the semiconductor industry for the EMs aren't higher than transaction facilitators. Therefore, all the representative EM cases in the semiconductor industry started with a higher level business model but failed their ambitions in the end. The change to a lower level business model these EMs experienced reflected the low consolidation nature of the semiconductor industry competitive structure.

Proposition 2 (including P2a, P2b, and P2c): the more consolidated an industry, the more likely that participant ownership will exisit for success.

The case findings also support proposition 2.

All three auto industry cases had consortium ownership backing their higher level business model. The consortium ownerships involved major industry participants. They built large scale of industrial linkages for the auto EMs and were critical to their visibility in the industry. High concentration, low production differentiation, and high entry barriers in the auto industry gives the small number of players tremendous market power.

It is the market power that is used to develop deeper industry linkages and lead the auto EMs to their success on their higher level business models.

On the other hand, in the semiconductor industry, market powers are much diversified due to the industry's lower concentration, higher production differentiation, and lower entry barriers. Without the power, participant ownership in semiconductor industry can not help EMs in the industry to engage other players in more collaborative network roles. In the case of ***E2open*** and ***Converge***, even with the participation of several powerful players, the two EMs still couldn't push industry-wise cooperation and collaboration. The owners of ***E2open*** and ***Converge*** themselves were reluctant to share information across their private network too. This resulted in ***E2open*** restricted its collaboration scope and ***Converge*** quitted completely from its collaboration services. The low consolidation feature of the semiconductor industry competitive structure opened the door of niche competition among EMs. The success of ***PartMiner*** demonstrates that at the lower level business model, competitions among EMs are more about their unique competence than their industry background.

The effect of Industry Supply Chain Structure:

Proposition 3: The more balanced an industry supply chain structure, the more likely that a neutral EM bias will exisit for success.

P3a: EMs in industries characterized by a divergent late assembly supply chain are more likely to exhibit neutral governance model for success.

P3b: EMs in industries characterized by a convergent assembly supply chain are more likely to exhibit buyer-driven governance models for success.

Proposition 3 (including P3a and P3b) is supported by the case study too.

Chapter 3 pointed out that industrial SCN structure pattern will influence inter-organization network cooperation in the industry. In a convergent assembly SCN structure, buyers have more supply chain power than their suppliers because resources and information are converged together towards the assembly point of the network. Buyers therefore more likely lead the formation and development of EMs. The auto manufacturing SCN is a typical convergent assembly SCN. Along the auto supply chain, the number of automotive manufacturers is less than Tier 1 suppliers, and that of Tier 1 suppliers is much less than Tier 2 suppliers. As their number increases, their supply chain power decrease. The three representative EM cases from the automotive industry are all buyer biased. Their bias orientations reflect the supply chain structure needs of the auto industry.

In contrast, due to the separate manufacturing and assembly of semiconductor products, many firms in the semiconductor industry have applied divergent late assembly supply chain network approach to manage their component supply. This type of SCN pattern allows two-way information sharing between buyers and sellers within the network. The supply chain powers of buyers and sellers are well balanced in this type of SCN. Furthermore, firms in the semiconductor industry are also much diversified on their size and supply chain expertise. While small companies specialize in certain components supply, many giant OEMs, for example IBM and Seagate, can play on both buy and sell sides. Their multiple supply chain roles let industry supply chain power be further balanced. The well balanced supply chain power structure has pressed EMs to avoid being biased towards either buyers or sellers. The three semiconductor EM cases all chose to be neutral between buyers and sellers. Their choices are not made by chance but logical adaptation to the industry supply chain structure.

The effect of Industry Norm Structure

Proposition 4: The industry e-business standardization will have interaction with EM characteristics for success.

P4a: the more inconsistent an industry's e-business standards, the more likely that higher-level EM business models will be applied for success.

One of the functions that differs higher level EM business model from the lower ones is to enable industry wise standards collaboration. Chapter 3 indicates that in those industries that involve highly inconsistent e-business standards, the industry collaboration brought by EMs on common standards can significantly improve the industry efficiency and create overwhelming revenue for the EMs. EMs in those industries are thus enthusiastic about enabling industry wise common business standards. Currently, about 42.41% plants in the automotive industry are using EDI as e-business standards (Census Bureau E-Stats Report, 2004). However, the widely deployed EDI methodology is a dyadic approach where each company establishes a unique connection with each of their trading partners. Managing the EDI infrastructure has become time-consuming, costly, and labor-intensive. Most importantly, it creates no strategic advantage. Since the automotive industry has being used inconsistent e-business standards historically, EMs could appropriate exceptional value by helping the industry with standard development. Not surprisingly, all three EM cases studied have assumed industry standard leadership. That network role matches the inconsistent IT standard structure of the automotive industry.

Historically, the semiconductor industry has much less EDI use than the automotive industry. According to the census bureau's data, the EDI usage ratio by plants number is only 27.43% in the semiconductor industry. The semiconductor industry started its common standards development very early too. Founded in June 1998, ***RosettaNet*** is one of the first independent industry non-profit consortiums that dedicated to the development and deployment of common electronic commerce standards to align the processes between supply chain partners. With relatively common e-business standard, there is little space left for EMs to appropriate their value from this role in the industry. The business models of three representative semiconductors EMs didn't include any role of common standard development. They either participated in ***RosettaNet*** for standards development as in ***E2open*** and ***Converge*** cases or outsourced the work to the third party as ***PartMiner*** did. Their experiences combined with the three automotive EM cases support proposition 4 a.

P4b: the more inconsistent an industry's e-business standards, the more likely that a participant ownership will exisit for success.

Industry e-business standardization also affects EM's ownership. Inconsistent e-business standards can increase network nodes' asset specialties and make the participation of network nodes in EM ownership necessary for information sharing. In the automotive industry, widely used EDI cause the industry lack of consistent e-business standards. To develop a common standard for the industry, EMs will need to involve the participation of major automakers and Tier 1 suppliers. It is not a surprise that the three major automotive EMs were all supported by industry consortium while they were acting as e-business standard development leaders for the industry.

On the contrary, consistent industry e-business standards promote inter-organizational network cooperation. The consensus of network participants can to some extents substitute ownership governance. In an industry characterized with consistent e-business standards, independent EM can seek legitimacy by applying common e-business standards. In the ***PartMiner*** case, the EM won wide acceptance on its outsourced e-business data standards without the participation of any major semiconductor player. In an industry characterized with inconsistent industry norms, ***PartMiner***'s success would be difficult to repeat. The experiences these different cases had support the proposition 4b.

Proposition 5: the industry clockspeed will have interaction with EM characteristics for success.

P5a: The slower an industry's clock speed, the more likely that higher-level EM business models will be applied for success.

P5b: The faster an industry's clock speed, the more likely that non-participant EM ownership will exisit for success.

According to chapter 3, stable industry structure benefits the development of inter-organization network cooperation. This is because trust building and integration of diversified systems require longer time. In contrast, companies in a dynamic environment can hardly keep organizational and technological proximity, which cause huge difficulties for inter-organization network cooperation.

Due to its slower internal clockspeed, automotive industry has relatively slower technological and organizational change rate. Industry-wise inter-organization collaboration therefore can be observed in the industry. EMs in the automobile industry were set up to help the existing network collaboration. Their roles as collaboration enabler were expected by the network participators. All three auto industry cases have successfully fulfilled the expectation with higher level business model.

The semiconductor industry, however, has a relatively faster clockspeed. The organizational and technological proximities within the industry are so little that semiconductor giants are reluctant to cooperate. Both ***e2open*** and ***Converge*** were created as consortium. They are the highlights of the semiconductor industry. But none of them found that enabling large scale of collaboration was attractive to the industry. The downscale of their business model from higher level to lower level reflect an adaptation from their dream to the reality. Compared to EM cases in the auto industry, a slower industry, their experiences support the influence of industry clockspeed in proposition 5a.

The clockspeed not only set the network role for the industry, it also affects the formation of industry linkages. Since industry wise cooperation is difficult in the faster clockspeed industry, the participant EM ownerships cannot work as well as those in the slower clockspeed industry. Non-participant owned EMs therefore more likely compete with participant owned EM successfully. In the ***PartMiner*** case, the EM successfully grabbed the key to compete with consortium owned EM in the same industry by controlling the world largest electronics database. By concentrating on appropriate niche, it runs as well as the other participant peers. However, the experience of PartMiner is non-repeatable in the automobile industry. Slower industry clockspeed there gives participant owned EMs tremendous advantages over non-participant owned EMs. All three highly visible EMs are unanimously owned by industry consortiums. Their non-participant competitors are either not unknown to the whole industry or failed soon after their establishments. This industry comparison supports proposition 5b.

The co-variation of EM business model and governance model

Proposition 6 EMs applying higher level business models are more likely to exhibit participant ownership for success.

All three automotive cases have applied higher level business models. Their ownerships are all participant ownership. The co-variation of higher level business model and governance models in these cases are not at odds. Chapter 3 point out that higher level business model requires deeper network cooperation associated with large scale of industry linkages. Industry consortiums involved the participation of major industry players provided the EMs necessary industry linkages. Without the participant ownership, the three EMs couldn't achieve their mission. The higher level business they applied would more likely fail. That partially supports proposition 6.

6.4 Summary of the Chapter

Chapter 6 conducted case study in the automotive and semiconductor industries. Six cases in the two industries are all very successful EMs. But they exhibited very different characteristics and experienced comparable evolvement paths.

The case analyses in section 6.1.2 shows the impact of automotive industry structure on the formation and development of three highly visible EMs: ***Covisint***, ***SupplyOn*** and ***RubberNetwork*** in the industry. All of them took collaboration enabler business model and consortium governance in the end. Their choices of higher level business models reflect the network role expectation of automotive industry. The consortium governance model encourages their choices of higher level business model and supports their choices with major industry players' involvement and industry linkages they bring in. Due to the characteristics of automotive industry supply chain structure, the three EMs are all biased towards buyers in the market. The existing norm structure also let all three EMs take standards leadership in the entire industry or their sectors. These leaderships are indicators of their collaboration enabler roles in the network.

The cases studied in the section 6.2.2 displays the business model and governance model pattern of three major semiconductors EMs: ***E2open***, ***Converge,*** and ***PartMiner***. These three EMs all promoted very limited and shallow inter-organizational cooperation in the semiconductor industry. All three EMs tended to work on collaboration services in their early time. However in the end, ***E2open*** narrowed down the scope of its services. ***Converge*** and ***PartMiner*** completely gave up their collaborative efforts. The shrink of the three EMs' business models suggests the network roles they can play in the semiconductor industry competitive structure. Both ***E2open*** and ***Converge*** have taken consortium governance model. However, the industry linkages this model can bring into the network are not robust enough in the highly fragmental semiconductor industry. In contrast, by taking appropriate market niche, non-participant EM like ***PartMiner*** can compete well in the game. The late divergent assembly SCN pattern in the semiconductor industry has given buyer and sellers balanced power. All three EMs were neutral towards the buyers and sellers to address this characteristic. At last, the norm structure of the semiconductor industry won't allow any of the three EM takes the leadership of e-business standardization in the industry.

Overall, the 6 EM cases support most propositions of chapter 3 well. Together, the consistent pattern of these EMs in each industry have demonstrated the effect of industry structure on EMs characteristics including both business and governance model.

Chapter 7 Discussion and Conclusion

Introduction

The section 7.1 of this chapter will summarize the theoretic framework and the empirical results. Based on the results, managerial implications are derived in Section 7.2. Section 7.3 suggests future research areas. Section 7.4 gives the conclusion and contribution. Finally, section 7.5 summirazes the chapter

7.1 Summary of the Study

During the mid-1990s to early 2000s, the explosion of eMarketplaces has created a crowded landscape within most industries. It has been predicted that more than 80 % of the Global 1000 companies would participate in B2B e-marketplaces by 2002 - and 100,000 of these marketplaces would be operational by 2001 worldwide(Gartner Group, 2001). It was also predicted that 37% of the U.S. B2B e-commerce transactions would be done via B2B marketplaces by the year 2004 (Forrester Research Reports, 2000).

However, things changed dramatically after 2002. Both dot-coms and industry-specific e-marketplaces have gone through a massive shakeout since then. It appeared that the growth of the e-marketplace trade couldn't support many EMs in each industry. Forrester Research estimated that of the more than 1,000 B2B E-Marketplaces in the US, only 200 would survive past the year 2004, and only a few would remain in each industry (Kafka, 2000).

Struggling to attract firms to their website for survival, EMs faced a confusing set of options for building their ventures: different ownership models, equity structures and product offerings. How do the EMs design and develop themselves in order to be more competitive and eventually survive in the shakeout? More importantly, what determines the success of EMs in their industry?

This dissertation analyzed the impact of industry structures on the emergence of EMs in the past few years. From the organizational ecology perspective, the dissertation viewed the emergence of EMs as a process of both selection and adaptation, in which the industry structures selected the EM by their inter-organizational network roles and industrial linkages, and the EMs adopted appropriate business models and governance models to fit the requests of industry structures.

The analysis started with an elaborate literature review that identified major industry structures, defined the main elements of EM business model and governance model, and categorized EMs according to their differences in business models and governance models. According to the literature review in chapter 2, industry structures have three aspects: competitive structures, supply chain structures, and norm structures. The EM business models differed on EM network roles that were reflected in EM's value proposition, value adding activities, and value appropriation. Four types of EM business models could be identified. They were communicator, transaction facilitator, value chain coordinator, and collaboration enabler. The EM governance model brought an EM the essential industry linkages. It could be categorized into non-participant EM, consortium, and private EM by the participation extent of industry players in EM ownership, or be considered from the supply chain perspective into buyer biased EM, seller biased EM, or neutral EM.

Based on the literature review, chapter 3 provided the theoretical framework for this study. A conceptual model was developed while propositions were given. Through the work of chapter 3, the success of EM in a particular industry structure was proposed to be determined by the interaction of three different industry structures and various types of EM business models and governance models.

Chapter 4 developed both quantitative and qualitative research methodologies. The quantitative research was designed to provide statistical support to the theory developed in chapter 3. The qualitative research methods were used to explain the influence of industry structure on the pattern of EM characteristics in a longitudinal perspective.

Chapter 5 and 6 provided the results and analysis of quantitative and qualitative researches. The quantitative research in chapter 5 involves six different industries and 183 sample EM subjects. Both the logistic regression model and Poisson regression model were applied to explore the relationship between industry structures and EM characteristics, and the impact of this relationship on the success of EM. The qualitative research in chapter 6 examined into the evolution of six EM successful cases from two comparative industries: the automotive industry and the semiconductor industry. The multiple case studies here took a historical analysis approach. For each case, the origin and background and the time log of main events since EM launch were given along with the description of EM business model evolution process. The success of EM was evaluated. Lessons learned from each case were laid out. After all, Chapter 6 compared and contrasted these cases within and across industries. The major findings from Chapter 5 and 6 are given in Table 7.1.

Chapter 7 concluded the dissertation.

Table 7.1 Summary of Research Findings

Proposition	Quantitative Method	Qualitative Method
P1: The more consolidated the industry, the more likely that higher-level EM business models will be applied for success.	Not Supported	**Supported**
P1a: The higher an industry's concentration, the more likely that higher-level EM business models will be applied for success.	Not Supported	**Supported**
P1b: The higher the entry barriers within an industry, the more likely that lower-level EM business models will be applied for success.	Not Supported	**Supported**
P1c: The higher the product differentiation in an industry, the more likely that lower-level EM business models will be applied for success.	Not Supported	**Supported**
P2: The more consolidated an industry, the more likely that participant ownership will exist for success.	**Supported**	**Supported**
P2a: The higher an industry's concentration, the more likely that participant ownership will exisit for success.	**Supported**	**Supported**
P2b: The higher an industry's entry barriers, the more likely that participant ownership will exisit for success.	**Partially Supported**	**Supported**
P2c: The higher an industry's product differentiation, the more likely independent ownership will exisit for success.	**Supported**	**Supported**
P3. The more balanced an industry supply chain structure, the more likely that a neutral EM bias will exisit for success.	Not supported	**Supported**
P3a: EMs in industries characterized by a divergent late assembly supply chain are more likely to exhibit neutral governance models for success.	Not supported	**Supported**
P3b: EMs in industries characterized by a convergent assembly supply chain are more likely to exhibit buyer-driven governance models for success.	Not supported	**Supported**
P4. The industry e-business standardization will have interaction with EM characteristics for success.	Not applicable	**Supported**
P4a: the more inconsistent an industry's e-business standards, the more likely that higher-level EM business models will be applied for success.	Not applicable	**Supported**
P4b: the more inconsistent an industry's e-business standards, the more likely that a participant ownership will exisit for success	Not applicable	**Supported**
P5. The industry clockspeed will have interaction with EM characteristics for success.	**Supported**	**Supported**
P5a: The slower an industry's clock speed, the more likely that higher-level EM business models will be applied for success.	Not supported	**Supported**
P5b: The faster an industry's clock speed, the more likely that non-participant EM ownership will exisit for success.	**Supported**	**Supported**
P6: EMs applying higher level business models is more likely to exhibit participant ownership for success.	Supported	**Partially Supported**

7.2 Implications of Research Findings

The research findings given in table 7.1 shows that both the quantitative and qualitative results identified the effect of industry structures on EM governance characteristics.

The quantitative analysis supported the impact of industry concentration and product differentiation on EM governance model but not on EM business model. It also supported the impact of industry clockspeed on both EM business model and governance model, as well as the co-variation of EM characteristics. However, the quantitative analysis is either not applicable or not supporting for industry supply chain structures and e-business standardization.

The quantitative results presented in chapter 5 showed that industry consolidation including industry concentration, product differentiation, and entry barriers would request more cooperative and integration network roles from EMs. EMs that built participant ownership and adopted higher level business models would address this request better than the others. Industry clockspeed, on the other hand, created many problems for developing stable and reliable cooperation among network participators, therefore reduced the survival chances and longevity of participant EMs within a higher clockspeed industry. The quantitative research didn't support significant impacts from industry supply chain structure on EM biases. It didn't find a statistically significant influence of the interaction between industry structures and higher level EM business model on EM success. However, the positive co-variation of EM higher level business model and participant ownership was supported, which implied an indirect relationship between industry structures and EM business model. This finding seemed to suggest a conceptual model that was different from what are presented in chapter 3. The existing model in Fig. 3.1 considered the fit among industry structures and EM business model as well as governance model. However, it says nothing about their interaction process. The quantitative analysis in chapter 5 found out that there was no significant relationship between industry structures and EM business model, but there was a significant relationship between industry structures and EM governance model, and between EM business model and governance model. These findings together seemed to imply that EM governance model can be a mediator between industry structures and EM business model. Industry structures can determine the industry linkages that an EM should develop in a specific industry. EM governance model reflected the industry linkages that an EM had and provided the foundation for different EM network roles. An EM business model can only be successful with appropriate support from EM governance model. Industry structures therefore influence EM business model indirectly through EM governance model.

The qualitative results in chapter 6 supported all the propositions of chapter 3. The multiple case analyses found out that in a highly consolidated industry like automotive industry, the most successful EMs typically had dominant industry participant involved in their ownerships. Their involvements have been critical for EMs to adopt a higher level business model that gave more emphasis to industry network cooperation and integration. Sooner or later, all three EM cases evolved into collaboration enablers in the network of their sectors. Widely adopted proprietary computer network and slower industry clockspeed allowed all leading EMs in the industry to approach business standard development. At the same time, since the automotive industry had convergent assembly supply chain networks management pattern, all leading EM are biased towards the buyers who have more power in the industry's supply chain power structure. On the contrary, the semiconductor industry had a very different EM evolution pattern. Industry consortium EM and non-participant EM competed with each other by developing market niches. Winning of the game was not granted for either of them. Those best EMs changed their business model from higher level to lower level after an unsuccessful try. None of them would like to take a leadership on industry e-business standard development. The different picture EMs in the semiconductor industry appeared apparently lied in the competitive structures and norm structures of this industry. The industry was less concentrated, greatly differentiated, and has lower entry barriers. In addition, the industry has relatively consistent e-business standards and faster clockspeed. All these industry structure features make inter-organizational network cooperation and integration difficult, the result of which is that EM not only have many problems in getting more industry participants involved, their participant ownership could help very much on adopting higher level business model too. Finally, the divergent late assembly supply chain structure shifts the power balance between the buyers and sellers in the semiconductor industry. A more balanced supply chain power structure results in neutral bias among all the best EMs in the industry.

The case analysis in chapter 6 confirmed the fit between EM network roles and their industry linkages. It did support the propositions that a fit between EM business model and industry structure was needed for the success of EM. However, it also suggested that industry structures could influence EM business model through EM ownership. In this sense, the results from qualitative analysis were consistent with quantitative analysis findings. Together, they seemed to suggest a different conceptual model from Fig 3.1 in chapter 3. Fig 7.1 gives the new conceptual model.

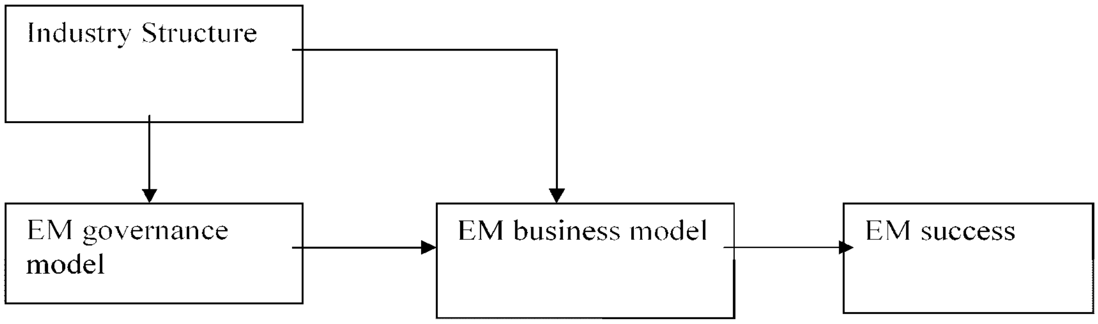

Fig.7.1 Conceptual Research Model

In our new model, industry structures modify the relationship between EM characteristics and EM success. Industry structures can determine the best fit EM governance model for EM success. The development of an EM business model is a combined result of both EM governance model and industry structures. Fit exists between EM business model and industry structures, between EM governance model and industry structures, and between EM governance model and business model. These fits together will determine the success of EMs in the end.

7.3 Managerial Implications

This research studied the factors affecting EM success in an industry structures context. Its finding that the interaction of industry structures and EM characteristics will influence the success of EM make great sense to managerial practice.

Since its inception, EM has been expected to greatly improve industry efficiency, transforming business process and making huge profits. However, with the up and down of B2B EM passion in the last few years, EM market makers and venture capital investors are wondering what characteristics EM should have to be successful in each industry. Manufacturing managers would also like to know which EM will be more successful so that they could associate with in a longer term. The findings from this research demonstrated that there is no "one size fit all". The industry context had a significant role in determining appropriate EM characteristics. Different competitive relationships, supply chain powers balance, and industry clockspeed as well as e-business standards all affect the formation and survival of EMs. In developing a predictive model for the success of EMs, one has to include industry structures and their interactions with EM characteristics into consideration.

Business model was one of EMs' most important winning weapons in competition game. However, building a good business model has been mystery to EM managers and market-makers. From the view of industry structures, this dissertation pointed out that EM business model reflected EM roles in an industry's inter-organizational network. When laying out their business models, EM managers needs to have an explicit understanding of appropriate roles so that their market can act in a specific industry context. They should have the fit of their network roles and the network configurations included into the value proposition, value adding activities, and value appropriation components of their business models to increase EM appealing to the industry. In a highly consolidated and stable industry, there is more expectation for an EM to help on industry cooperation. The services that an EM provides therefore should be more oriented towards industrial integration and collaboration, e.g., product design sharing, market forecasting coloration, and developing common communication and cooperation standards. However, in industries that have great diversity and fast change rate, EM mangers will need to explore the opportunities of developing specialty for communication and transactions improvement. EM business models that succeed in the end are those who are responsive to the request of their industry. Therefore, an understanding of industry context should be the first step for EM managers to build a successful EM business model.

Moreover, business model isn't a mental artifact of EM managers. It is deeply rooted in the industry linkages an EM can obtain. An advanced business model can fail if the EM didn't control necessary linkages from the industry. The industry linkages support an EM in many aspects, e.g., marketing channel, trading volume, product information, trust and cooperation, etc. These supports are essential to the survival and sustainable competitive advantages of an EM. A typical way for EM managers to develop industry linkages is to involve industry participant into ownership. Participant involved ownership including industry consortia and private EM can be more likely to support business models that give more emphasis to industry integration and cooperation. For EM marketers who want revenue from those kinds of services, they should seriously consider the role of industry participants in their EM governance model. EM managers also should note that in a less consolidated or fast moving industry, the industry linkages they could develop are limited and unreliable. Even if they could involve industry participants into their ownership, they cannot expect the same support as it does in an industry that has opposite characteristics.

Additionally, the EM managers need to pay attention to the supply chain structure of their industry. In the beginning of the EM trend, many EMs claimed to be neutral to buyers and sellers. The goal of a neutral position in the industry apparently is to comfort buyers and sellers about the security of information sharing, and attract more market partners from both sides. However, the reality is that a third party owned EM might not have enough power to coordinate and integrate the supply chains networks in some industries. Automotive industry, for example, has widely developed convergent assembly supply chain networks, in which a neutral supply chain position would not be powerful buyer's favorite. EM managers, therefore, may want to have their marketplace biased towards the powerful supply chain party if the industry supply chain has an unbalanced power structure.

7.4 Future Research Areas

As with most research, this study has some limitation, which opens the door for future research.

This study has been conducted in six industries for the quantitative part and two for the qualitative part. Both parts focused on the U.S industries. While the industries selected for this study have significant diversity, it would certainly be valuable to extend the research to more industries and to international context. By involving more industries and EM samples, the quantitative results could be richer and more robust, and the qualitative findings could be more convincing. The extension to an international context will also help to generalize the conclusion in wider circumstances.

The success of EM has been the main concern of this dissertation. Both the quantitative and qualitative researches use EM success as their dependent variable. By focusing on the success of EM, the study contributes to finding the best practice of EM implementation. The successful EMs are also easier to identify and assessed in comparison to the EM failures whose reasons can be very complex and need more internal information to analyze. However, people can learn lessons the failures too. It is meaningful to explore how the interaction of the industry structures with EM characteristics results in the failure of EMs. A quantitative failure analysis will probably need to introduce hazard function and analyze the risks that a misfit of industry structures and EM characteristics could have. A qualitative failure analysis, on the other hand, may need to involve insiders. In addition, the success measures used in the quantitative research are EM survivability and longevity. In the future, if more private financial data were accessible, one could use return on investment or other quantitative performance measures.

Unfortunately, this research didn't find support for the impact of supply chain structure in its quantitative analysis. Due to very limited existing literatures on industry supply chain structures, it is difficult to identify the dominant SCN structures in many industries. This restricted the extendibility of this research into many industries whose SCN are unknown. With more empirical research on the SCN of industries, it is expected that a better understanding of the impact of industry supply chain structure on EM characteristics could be developed.

Finally, this dissertation conducted its analysis primarily at the industry level. The assumption made in this research is consistent with the existing industry economics reseach stream. The industry context is believed to select the 'fit' EMs by their characteristics. Starting from this dissertation, researchers can dive into lower level contexts such as business or strategic groups, industry sub-sectors, or geographical regions for more specific roles and linkages an EM should develop. This type of analysis will further enrich the conclusion made here that an EM needs to fit with its context for success.

Looking forward, further researches can be conducted to answer many interesting questions such as: how does a market evolve? What is the difference between market evolution and firm evolution? Will the difference lead to different business strategies? Do the industry structures influence a market and a firm differently? What are the differences if any? Will strategic groups or allies influence on the EM characteristics? What are the other factors determining EM characteristics besides industry structures? Are there other ways to categorize EM characteristics? What are the other EM characteristics associated with EM success or failure? What exactly is a successful EM? How can EM success be measured? What changes will a successful EM bring into legacy industry structures? Can what we learned from EM be generalized to other new types of technology and organizational forms? Research on the above questions will certainly hellp develop a broader picture of market evolution and new technology adoption.

7.5 Conclusion and Contribution

This dissertation is the first research that systematically examined the relationship among industry structures, EM characteristics, and EM success. It offers a clear contribution to the nascent body of knowledge in B2B e-marketplaces, and existing organization research.

First, this research has clarified what industry structures are relevant to the emergence, adoption, and diffusion of electronic marketplaces. It distinguished three aspects of industry structures: competitive structures, supply chain structures and norm structures, developed variables these structures, and analyzed the impact of each on EM characteristics. By doing so, the dissertation built a strong research foundation for future studies relevant to the industry structures.

Second, the dissertation developed a good theoretical framework to analyze EM. EM business model and governance model including ownership and bias are two important components in this framework. They together composed a sound description for EM characteristics. The finding of positive co-variation relationship between them initiates the needs of systematic analysis on EM characteristics. Exploring the various co-variation patterns of multiple EM characteristics and their implications can be an exciting area worthy of researchers' future research.

Third, the dissertation integrated multiples theory streams and applied relatively new perspectives. The emergence of EM is a complex technical and social phenomenon. Many factors, objects, and actors are involved in its evolution process. A research in this new area inevitably involves many different theories and perspectives. The dissertation integrated existing theories such as industry economics, organizational ecologies, innovation adoption theories, transaction economics, agency theory, firm strategy researchers, supply chain management theory, relational theory, and so on, into one theoretical framework. It took a network configuration perspective to consider EM characteristics by viewing an EM as an inter-origination network. The network configuration perspective is a relatively new perspective that can bring in some insights for analyzing a market, which differ from hierarchy based firms. Following this network perspective, the dissertation also applied a relational theory to analyze the roles an EM play in the network and the linkages that constraint these roles. This approach is a new development in the area of B2B EM researches.

Fourth, both the quantitative and qualitative results demonstrated the existence of industry structure effects on EM characteristics. Industry competitive structures and norm structures both were found affecting EM business models and ownerships. Industry structure was found affecting EM bias. The dissertation concluded that the interaction of industry structures and EM characteristics would influence the success of B2B EMs. By exploring these interactions, this study highlighted a gap in the current B2B emarketplace literature, e.g., the influence of context and environment. Although EMs are expected to improve industry efficiency and create great business values, many companies and academics underestimate the importance of industry structures to EM success, which partly results in the high failure rate of EM initiatives in the past years. Through its quantitative and qualitative work, this study found out that the EM business model and governance models vary on different industry structures. This finding has contributed to a more successful industry adoption of B2B E-marketplace.

Fifth, the dissertation has taken a combined research methodology for its purposes. Both quantitative and qualitative methods were used. Together they provided a strong support for the dissertation conclusions. In the quantitative method, both logistic and Poisson regression models are relatively new statistical modeling approaches. In the qualitative method, the historical analysis has not been conducted widely in EM researches. The application of these new research methods has brought more insights for the future research design in the B2B EM field.

At last, the study here can be interesting for research on new organizational forms and market evolution. New forms of organizations such as B2B emarketplaces usually come to the practice as a fashion. The ecology of new organizational forms is an area that fascinates the academy of management but about which little is known. The dissertation takes an initial step to cultivate a theory for the business strategy of B2B emarketplaces or other new organizational forms. Researches like this dissertation will deepen our understanding of the emergence of various types of new organization forms and the factors that have influences during the process.

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Appendix A: EM Characteristics Coding Rules

1. The content that will be coded:

From the website

- Homepage,
- about us/FAQ,
- representative business functions –if the pages doesn't talk about it directly, print out the buyer/seller pages
- investment relationship

From the newswire/business elite

- Newswire about initiation of the marketplace,
- Newswire about milestones of technology applied, strategic actions,
- Newswire about the acquisition and financing and return of the marketplace

2. Coding Procedure:

a. The first coder will collect website evidence. He will prepare the list of sites for coding and relevant evidence. These evidences include the web address, the starting date and ending date of this site, and governance evidence. The first coder will also preview the website and determine if additional evidence is needed for coding from Lexis-Nexis. If so, he will further collect evidence from there.

b. Website review and coding:
Three coders will review the web site or printout from the website of the marketplace first to determine the business functionalities within each site. Coders then read the business/governance evidence prepared by the first coder to determine its governance model. When the coders read the evidence found, they will highlight the relevant information on the evidence paper but mark their codes on their own coding sheets. The codes should be put into their individual coding sheet and wait for the discussion. All the sites unable to give a code will be left to the coders' discussion. The coders will then make a decision on whether further search is needed or the site should be dropped. If further information is needed, the first and third coder will then get back to the coders with either new information if they could or an appeal to drop this site.

d. For each marketplace, Coders need to make up mind on the following decisions

i)What is the business model?—business functions provided by the site

ii) What is the governance model?

Ownership by participation—Non-participators, Consortium, Private and unknown

Ownership by supply chain—buyer-driven, seller –driven, neutral.

e. The final code will be given to the majority (2 beat 1). Reviewers will review their codes and discuss the material (a) when the three reviews have three different codes; (b) there is strong argument from a single reviewer.

3. Coding Rules:

E-marketplace definition:

An EM is a **NETWORK** facilitated by telecommunications created to enable multiple buyers and suppliers to exchange information and complete transactions (Zwass, 1999). This definition means:

- An EM doesn't have to be a central place, e.g. www.Anx.com. However, the EM must have the information or financial exchange between buyers and suppliers. Otherwise, it is not a marketplace, e.g. www.powerway.com
- An EM differs from ASP in that: ASPs sell product and service to clients. They provide support and sometimes help to manage a marketplace package. However, they don't own, control, or administrate the sold marketplace package. The relationship between ASP providers and their sold e-marketplace product is based on commercial contract but not governance. If a coder cannot decide if a site is ASP, he should code it first but bring the question in group meeting.

Ownership Coding

(1) The marketplace is non-participator owned if the owner of the marketplace is:

- venture capital or a set of venture capital;
- Public companies (not in same industry);
- Pure e-business software/solution providers.
- Individuals, even if they are professional from that industry.

(2) If the company has only one investor from the industry, even if it is a venture between one industry player and several independent companies, it is private. However this investor is only an information/technology provider (chrome.com) or consulting company, it is non-participator owned.

(3) If there is more than three investors from the same industry, it is consortium. These investors must be creating or transfer values along the industry value chain. Two industry players can be a join venture not representing the industry.

(4) If the ownership isn't clear from the evidence, it is unknown.

(5) If one company owns several websites, then each site is counted as one sample. They will have the same governance model.

(6) If the governance model changed during the coding years, code the latest one found in the evidence. If the company is acquired during its operation and still continues to work, the current governance model is the code. However, if the company is acquired and lost its brand or stop operation, the previous governance model is the code.

Bias Coding

(1)The Bias of an e-marketplace refers to the structural orientation of the marketplace, i.e. who is dominating the market. It is a concept combining both governance and functionality meaning. Governance biased marketplace can have neutral service orientation. Service biased marketplace can be founded by independent third party (For more discussion about bias see the end of this document). To simplify coding, the rule is: when the governance bias is opposite to the service bias, the code is neutral. When there is one neutral on either governance and service, the code is decided by the rest bias.

***** The next table can be used as references if coders feel comfortable to use them. Otherwise, the coders can go with their understanding of bias definitions. There are 9 cases here:

		Service bias		
Governance bias		towards Seller	towards Buyer	Neutral
	towards Seller	Seller biased	Neutral	Seller biased
	towards Buyer	Neutral	Buyer biased	Buyer biased
	Neutral	Seller biased	Buyer biased	Neutral

For example, sellers can create a market primarily being a search engine for their inventory. So the governance bias here is towards seller but the service bias is towards buyer. The final code is thus neutral.

(2) When buyers and sellers are the same entities, the bias of the marketplace is neutral.

(3) If the auction site has the sellers to initiate the auction and the buyers can only bid on the items, the auction is used by the sellers to explore higher price and therefore is seller-oriented. If the buyers can initiate an auction (reverse auction), the auction is used for buyers to lower the price and thus is buyer-oriented. If both ways work, it is a neutral auction site.

Business Model Coding

(1) Business models are cumulative. A higher level model cannot be fulfilled without applying lower level model. E.g.Value chain model must have transactions flow. Coders code the highest level of business model by the order of communication, transaction, value chain coordinator, and collaborator.

(2) If there is any functionality of one particular model listed below found in the evidence, the site applies this model.

(3) Business models will be coded without considering the time they are applied. The coders look at the full package at the time the material is to be coded.

(4) Coded business functionalities must be **electronically** supported by the business model of an e-marketplace. For example, VC model must be done electronically but not by phone or fax.

(5) VertiMart: Unless the site specifically mentioned auction or other higher level of functions, marketplaces owned by VertMart are communication model, non-participant and neutral.

Functionalities classification:

Communicator model

Content provision, e.g. :

- public storefronts,
- E-catalog—*Definition:* The exchange hosts an electronic version of the print catalogs of a myriad of suppliers. Buyers can access the catalogs online at the exchange and place orders to be fulfilled by the supplier of their choice.
- Request for Product /Quotation (RFP/RFQ) —*Definition:* A buyer submits a request for quote (RFQ) or request for proposal (RFP) to all sellers on an exchange or to a seller of the buyer's choice. Buyers get multiple quotes for goods or service, and the seller gets sales leads. Elance, for instance, is an exchange that allows a buyer to submit an RFP for a project, such as designing a Web site, and receive proposals (bids) from free-lancers.
- classified Ads

Other Information services

- discussion forums
- industry newsletters
- Events calendar
- bulletin board—*Definition* : The site administrator can set up bulleting boards for announcements, or delegate the authority to moderators to manage discussions and postings. Postings can either be real-time, or an approval basis
- scrolling ticker —*Definition:* A scrolling ticker displays new bids and offers, postings, trade information, and transaction prices, as well as news headlines in real times. for a sample, see: http://cp.stockgroup.com/tickerdemo_cp.asp
- industry rolodex—*Definition:* address book of members within the vertical market sector, for a sample, see: http://www.adjobsinc.com/category.cfm?Category=26

Transaction Facilitator model:

Spot trading, search and price discovery related services, e.g. :

- Bid and Ask trading: The exchange works like the stock market, matching the bids and offers of buyers and sellers.
- online comparison of offers & recommendation (auto-matching)
- private negotiation & contract management tools
- Traditional Auction: the seller on the exchange auctions inventory off to the highest bidding buyer.

- Reverse auction: In a reverse auction, a company states its need for services or products and sellers bid to fulfill that need. Because the lowest bidder wins the account, reverse auctions are sometimes called "downward price" auctions. FreeMarkets.com, for instance, hosts reverse auctions of industrial goods and services.
- Derivatives trading: introduce derivatives --transactions have future delivery dates--to enable the existing buyers and sellers to directly integrate their daily business activity with risk management instruments in one centralized location.

Post-sale transaction automation, e.g.:

- Online issuing of purchase order
- E-invoicing and e-payment
- Bilateral clearing and settlement
- Escrow: an account held in trust or as security until the occurrence of a certain condition.

Value Chain Coordinator model :

Aggregated selection and Dynamic pricing along value chain, e.g.:

- Aggregate pricing and auction: lets small businesses enjoy the benefits of volume pricing typically available to only large companies. A twist on the reverse auction, the aggregate auction puts businesses looking for similar goods and services into a pool. Suppliers bid for the business of the entire pool, and the lowest bid wins. The guarantee of winning a large amount of business (all the business in the pool) makes it worthwhile for suppliers to lower their margins. Demandline.com is an example of a site that allows small businesses to join buying pools to obtain services such as long-distance telecommunications or temporary staffing.
- Interoperability with other B2B exchanges: provide system integration for transaction to reach other B2B exchanges rather than simply give other B2B exchanges' web links on homepage.

Supply Chain and Logistic coordination, e.g.

- warehousing, transportation, quality assurance,
- centralized and multilateral clearing and settlement,
- Inventory visibility: automated Request for Product /Quotation (RFP/RFQ) and order management backed by full integration of back-end inventory management systems.
- Supply chain consulting

The others:

Workflow process management and decision support (e.g. aviationX.com)

Collaboration-enabler model:

- Private sellers' extranets with pricing personalized to individual customers,
- Sharing design, R&D , & marketing innovation
- Customizing and developing specific business processes and workflow,

- and provides an architecture allowing integration to marketplaces and existing legacy enterprise applications.
- Developing industry-wise technique or business standards.

Table A-1 EM business/governance models Coding Sheet

Industry :	EM Website:	Final Code:
EM Network Roles (Business Model)	Representative functionality **Codes**	**(Yes/No)**
Communicator model	**Content provision, e.g. :** • public storefronts, • capabilities for supplier/ product search, • Request for Product /Quotation (RFP/RFQ), • classified Ads **Other Information services** • discussion forums • industry newsletters • Events calendar • bulletin board • scrolling ticker • industry rolodex	
Transaction Facilitator model	**Spot trading, search and price discovery related services, e.g. :** • E-trading • aggregated catalogs **Post-sale transaction automation, e.g.:** • Online issuing of P.O. • invoicing, e-payment	
Value Chain Coordinator model	**Selection and Dynamic pricing, e.g.:** • auction/reverse auction, • private negotiation, • online comparison of offers & recommendation (auto-matching) **Logistic coordination, e.g.** • warehousing, • transportation, • quality assurance • clearing and settlement • Escrow	
Collaboration-enabler model	Collaboration facilitation. e.g.: • **private sellers' extranets with pricing personalized to individual customers,** • **inventory visibility,** • **design sharing** • **Co-R&D or Co-marketing**	

EM Ownership/Board Membership	**Codes (Yes/No)**	**EM Bias**	**Codes (Yes/No)**
Independent EM		Neutral	
Consortia		Buyer-driven	
Private		Seller-driven	
Public or Private Held:	**Codes (Yes/No)**		

Appendix B: Case Evidence Source

Government publication:

- Department of Justice (http://www.usdoj.gov/)
- National Bureau of Economic Research (http://www.nber.org/cgi-bin/get_bars.pl?bar=data)
- U.S. Patent and Trademark office (http://www.uspto.gov/)
- U.S. Small Business administration (http://www.sba.gov/)
- U.S. Census Bureau (http://www.census.gov/epcd/www/concentration.html) (http://www.census.gov/epcd/www/recent.htm)
- U.S. Department of Commerce (http://www.commerce.gov/)
- U.S. Security and Exchange Commission (http://www.sec.gov/edgar.shtml)

Electronic Market list Server:

- Jupiter Media Matrix (http://web.archive.org/web/20020602091013/http://www.nmm.com/kb/ism/index.asp)
- Forbes Best Web (http://www.forbes.com/bow/b2b/main.jhtml)
- E-market Services (http://www.emarketservices.com/training_consulting/)
- B2B Business Net (http://www.b2business.net/eMarketplaces/Major_Markets/)
- Line 56 (http://www.line56.com/directory/company.asp?CompanyID=495&CategoryID=52)
- B2B business yellow page (http://www.b2byellowpages.com/directory/dir.cgi?cat=708)

Industry Newswire Database:

- Lexis-Nexis Newswire
- Industry Association website

Scientific on-line literature Databases:

- ABI Inform (ProQuest)
- Emerald Library
- ACM Digital Library

Additional research servers

- Goldman Sachs (http://www.gs.com/hightech/research/)
- Deloitte Research (http://www.dc.com/obx/pages.php?Name¼eviews)
- PricewaterhouseCoopers (http://www.pwc.de/30000_publikationen/30000_publikationen.htm)
- Nerve Wire (http://www.nervewire.com)
- Deutsche Bank (http://www.dbresearch.de/)
- Gartner Group (http://gartner12.gartnerweb.com/public/)
- Bloor Research (http://www.bloor-research.com/)
- Aberdeen Group (http://www.aberdeen.com/)
- AMR Research (http://www.amrresearch.com/practices/scs.asp)
- Forrester (http://www.forrester.com/)
- Xephon (http://www.xephon.com/)
- Metagroup-Commerce Chain Management (http://www.metagroup.com/communities/ccm/ccm.shtml)
- McKinsey & Company, (http://www.montgomeryresearch.com/)

- Accenture Consulting (http://www.accenture.com/)
- IDC (http://www.idc.com/)
- Montgomery Research (http://www.montgomeryresearch.com/)

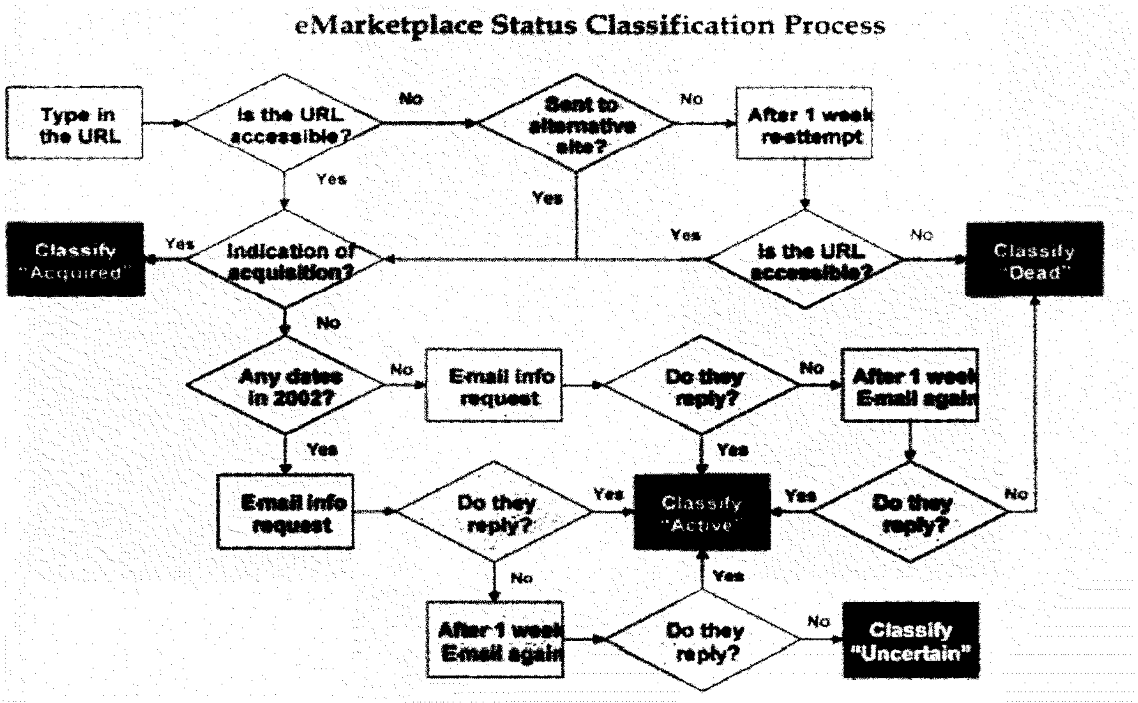
Internet portals

- FTC on Consumer Protection: E-Commerce & the Internet: (http://www.ftc.gov/bcp/menu-internet.htm)
- E-Commerce Times: http://www.ecommercetimes.com/
- Dissertation Online: (http://www.educat.hu-berlin.de/diss_online/biblio.html)
- The Hub for B2B e-Commerce White Papers: (http://www.nmm.com/reports/index.asp)
- B2b exchange Database: (http://www.b2bexchanges.com/list.cfm)
- abour.com: (http://onlineretailing.about.com/onlineretailing/cs/b2bexchanges/index.htm?once¼true&amp)
- European Electronic Commerce Website: (http://europa.eu.int/ISPO/ecommerce/Welcome.html)
- Encyclopedia of the New Economy: (http://hotwired.lycos.com/special/ene/)
- E-Marketer: (http://www.emarketer.com/)
- E-Business Central: (http://www.montgomeryresearch.com/ebcentral/)
- Print-The Premier New Economy Business Technology Portal: (http://www.brint.com/interest.html)
- Electronic Markets: (http://www.electronicmarkets.org/)
- Skillbot-Community Finder: (http://www.skillbot.com/community/community.htm)
- DMOZ e-Commerce: (http://dmoz.org/Business/E-Commerce/)
- DMOZ e-markets: (http://dmoz.org/Business/E-Commerce/Marketplaces/)
- WSJ.com-Special Report: E-Commerce: (http://interactive.wsj.com/public/current/summaries/ecom00-2.htm)

Search engines

- www.google.com,
- www.yahoo.com,
- www.business.com

Appendix C: EM Status Classification Process



* cited from Laseter (2003)

Appendix D: SPSS Logistic Regression Results for Survival Analysis

Model 1: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	4.867	3	.182
	Block	4.867	3	.182
	Model	4.867	3	.182

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	217.227(a)	.029	.039

a Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	5.422	4	.247

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I.for EXP(B)	
								Lower	Upper
Step 1(a)	Concentration	1.137	.789	2.075	1	.150	3.117	.664	14.640
	ClockSpeed			1.214	2	.545			
	ClockSpeed(1)	-.416	.417	.997	1	.318	.659	.291	1.493
	ClockSpeed(2)	-.088	.447	.039	1	.844	.916	.382	2.198
	Constant	.141	.496	.081	1	.777	1.151		

a Variable(s) entered on step 1: Concentration, ClockSpeed.

Correlation Matrix

		Constant	Concentration	ClockSpeed(1)	ClockSpeed(2)
Step 1	Constant	1.000	-.824	-.666	-.723
	Concentration	-.824	1.000	.345	.444
	ClockSpeed(1)	-.666	.345	1.000	.577
	ClockSpeed(2)	-.723	.444	.577	1.000

Model 2: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	10.253	5	.068
	Block	10.253	5	.068
	Model	10.253	5	.068

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	211.841(a)	.060	.081

a Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	19.468	7	.007

Variables in the Equation

								95.0% C.I.for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1(a)	GBM_H	-.213	.406	.276	1	.599	.808	.365	1.790
	GOSPR	.864	.381	5.136	1	.023	2.374	1.124	5.013
	Concentration	.858	.813	1.114	1	.291	2.358	.480	11.592
	ClockSpeed			1.606	2	.448			
	ClockSpeed(1)	-.433	.425	1.038	1	.308	.649	.282	1.492
	ClockSpeed(2)	.016	.457	.001	1	.972	1.016	.415	2.487
	Constant	-.017	.512	.001	1	.974	.983		

a Variable(s) entered on step 1: GBM_H, GOSPR, Concentration, ClockSpeed.

Correlation Matrix

	Constant	GBM_H	GOSPR	Concentration	ClockSpeed(1)	ClockSpeed(2)
Constant	1.000	-.084	-.115	-.777	-.649	-.723
GBM_H	-.084	1.000	-.272	-.046	-.019	-.019
GOSPR	-.115	-.272	1.000	-.133	-.036	.093
Concentration	-.777	-.046	-.133	1.000	.348	.427
ClockSpeed(1)	-.649	-.019	-.036	.348	1.000	.572
ClockSpeed(2)	-.723	-.019	.093	.427	.572	1.000

Model 3: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	6.072	1	.014
	Block	6.072	1	.014
	Model	16.325	6	.012

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	205.769(a)	.094	.127

a Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	13.762	8	.088

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I.for EXP(B)	
							Lower	Upper
Concentration	.656	.828	.627	1	.428	1.927	.380	9.769
ClockSpeed			2.880	2	.237			
ClockSpeed(1)	-.639	.440	2.110	1	.146	.528	.223	1.250
ClockSpeed(2)	-.049	.465	.011	1	.916	.952	.383	2.369
GBM_H	-1.167	.591	3.894	1	.048	.311	.098	.992
GOSPR	.328	.425	.593	1	.441	1.388	.603	3.195
GBM_H by GOSPR	2.144	.906	5.607	1	.018	8.536	1.447	50.360
Constant	.283	.534	.282	1	.596	1.328		

a Variable(s) entered on step 1: GBM_H * GOSPR .

Correlation Matrix

	Constant	Concentration	ClockSpeed(1)	ClockSpeed(2)	GBM_H	GOSPR	GBM_H by GOSPR
Constant	1.000	-.772	-.660	-.717	-.205	-.226	.214
Concentration	-.772	1.000	.343	.427	.024	-.073	-.077
ClockSpeed(1)	-.660	.343	1.000	.570	.124	.079	-.201
ClockSpeed(2)	-.717	.427	.570	1.000	.025	.116	-.056
GBM_H	-.205	.024	.124	.025	1.000	.190	-.670
GOSPR	-.226	-.073	.079	.116	.190	1.000	-.460
GBM_H by GOSPR	.214	-.077	-.201	-.056	-.670	-.460	1.000

Model 4: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	8.943	2	.011
	Block	8.943	2	.011
	Model	25.269	8	.001

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	196.825(a)	.142	.192

a Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	8.458	7	.294

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I.for EXP(B)	
								Lower	Upper
Step 1(a)	Concentration	-.586	1.035	.321	1	.571	.557	.073	4.230
	ClockSpeed			3.149	2	.207			
	ClockSpeed(1)	-.730	.456	2.558	1	.110	.482	.197	1.179
	ClockSpeed(2)	-.139	.467	.088	1	.767	.871	.348	2.176
	GBM_H	-.214	.920	.054	1	.816	.807	.133	4.902
	GOSPR	-1.765	.879	4.032	1	.045	.171	.031	.959
	GBM_H by GOSPR	2.373	.986	5.794	1	.016	10.733	1.554	74.128
	Concentration by GOSPR	5.556	2.153	6.661	1	.010	258.844	3.806	17603.442
	Concentration by GBM_H	-3.219	2.506	1.649	1	.199	.040	.000	5.439
	Constant	.781	.585	1.779	1	.182	2.183		

a Variable(s) entered on step 1: Concentration * GOSPR , Concentration * GBM_H .

Correlation Matrix

	Constant	Concentration	ClockSpeed (1)	ClockSpeed (2)	GBM_H	GOSPR	GBM_H by GOSPR	Concentration by GOSPR	Concentration by GBM_H
Constant	1.000	-.803	-.616	-.677	-.187	-.369	.199	.271	.039
Concentration	-.803	1.000	.278	.368	.174	.334	-.067	-.362	-.124
ClockSpeed(1)	-.616	.278	1.000	.578	-.027	.141	-.226	-.098	.120
ClockSpeed(2)	-.677	.368	.578	1.000	.003	.113	-.050	-.068	.014
GBM_H	-.187	.174	-.027	.003	1.000	-.244	-.197	.357	-.757
GOSPR	-.369	.334	.141	.113	-.244	1.000	-.330	-.854	.441
GBM_H by GOSPR	.199	-.067	-.226	-.050	-.197	-.330	1.000	.096	-.280
Concentration by GOSPR	.271	-.362	-.098	-.068	.357	-.854	.096	1.000	-.516
Concentration by GBM_H	.039	-.124	.120	.014	-.757	.441	-.280	-.516	1.000

Model 5: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	11.239	4	.024
	Block	11.239	4	.024
	Model	27.564	10	.002

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	194.529(a)	.154	.208

a Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	7.933	8	.440

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I.for EXP(B)	
							Lower	Upper
GBM_H	-.611	.915	.446	1	.504	.543	.090	3.262
GOSPR	2.124	.839	6.410	1	.011	8.368	1.616	43.342
Concentration	.593	.869	.466	1	.495	1.810	.330	9.937
ClockSpeed			1.394	2	.498			
ClockSpeed(1)	.369	.551	.449	1	.503	1.447	.491	4.263
ClockSpeed(2)	.669	.567	1.392	1	.238	1.952	.643	5.929
GBM_H by GOSPR	2.971	1.279	5.393	1	.020	19.515	1.590	239.567
ClockSpeed * GOSPR			8.145	2	.017			
ClockSpeed(1) by GOSPR	-3.012	1.092	7.605	1	.006	.049	.006	.418
ClockSpeed(2) by GOSPR	-2.471	1.119	4.872	1	.027	.085	.009	.758
ClockSpeed * GBM_H			.502	2	.778			
ClockSpeed(1) by GBM_H	-1.027	1.480	.482	1	.488	.358	.020	6.506
ClockSpeed(2) by GBM_H	-.586	1.217	.232	1	.630	.556	.051	6.047
Constant	-.308	.582	.281	1	.596	.735		

a Variable(s) entered on step 1: ClockSpeed * GOSPR , ClockSpeed * GBM_H .

Correlation Matrix

	Constant	GBM_H	GOSPR	Concen-tration	Clock Speed (1)	Clock Speed (2)	GBM_H by GOSPR	Clock Speed (1) by GOSPR	Clock Speed (2) by GOSPR	Clock Speed (1) by GBM_H	Clock Speed (2) by GBM_H
Constant	1.000	-.268	-.283	-.740	-.680	-.731	.092	.258	.215	.086	.198
GBM_H	-.268	1.000	.142	-.006	.277	.271	-.097	-.089	-.091	-.557	-.734
GOSPR	-.283	.142	1.000	-.024	.302	.294	-.087	-.748	-.735	-.034	-.091
Concentration	-.740	-.006	-.024	1.000	.278	.363	-.089	-.044	.009	.088	.003
ClockSpeed(1)	-.680	.277	.302	.278	1.000	.592	.042	-.443	-.240	-.233	-.221
ClockSpeed(2)	-.731	.271	.294	.363	.592	1.000	.006	-.257	-.405	-.161	-.366
GBM_H by GOSPR	.092	-.097	-.087	-.089	.042	.006	1.000	-.134	-.097	-.577	-.108
ClockSpeed(1) by GOSPR	.258	-.089	-.748	-.044	-.443	-.257	-.134	1.000	.584	-.039	.092
ClockSpeed(2) by GOSPR	.215	-.091	-.735	.009	-.240	-.405	-.097	.584	1.000	.118	.100
ClockSpeed(1) by GBM_H	.086	-.557	-.034	.088	-.233	-.161	-.577	-.039	.118	1.000	.522
ClockSpeed(2) by GBM_H	.198	-.734	-.091	.003	-.221	-.366	-.108	.092	.100	.522	1.000

Model 6: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	6.565	2	.038
	Block	6.565	2	.038
	Model	34.129	12	.001

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	187.965(a)	.187	.253

a Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	8.054	8	.428

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I.for EXP(B)	
							Lower	Upper
GBM_H	1.642	1.537	1.140	1	.286	5.165	.254	105.122
GOSPR	-.255	1.337	.036	1	.849	.775	.056	10.649
Concentration	.040	1.070	.001	1	.970	1.041	.128	8.473
ClockSpeed			.908	2	.635			
ClockSpeed(1)	.237	.561	.179	1	.672	1.268	.422	3.808
ClockSpeed(2)	.550	.588	.874	1	.350	1.733	.547	5.488
GBM_H by GOSPR	3.965	1.533	6.685	1	.010	52.711	2.610	1064.646
ClockSpeed * GOSPR			5.246	2	.073			
ClockSpeed(1) by GOSPR	-2.782	1.220	5.197	1	.023	.062	.006	.677
ClockSpeed(2) by GOSPR	-1.704	1.198	2.023	1	.155	.182	.017	1.905
ClockSpeed * GBM_H			1.956	2	.376			
ClockSpeed(1) by GBM_H	-2.195	1.642	1.786	1	.181	.111	.004	2.785
ClockSpeed(2) by GBM_H	-1.555	1.393	1.246	1	.264	.211	.014	3.240
Concentration by GBM_H	-5.305	3.056	3.014	1	.083	.005	.000	1.982
Concentration by GOSPR	5.430	2.637	4.240	1	.039	228.050	1.299	40030.233
Constant	-.026	.659	.002	1	.969	.974		

a Variable(s) entered on step 1: Concentration * GBM_H , Concentration * GOSPR .

Correlation Matrix for model 6

	Constant	GBM_H	GOSPR	Concentration	Clock Speed (1)	Clock Speed (2)	GBM_H by GOSPR	Clock Speed (1) by GOSPR	Clock Speed (2) by GOSPR	Clock Speed (1) by GBM_H	Clock Speed (2) by GBM_H	Concentration by GBM_H	Concentration by GOSPR
Constant	1.000	-.292	-.445	-.805	-.676	-.743	.038	.324	.345	.151	.257	.104	.263
GBM_H	-.292	1.000	-.188	.182	.212	.252	.285	-.161	-.052	-.635	-.705	-.751	.377
GOSPR	-.445	-.188	1.000	.336	.325	.330	-.234	-.393	-.628	.061	.018	.388	-.755
Concentration	-.805	.182	.336	1.000	.328	.433	-.033	-.177	-.193	-.025	-.121	-.132	-.320
ClockSpeed (1)	-.676	.212	.325	.328	1.000	.608	.067	-.439	-.297	-.262	-.231	-.022	-.131
ClockSpeed (2)	-.743	.252	.330	.433	.608	1.000	.020	-.294	-.464	-.185	-.380	-.071	-.131
GBM_H by GOSPR	.038	.285	-.234	-.033	.067	.020	1.000	-.270	-.032	-.607	-.196	-.431	.287
ClockSpeed (1) by GOSPR	.324	-.161	-.393	-.177	-.439	-.294	-.270	1.000	.542	.048	.143	.123	-.108
ClockSpeed (2) by GOSPR	.345	-.052	-.628	-.193	-.297	-.464	-.032	.542	1.000	.094	.116	-.042	.197
ClockSpeed (1) by GBM_H	.151	-.635	.061	-.025	-.262	-.185	-.607	.048	.094	1.000	.585	.336	-.148
ClockSpeed (2) by GBM_H	.257	-.705	.018	-.121	-.231	-.380	-.196	.143	.116	.585	1.000	.305	-.134
Concentration by GBM_H	.104	-.751	.388	-.132	-.022	-.071	-.431	.123	-.042	.336	.305	1.000	-.563
Concentration by GOSPR	.263	.377	-.755	-.320	-.131	-.131	.287	-.108	.197	-.148	-.134	-.563	1.000

Appendix E: SAS Poisson Regression Results for Survival Analysis

The GENMOD Procedure

Model Information

Data Set	WORK.GG	
Distribution	Poisson	
Link Function	Log	
Dependent Variable	Longevity	Longevity
Offset Variable	MeanLongevity	MeanLongevity
Observations Used	165	

Class Level Information

Class	Levels	Values
ClockSpeed	3	F M S
SupplyChain	3	CONV DE DL
GBias	3	BD Neu SD

Criteria For Assessing Goodness Of Fit

Criterion	DF	Value	Value/DF
Deviance	140	163.3551	1.1668
Scaled Deviance	140	163.3551	1.1668
Pearson Chi-Square	140	153.7010	1.0979
Scaled Pearson X2	140	153.7010	1.0979
Log Likelihood		297.8478	

Algorithm converged.

Analysis Of Parameter Estimates

Parameter			DF	Estimate	Standard Error	Wald 95% Confidence Limits		Chi-Square	Pr > ChiSq
Intercept			1	-3.3685	0.5475	-4.4416	-2.2955	37.86	<.0001
GBMH			1	0.0572	0.3355	-0.6003	0.7148	0.03	0.8645
GOSPR			1	-0.1899	0.3240	-0.8250	0.4452	0.34	0.5579
GBias	BD		1	-0.0136	0.2972	-0.5962	0.5689	0.00	0.9634
GBias	Neu		1	-0.0150	0.2632	-0.5308	0.5009	0.00	0.9547
GBias	SD		0	0.0000	0.0000	0.0000	0.0000	.	.
Concentration			1	1.0512	0.9836	-0.8765	2.9790	1.14	0.2852
AdsByValAdded			1	170.7954	114.2296	-53.0905	394.6812	2.24	0.1349
CapbyFirm			1	-0.0000	0.0000	-0.0001	0.0001	0.02	0.8949
ClockSpeed	F		1	-0.8384	0.4295	-1.6802	0.0034	3.81	0.0509
ClockSpeed	M		1	-0.6023	0.3156	-1.2208	0.0163	3.64	0.0564
ClockSpeed	S		0	0.0000	0.0000	0.0000	0.0000	.	.
SupplyChain	CONV		0	0.0000	0.0000	0.0000	0.0000	.	.
SupplyChain	DE		0	0.0000	0.0000	0.0000	0.0000	.	.
SupplyChain	DL		0	0.0000	0.0000	0.0000	0.0000	.	.
GBMH*GOSPR			1	0.4162	0.2489	-0.0716	0.9040	2.80	0.0945
GBMH*ClockSpeed	F		1	0.7062	0.6514	-0.5706	1.9830	1.18	0.2783
GBMH*ClockSpeed	M		1	0.7870	0.6241	-0.4362	2.0102	1.59	0.2073
GBMH*ClockSpeed	S		0	0.0000	0.0000	0.0000	0.0000	.	.
GOSPR*ClockSpeed	F		1	1.4047	0.5753	0.2770	2.5323	5.96	0.0146
GOSPR*ClockSpeed	M		1	1.2898	0.5644	0.1835	2.3961	5.22	0.0223
GOSPR*ClockSpeed	S		0	0.0000	0.0000	0.0000	0.0000	.	.
GBMH*Concentration			1	-2.1121	0.9199	-3.9150	-0.3092	5.27	0.0217
GOSPR*Concentration			1	1.8029	0.7749	0.2842	3.3217	5.41	0.0200
SupplyChain*GBias	CONV	BD	1	-0.1739	0.4005	-0.9589	0.6111	0.19	0.6642
SupplyChain*GBias	CONV	Neu	1	-0.2705	0.3622	-0.9804	0.4395	0.56	0.4553
SupplyChain*GBias	CONV	SD	0	0.0000	0.0000	0.0000	0.0000	.	.
SupplyChain*GBias	DE	BD	1	0.4548	0.5137	-0.5520	1.4616	0.78	0.3760
SupplyChain*GBias	DE	Neu	1	0.1394	0.4508	-0.7442	1.0230	0.10	0.7572
SupplyChain*GBias	DE	SD	0	0.0000	0.0000	0.0000	0.0000	.	.
SupplyChain*GBias	DL	BD	0	0.0000	0.0000	0.0000	0.0000	.	.
SupplyChain*GBias	DL	Neu	0	0.0000	0.0000	0.0000	0.0000	.	.
SupplyChain*GBias	DL	SD	0	0.0000	0.0000	0.0000	0.0000	.	.
GBMH*AdsByValAdded			1	-47.3920	103.7940	-250.825	156.0404	0.21	0.6480
GOSPR*AdsByValAdded			1	-227.390	95.2355	-414.048	-40.7320	5.70	0.0170
GBMH*CapbyFirm			1	0.0000	0.0001	-0.0001	0.0001	0.20	0.6517
GOSPR*CapbyFirm			1	-0.0001	0.0000	-0.0002	-0.0000	4.89	0.0270
Scale			0	1.0000	0.0000	1.0000	1.0000		

NOTE: The scale parameter was held fixed.

LR Statistics For Type 1 Analysis

Source	Deviance	DF	Chi-Square	Pr > ChiSq
Intercept	207.2149			
GBMH	205.6698	1	1.55	0.2139
GOSPR	202.5139	1	3.16	0.0757
GBias	202.0785	2	0.44	0.8044
Concentration	201.2712	1	0.81	0.3689
AdsByValAdded	191.9295	1	9.34	0.0022
CapbyFirm	190.6935	1	1.24	0.2662
ClockSpeed	185.7178	2	4.98	0.0831
SupplyChain	185.7178	0	0.00	.
GBMH*GOSPR	185.7173	1	0.00	0.9831
GBMH*ClockSpeed	182.3171	2	3.40	0.1827
GOSPR*ClockSpeed	182.0027	2	0.31	0.8545
GBMH*Concentration	178.3917	1	3.61	0.0574
GOSPR*Concentration	173.3504	1	5.04	0.0248
SupplyChain*GBias	170.1293	4	3.22	0.5215
GBMH*AdsByValAdded	169.7987	1	0.33	0.5653
GOSPR*AdsByValAdded	168.2640	1	1.53	0.2154
GBMH*CapbyFirm	168.2638	1	0.00	0.9885
GOSPR*CapbyFirm	163.3551	1	4.91	0.0267

LR Statistics For Type 3 Analysis

Source	DF	Chi-Square	Pr > ChiSq
GBMH	1	1.04	0.3080
GOSPR	1	2.22	0.1366
GBias	2	1.13	0.5689
Concentration	0	0.00	.
AdsByValAdded	0	0.00	.
CapbyFirm	0	0.00	.
ClockSpeed	0	0.00	.
SupplyChain	0	0.00	.
GBMH*GOSPR	1	2.83	0.0926
GBMH*ClockSpeed	2	1.56	0.4575
GOSPR*ClockSpeed	2	5.64	0.0597
GBMH*Concentration	1	5.33	0.0209
GOSPR*Concentration	1	5.58	0.0182
SupplyChain*GBias	4	2.14	0.7104
GBMH*AdsByValAdded	1	0.21	0.6506
GOSPR*AdsByValAdded	1	5.45	0.0196
GBMH*CapbyFirm	1	0.20	0.6512
GOSPR*CapbyFirm	1	4.91	0.0267