A Dissertation

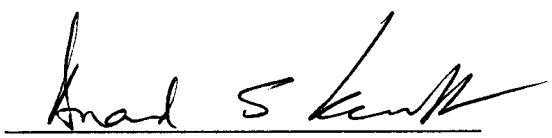
entitled

Supportive Leadership, Learning Capability, IT Support Capability, Power And Value Appropriation In IOS Supply Chain Network Context

By

Xiao Li

Submitted as partial fulfillment of the requirements for
The Doctor of Philosophy Degree in
Manufacturing Management



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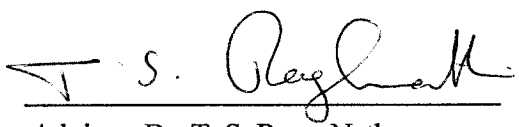

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An Abstract of

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One of the challenging developments to affect supply chain management in recent year is the advent of Electronic business-to-business commerce. New information technology offers new opportunities to improve effectiveness and efficiency of supply chain management. Interorganizational information systems (IOS) change the ways in which firms do business and provide the foundation for timely information sharing among trading partners. IOS has the potential to significantly alter the basis of competition in the marketplace and provides new opportunity to allow trading partners to get expanded benefits. During the process of IOS design, implementation and usage, power imbalance is an unavoidable phenomenon, which determines the competitive position within and outside the IOS supply chain network.

This study focuses on the following questions: What determines the apportionment of the expanded benefits brought by the participation of IOS supply chain network? What is the role of power in the relationships during the division process of expanded benefits in IOS context? What are the determinants of power in IOS supply chain network? What are the relational outcomes and economic outcomes of power in IOS supply chain network context?

This research represents one of the first large-scale empirical efforts to explore the power in IOS supply chain network context. Based on a comprehensive literature review, a research model was developed to explore the determinants (i.e. learning capability, supportive leadership and IT support capability) of the power from behavioral and technical perspectives and examine the economic and relational outcomes of power (i.e., value appropriation and relational quality).

Valid and reliable measures of the constructs were developed. A large-scale survey yielded 228 usable responses from purchasing professionals. Rigorous statistical methods were used to assess and validate the constructs. The research findings supported almost all of the proposed hypotheses. This research has important implications for academicians and practitioners.

To My Parents: Xiaolian Li & Aihua Tian
Live well and be happy

To My Husband: Xiaodong Duan
A beloved companion

To My Gifted Children: Nika, Rana & the child on the way
The source of my happiness, pride and strength

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CHAPTER 1 INTRODUCTION

1.1 Introduction

The success of companies like Wal-Mart and Dell in exploiting supply chain opportunities has motivated the whole field of supply chain management. The supply chain, with all its transaction and information-intensity, offers substantial opportunities for inventory and working capital reductions and closer relationships with its trading partner (Davenport and Brooks, 2004). In manufacturing companies, the main task of supply chain management is to meet end-customer demands on the one side through the supply chain networks on the other side. Effectively using supply network means managing material and information flow between one company and its trading partner and within the company's different functional areas.

Information is the glue that holds the supply chain network participants together and information and communication technology are an important enabler for effective supply chain management (Kopczak, 2001). The rapidity of information technology development represents a major challenge and opportunity for supply chain management. With the development of IT, inter-organizational information system (IOS) gradually becomes strategic necessity for the organizations. IOS is mostly used as a defensive tool, without the IOS, the company will be in bad competitive position in the future. IOS is defined as IT-based systems that link an organization with its trading partner (suppliers or

buyers), such as Electronic Data Interchange (EDI), Electronic Funds Transfer (EFT), and Internet services (Bakos, 1987; Kumar and Crook, 1999). In general, an IOS consists of computers and communication network infrastructure that permit sharing of applications while for making reservations and/or ordering supplies (Cash and Konsynski, 1985). IOS facilitates supply chain network development and supply chain network benefits creation, its basic purpose is the exchange of information-based products or service (Bakos, 1987).

One important advantage of the participation of IOS network is information sharing. IOS reduces information sharing cost dramatically. IOS provides the technical means to improve supply chain management responsiveness and efficiency. Information sharing is necessary. However, information sharing is not free and the cost/ benefits of information sharing are not equally distributed among trading partners. Of significant importance to our understanding of IOS is the analysis of the benefits it grants upon adopting companies.

Although the use of IOS is gaining widespread practical application in many industries such as automobile, airline and textile industry etc. and the buyer-supplier relationship has drawn much attention in recent years, there is sparse theoretical development to analyze the nature of the relationship and the effect of IOS on the relationship. The nature of the inter-organizational relationship is not clearly understood.

There has been a growing interest in the development of cooperative relationships between organizations. Some researchers emphasize cooperation and propose that competition shifts from competing between organizations to competing between supply chains (Harland, 1996). Some researchers such as Webster (1995) realize that conflict exists in the inter-organizational relationship behind cooperation, because each organization has individual preferred interest (Brett et al., 1994). Obviously, competition between organizations in IOS context has some change comparing with traditional competition, but competition does not disappear, it just manifests in a different way. Ray Noorda, the founder of the networking software company, coined the word "co-opetition" first. Brandenburger and Nalebuff (1996) use Noorda's word "co-opetition" to describe the relationship between trading partners, which means "business is cooperation when it comes to creating a pie and competition when it comes to dividing it up. ... (Business) is simultaneously war and peace" (Brandenburger and Nalebuff, 1998, p.4). How to handle the inter-organizational relationship is a new challenge faced by the organizations, which want to build stable relationship with its trading partners. This study adopts this "co-opetition" point of view about the nature of inter-organizational relationship.

In supply chain management literature, management is now looking to the supply function to achieve cost reductions, product delivery and quality improvement, access to new source of technology, cycle time reduction, and streamlined processes. Strategic supply management involves developing the strategies and approaches to do the following jobs: 1) developing strategies to assure the flow of materials required to support daily operations; 2) establishing real-time information systems with trading

partners; 3) working with trading partners to access leading-edge technology; 4) developing positive relationship with trading partners etc.

Much attention has been paid to why/how supply chain management can achieve the expanded benefits (e.g. squeezing waste from supply chain/value chain) through IOS implementation. Clearly, opportunities to reduce inventories, shorten lead times and improve operation process, squeeze waste out of supply chain are abundant. Search for extra value or "the expanded pie" through supply chain or supply network is the main objective of supply chain management. Supply networks do expand "the pie of benefits" through IOS application, such as TradeNet in Singapore (Teo et al. 1997). However, little is mentioned on how to distribute the expanded benefits (Jap, 2001). The expanded benefits are not equally divided among trading partners; powerful companies such as the giants in automotive, electronics and retailing industries use IOS supply chain network as a tool to exploit more expanded benefits (Webster, 1995).

Power is an important issue. Power is context related. In different context, the content of power will be different. The research of power in IOS supply chain network context is limited. Clearly definition of power, valid measurement of power and exploration of determinants/outcome of power in IOS context will no doubt offer some insights into the supply chain management process to both academics and practitioners. In this research we will explore power in IOS supply chain network context. In brief, the phrase IOS context is used to represent IOS supply chain network context.

1.2 Problem Statement

Power in IOS context is an unavoidable phenomenon. In any IOS supply chain network, there is always one organization or some combination of organizations in a dominant position (i.e. power). For example, General Motors, Ford, and Daimler-Chrysler teamed up to form Covisint, an IOS supply chain network that handles up to half a trillion dollars in annual purchases from 8,000 individual suppliers. Obviously, the combination of the three organizations is powerful.

Power has been described as the dirty word, just as the phrase "power corrupts, and absolute power corrupts absolutely". However, power is a natural process in any group or organization, it is not going to go away and power is not always bad (Robbins, 2000). In IOS context, some researchers such as Allen et al. (2000) regard powerful companies as necessary since they provide effective governance structure. These investigations are limited to conceptualization and case study. But these analyses provide evidences in support of the importance of the power in IOS context.

Power based on the control over resources vital to organizations is one of mechanisms for decision-making, which solves the organizations' different interests and preference. The nature of power has been explored in several disciplines such as: social psychology, sociology, marketing and economics. When power is studied in the inter-organizational context, interdependence is a necessary prerequisite condition for exerting power (Pfeffer and Salancik, 1978), and because interdependence is not symmetric or balanced, some organization with less dependence on other trading partners will have

power in interorganizational context. Advancement in the use of information technology entails greater interdependence between organizations than before (Williams, 1997; Clark and Lee, 2000). In order to explore the potentials of IOS supply chain network, high levels of rational control and/or high levels of consensus and cooperation are required. There is no power without control (Cendon and Jarvenpaa, 2001). Dominance (power) is related to the control of critical resources (Aldrich, 1979). "Dominance attaches to the unit that controls the conditions necessary to the functioning of the other units" (Hayley, 1950, p221). Power is the ability to get other party to do something it would otherwise not to do out of its self-interest (Ancona et al., 1999).

This research focuses on: What's the content of power in IOS context? What is the role of power during the division process of expanded benefits in IOS context? When IOS becomes strategic necessity, what are the determinants of power in IOS context? What are the relational outcomes and economic outcomes of power in IOS context?

1.3 Research Objectives

Some studies have tended to highlight the importance of the unequal power relationship between buyer and supplier companies. Supply chain relationships are regarded as a vehicle for intensifying exploitation of one organization by another. Although some researchers have recognized the power imbalance in the relationship, these arguments are case-based. A systematic empirical assessment of the power in IOS context is limited. The following are the objectives of this research.

First, this research explores the determinants of the power in IOS context from both ***behavioral*** and ***technical*** perspectives. Second, this research explores economic and relational outcomes of power in IOS context. Third, the developed conceptual model tries to address the missing link in the power literature, organizational learning literature and IOS supply chain network literature. Fourth, this research tries to develop valid and reliable instruments for some important concepts such as Learning capability, power in IOS context etc. Finally, using an empirical method (large scale survey), this study will explore the following important relationships between the (1) Learning Capability, (2) Supportive Leadership, (3) IT Support Capability, (4) Power in IOS supply network context, (5) Value Appropriation, and (6) Relationship Quality.

CHAPTER 2 RESEARCH BACKGROUND

2.1 Literature Review of IOS Supply Chain Network

Supply chain network can enhance and broaden the organization's capability (Yamin, 1996). Networks are made up of inter-coupled connections (Cook and Emerson, 1978). A supply chain network refers to a set of firms that are connected through transaction (Choi and Hong, 2002). IOS supply chain network is a supply network linked by IOS. According to Bakos (1991), IOS has three characteristics: 1) decreasing the cost of information exchange; 2) IOS innovators' benefits increase as the number of firms joining the network increases; 3) switching cost is great when a firm shifts from one IOS to another.

Weick (1990) argues that the IOS application processes, the social context in which they are introduced, and the participant action may combine to influence the interorganizational relationship. Teo et al. (1997) reported that TradeNet in Singapore changes the business process, organizational structure as well as the business network and has achieved expanded benefits. Some researchers) argue that in some cases the reason that firms are unsuccessful in appropriating full value from their investments in technology is because they fail to simultaneously invest in the requisite complementary assets (e.g. new processes, work routines, organizational knowledge) that are necessary for obtaining benefits (Teece, 1987; Johnston and Vitale, 1988). Brynjolfsson and

Hitt (1998) suggested that IT value should be measured not only by cost saving, but also by improvement in quality, customer service, and new product development (i.e. strategic benefits or long-term benefits).

Adoption of electronic communications between the trading partners is a major part of the establishment of this highly coupled relationship. IOS increasingly support partnering among organizations. An IOS supply chain network makes it possible to seek new business opportunities and get expanded benefits. Organizations have invested heavily in IOS such as EDI to manage the information flows in the supply chain/supply network (Kanakamedala et al, 2003). However, SCM software alone cannot solve supply chain network problems (Sherer, 2005). Relationship management is important for the success of IOS establishment (Meier, 1995).

2.1.1 Cooperation in IOS supply chain network

Many researchers (e.g. Lee and Ng, 1997; Clark and Lee, 2000) maintain that cooperation within trading partners and organizational integration are key dimensions of SCM. Information is the glue that holds supply chain network participants together, and information & communication technology is an important enabler for effective SCM (Kopczak, 2001). IOS as a technical tool links multiple organizations together. IOS involve cooperation among different organizations. According to Kumar and Crook (1999), IOS usually take the form of long-term IT-related business arrangement regulated by contracts, such as: electronic data interchange (EDI) among members of a supply chain (Dearing, 1990), Electronic funds transfer (EFT) among financial institutions

(Neuman, 1994), Internet services to link organizations. Allen et al. (2000) find that the success of an IOS is based on cooperation rather than competition. Allen et al. (2000) indicate that different objectives require a need for strategic alignment. After discovering the inadequacy of traditional relationships across supply chain, many organizations are establishing cooperative relationship with their trading partners through improved electronic communications (Clark and Lee, 2000).

2.1.2 Conflicts between IOS participants in supply network

There are no doubts that IOS contributes to the expanded benefits for the whole supply chain network through cooperation. However, IOS often involves conflicts between trading partners, since each organization has individual preferred interests (Brett et al., 1994) and not all organizations realized equal benefits from the cooperation in IOS supply network (Webster, 1995).

The potential of IOS network will fundamentally redefine relationships between trading partners within an industry and will change industry structure (Clark et al. 2001). Webster (1995) highlights the reasons for conflicts between buyer-supplier relationships: 1) the structure of the supply chain in the industries, 2) the established expertise and resources in information systems held by the hubs; 3) electronic trading networks themselves; 4) competition factor in supply network relationship. Although these arguments relating to the conflicts in the relationship are case-based, they invoke the deep study of the IOS trading partners' relationship.

In many case studies (e.g. Brett et. al, 1994), companies recognized that conflicts are inevitable in all long-term relationships and the cost of resolving conflict can be high. According to Ancona et.al (1999), there are three ways to solve the conflicts: 1) based on who is powerful; 2) based on who is right under some standard of law or contract; and 3) based on they can reconcile their interests. There are many examples for solving conflicts without resorting to litigation. Because litigation will sacrifice both conflicting partners' potential opportunities promised by their relationship: such as becoming a major partner in the future. Profit-making is the main function for most companies. The most common use of power in conflict resolution is economic warfare among competitors (Ancona et.al., 1999).

2.1.3 Influence of IOS on Its Participants

IOS have become indispensable in some industries because inter-organizational transactions play a central role in our economic system. Using Porter's Industry and Competitive Analysis (ICA), Cash and Konsynski (1985) analyzed the potential competitive effect of IOS and argued that an IOS may serve as a means of differentiation by a radical modification of access to distribution channels. American Airlines' SABRE and United's APOLLO reservation systems illustrate inter-organizational links that control market access in their industry. Heavy equipment manufacturers have required their major suppliers to link directly into their CAD/CAM systems while also providing ancillary services such as order tracking to their customers via an IOS. In those cases, IOS sets the stage for redefinition of organizational boundaries and competition patterns in their industry segments.

Organizations may unite under a common set of standards and protocols, which can set up entry or exit barriers (Romano, 2003; Choi and Hong, 2002). For example, GM now requires its primary supplier to adhere to computer hardware standards and communication protocols recommended by the Automotive Industry Action Group, of which GM is a part. Clearly, inter-organizational links will bring changes in the pattern of competition within industries.

IOS appears to have a range of impacts on participants such as changes in business processes (e.g. order entry and production). Because some business processes must conform to the standards of IOS network or take into account various procedures in internal control, report formats, planning systems and communication patterns. When an organization is the initiator of IOS, the strategy and organization structure change first, then conduct training and selection of employees, business process will change correspondingly. When an organization is the follower of IOS, the change order reverses: business process (first); training and selection of employees (second); strategy and organization structure (third). The changing order reflects the strategic perspective.

2.1.4 Participation levels in IOS network

Several researchers have realized that participation in IOS falls into different levels based on their related responsibility, cost commitment, organizational and technical complexity in IOS network (Cash and Konsynski, 1985; Bakos, 1982).

As the level of involvement increases, related responsibility, cost commitment, and organizational and technical complexity increase. At lower level (e.g. information entry and receipt), users generally have access only through restricted protocols. For example, many companies have already accepted door-to-door EDI. Comparing with full-scale EDI system, door-to-door EDI is referred to as the company implements relatively few applications on a front-end system that is not integrated to its internal transaction processing systems. Higher-level participants determine the standards and procedures and retain control of the application. In the Airline Computer Reservation System, the travel agent must follow the policies and procedures embedded in the computer programs written and maintained by the major carrier. CIRRUS network permits ATM transactions nationwide; it must accept a great deal of responsibility for the reliability, availability, integrity, security, and privacy of its system. In general, higher level participants have more responsibility and power than lower level participants (Williams, 1997). IOS supply chain network reflect the strategic interests of powerful participants and the struggles of those participants for the domination in the market place.

2.2 Literature Review of Power

In general, power is the ability to achieve desired outcomes (Giddens, 1984; Salancik and Pfeffer, 1977; Pfeffer, 1992). Power has been explored at different levels such as individual level, organizational level and inter-organizational level (e.g. Stern and EI-Ansary, 1972; Egtar, 1978; Cendon and Jarvenpaa, 2001).

At individual level, French and Raven (1959) identify the bases of power (or sources of power) in a five-category classification scheme: coercive, reward, legitimate, expert, and referent. ***Coercive*** power means power that is based on fear; the opposite of coercive power is ***reward*** power, i.e. compliance achieved based on the ability to distribute rewards that others view as valuable; ***legitimate*** power is the result of his or her position in the formal hierarchy of an organization; ***expert*** power results from the expertise, special skills or knowledge the person possessed; **referent** power is the identification of a person who has desirable resources or personal traits, referent power explains why celebrities are paid millions of dollars to endorse products in commercials, which influence your choice of the product (Robbins, 2000). This does not conflict with resource dependency theory (Pfeffer and Salancik, 1978). When people have above power, they must have some resources vital to other persons such as special knowledge, reputation etc.

Pfeffer and Salancik (1978) explored the interorgainzational relationships from resource dependency theory and provided ten conditions which influence the interorganizational power. Organization can act to affect the conditions governing the influence process. The conditions are also partly consistent with various models of intra-organizational power. Salancik and Pfeffer (1974) have indicated that the power of a department in an organization is a function of the amount of important resources contributed by the department.

The *resource dependency theory* hypothesizes that power in exchange relations is a function of the relative control of the resources that are needed by the parties in the exchange. There are other theories relating to power. The *game theory* on decision-making has derived another view on power in exchange relationships. The essential element is the ability to create credible commitments that may change the other party's perceptions of the situation (Schelling, 1960; Dixit and Nalebuff, 1991). Projected to power in the IOS supply chain network, we may expect that the exchange of threats and promises and other commitment will affect the outcomes of negotiations on costs, prices, and thus profits. In fact, these commitments still need to be based on some resources which are important to others. The *structural theory* hypothesizes that power is derived not from the actions of people but from the organizational structures.

Based on the literature review, dependency is an important theme in any discussion of power and power is about the control of alternatives and action (Stannack, 1996; Ramsay, 1995; Porter, 1980). No matter what level it is (individual level, organizational level or inter-organizational level), the key to power is dependency. The greater B's dependency on A, the greater the power A has over B. The organization's power is increased when the resources the organization controlled is important, scare and non-substitute for its trading partner. The power will determine the competitive position within and outside the network.

In General, power has to do with the capacity of one party to control or influence the behaviors of another party or parties. EI-Ansary and Stern (1992) applied this notion

to distribution channels. Organizations that control the resources vital to their trading partners will tend to influence/control their partners. In IOS context, each party has different interest. These interests are embedded in the IOS design and implementation. Powerful companies in IOS supply network can determine IOS related standards and protocols, and can dictate IOS functioning: network architecture, communications protocols, message standards, product coding and information handling procedures etc. In fact, information, electronic trading network, and network structural bonding are necessary resources for any organization to survive and grow. Organizations that control the allocation, access or use of these resources can control and influence other participants in IOS supply network, i.e. the power in the IOS context. Thus, each participant has to determine for itself how far it can extend its scope of influence (i.e. power) within the supply network and how to respond to IOS initiatives by others.

2.3 Literature Review of Organizational Learning

The importance of learning capability is well documented in organizational learning literature (e.g. Huber, 1991; Goh and Richards, 1997, 2003). Organizational learning has emerged as one of the promising topic in the field of management (Smith et al., 1996). An organization's supply chain network provides it with new opportunities to create more value. The issue of value creation through alliance has received much attention recently (Gulati et al., 2001; Dyer and Singh, 1998).

Learning is a human behavior; organizational learning is accumulated through individual learning. However, organizational learning is beyond individual learning,

organizational learning needs appropriate management practices and internal conditions (Goh and Richards 1997, 2003). Strong learning capability will help organizations to survive and grow in dynamic environments and an organization's learning capability is closely related to its supportive leadership. Ability to learn and learning how to cooperate with its trading partners in a dynamic environment are dynamic processes. During this process the organization builds its organizational knowledge and changes its weaknesses and gains strength relative to its trading partner (Bellon and Niosi, 2001).

Numerous researchers have suggested the potential to learn from a strategic partner in an alliance and regarded alliances as tools used by companies to acquire knowledge and to learn new skills from others (Hamel, 1991; Powell et al., 1996; Parise and Henderson, 2001). The key to transferring the value creation opportunity into reality is the organization's learning capability. Such research has increased our collective understanding of the factors influencing an organization's power in IOS context (Sambamurthy and Zmud, 1999).

CHAPTER 3 CONCEPTUAL MODEL AND HYPOTHESES DEVELOPMENT

IOS are being widely adopted in diverse industries such as airline, health care, automobile, banking, retailing, transport and others (Meier, 1995; Webster, 1995). In the industries where IOS are used pervasively, participation in IOS becomes a necessity for the continued existence in their industry (Mackay, 1992; Iacovou et al., 1995; Galliers et al., 1995; Meier, 1995; Williams, 1997). IOS is a relative new technology; its development, maintenance and improvement are accompanied with risk and opportunities. According to Conway (2000), without adequate IT capability, organizations are more likely to feel threatened by the complexity of IOS and can't exploit IOS to its full potential use. Using EDI adoption as an example, organizations that have no adequate in-house IT resource can only adopt door-to-door EDI, which influences them to fulfill the potential benefits of EDI. They cannot integrate EDI to their own internal IT application, thus EDI adoption increases the cost rather than add value to them. Therefore, without adequate in-house IT capability to support its supply chain management, the organization has no choice but to incur the economic loss.

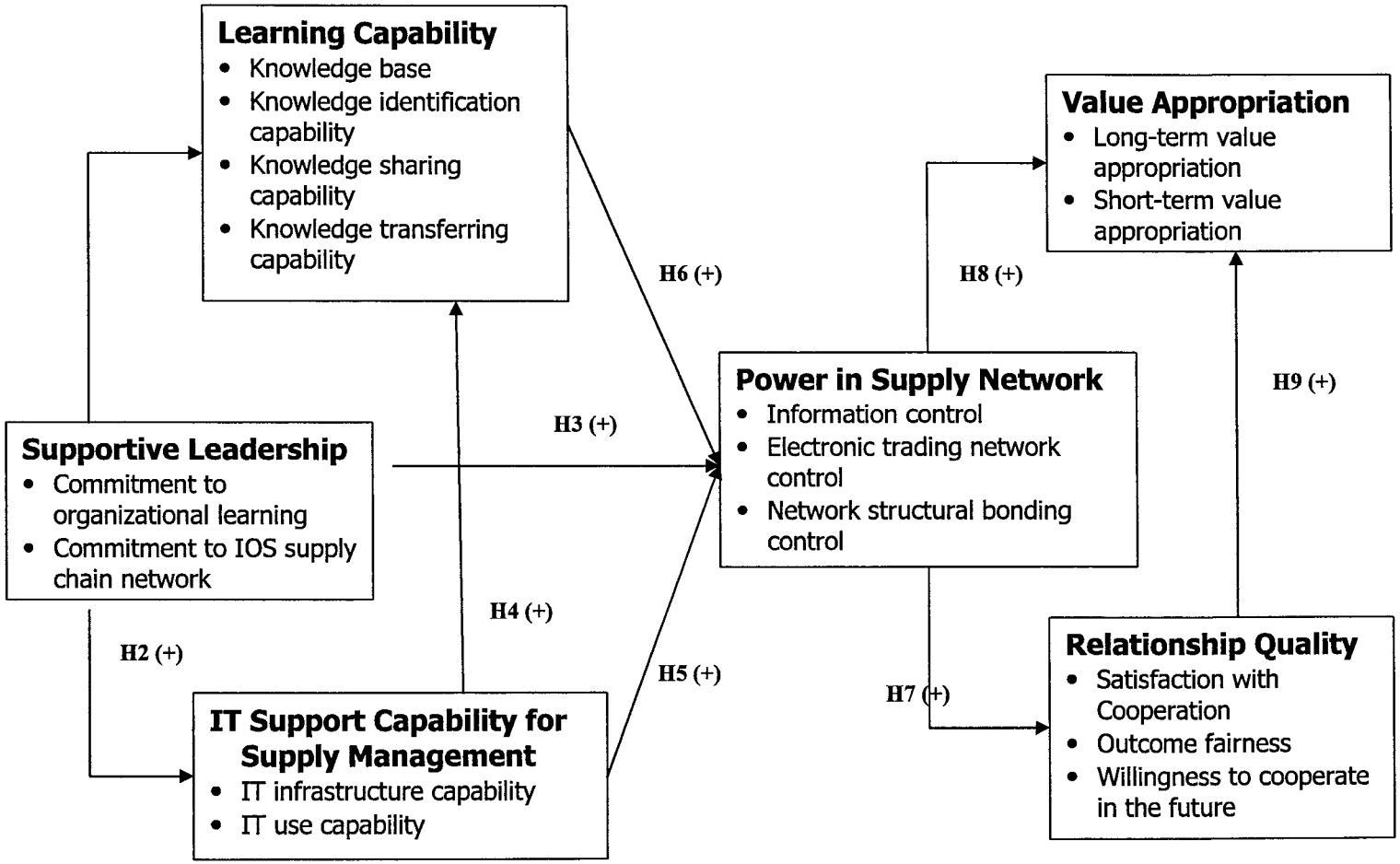
Currently, many inter-organizational information systems are simply order processing systems and electronic markets that link organizations to suppliers, distribution channels and customers locally, nationally and internationally (Johnston and vitale, 1988). However, when IOS are used to develop new forms of coordination and

control between organizations such as Covisint, they penetrate more deeply into the affairs of each organization (Williams, 1997). Connecting intensive information and business process environment between different organizations has proven to be much more difficult than expected. IT advancement provides technical capability to share real-time information between organizations. IOS design and implementation is more than just technical. Barber, as a political scientists argues (1966, p 65) "Insofar as knowledge is power, communication systems are power systems". In IOS context, IOS is a main electronic communication system between trading partners, reflecting the participant's strategic interest, which is not only closely related to the participant's IT support capability for supply chain management, but also closely related to the participant's top management involvement and its learning capability in a dynamic environment.

The structure of an organization ultimately emerges regardless of the intended design (Mintzberg, 1979). The structure of a supply network will also emerge over a period of time (Choi et al., 2001). But the structure is not exactly as any individual organization's intended design. It is the outcome of the actions of all the supply chain network participants. The underlying purpose of structure is to control/influence activities (Gilson et al., 1997; Miles, 1980; Choi and Hong, 2002). "Organizations are embedded in its social context, which is the outcome of the actions of social actors. .... organizations attempt to influence and control their social context" (Pfeffer and Salancik, 1978). In IOS context, the influence/control of each participant is subjected to its learning capability, IT support capability and supportive leadership, which determine the company's position in alliance (i.e. Power in IOS context).

Figure 3.1 is the conceptual model, which shows the determinants of power in IOS supply chain network context (i.e. learning capability, supportive leadership, IT support capability for supply management) and consequences of the power in IOS supply network (i.e. value appropriation and relationship quality). Supportive leadership will also positively influence an organization's learning capability and IT support capability. The relational outcome will positively influence the economic outcome.

Figure 3.1 the Conceptual Model of Power in Supply Chain Network Context



HYPOTHESES

H1: An organization's supportive leadership positively influences its learning capability

H2: An organization's supportive leadership positively influences its IT support capability for supply management

H3: An organization's supportive leadership positively influences its power in supply network context

H4: An organization's IT support capability for supply management positively influences its learning capability

H5: An organization's IT support capability for supply management positively influences its power in supply network context

H6: An organization's learning capability positively influences the focal company's power comparing with its trading partner

H7: An organization's power in supply network context positively influences its relationship quality with its trading partner

H8: An organization's power in supply network context positively influences its value appropriation.

H9: An organization's relationship quality with its trading partner positively influences its value appropriation

3.1 Learning Capability (LC)

Cohen and Levinthal (1990) described an absorptive capacity as an organization's ability to recognize the new external information, assimilate it, and apply it to commercial ends. It is largely a function of prior related knowledge. At organizational level, this prior knowledge includes basic skills, and the knowledge of the most recent scientific or technological developments in related field. Knowledge is a broad and abstract notion, there is no censuses about its definition (Alavi and Leidner, 1999). However there has been growing interest in treating knowledge as a significant organizational resource (Drucker, 1993; Nonaka and Takeuchi, 1995; Hamel and Prahalad, 1994).

Huber (1991) describes the four organizational learning-related constructs: *knowledge acquisition* (i.e. the process by which knowledge is obtained); *Information distribution* (i.e. the process by which information from different sources is shared and thereby leads to new information); *Information interpretation* (i.e. the process by which distributed information is given one or more commonly understood interpretations); *Organizational memory* (i.e. the means by which knowledge is stored for future use).

Nevis et al. (1995) suggest that learning process includes three basic stages: *knowledge acquisition, knowledge sharing* and *knowledge utilization* and developed a comprehensive model of organizational learning which includes 'learning orientations' (focus on sources of knowledge) and 'learning facilitator' (management practices and organizational environment).

Lane and Lubatkin (1998) find that an organization's absorptive capacity in inter-organizational context depends on the following factors: similarity of the two organization's knowledge bases, organizational structures and policies and dominant logics, which also implies that supportive leadership in inter-organizational context can influence organizational learning capability.

Goh and Richards (1997, 2003) developed an organizational learning survey to measure learning capability from managerial perspective. According to Goh and Richard (1997, p.577), "learning is a collective activities that take place under certain conditions or circumstances", learning capability is described as the ability of the organization to implement the appropriate management practices, structures and procedures that facilitate and encourage learning (Leonard-Barton, 1992; Garvin, 1993; Goh, 1998; 2003). Therefore they use certain conditions and management practices to measure learning capabilities, which include five dimensions: 1) clarity of mission and vision; 2) leadership commitment and empowerment; 3) experimentation and rewards; 4) effective transfer of knowledge; 5) teamwork and group problem solving. This study considers supportive leadership as an antecedent of learning capability. Supportive leadership provides appropriate management practices and internal conditions which contribute to the improvement of organizational learning capabilities.

Learning capability is a very strong concept; it draws much attention in literature. In general, learning capability is characterized by the ability to adapt environment and technology through knowledge identifying, knowledge base building, knowledge sharing

and knowledge transferring. Although learning capability is very popular in literature, no consensus definition and measurement of learning capability exist. This study accepts the Cohen and Levinthal (1990) view, and define learning capability in the IOS context as the ability of an organization to develop related knowledge bases (e.g. IOS technology knowledge), recognize valuable external knowledge, share existing knowledge and transfer internal and external knowledge to achieve business objectives. Therefore, learning capability is operationalized as four sub-constructs: 1) knowledge base; 2) knowledge identification capability; 3) knowledge sharing capability and 4) knowledge transfer capability.

Table 3.1.1 Key Constructs of Learning Capability

Variables		Definitions	Literature base
Learning capability		the ability of an organization to develop related knowledge bases (e.g. IOS technology knowledge), recognize valuable external information, share existing knowledge and transfer internal and external knowledge to achieve its business objectives	Cohen and Levinthal, 1990; Huber, 1991; Garvin, 1993; Goh and Richards, 1997; 2003; Bhatt, 2000.
	Knowledge base	the extent to which the richness and intelligence of an organization's knowledge relates to its own field (e.g. technical aspects), its trading partner, and IOS network	Sabherwal and King, 1991; King and Grover, 1991; Metcalfe and Gibbons, 1989; Lane and Lubatkin, 1998.
	Knowledge identification capability	The extent to which an organization's ability to identify /scan valuable knowledge for its survival and development from the external environment	Cohen and Levinthal, 1990; Leonard-Barton, 1992; Garvin, 1993; Huber, 1991; Brown, 1995.
	Knowledge sharing capability	the extent to which an organization disseminates its technical knowledge, its IOS related knowledge and knowledge about its IOS trading partners within the organization (e.g. different divisions)	Huber, 1991; Brown, 1995. Moorman and Miner, 1998; Calantone, et al. 2002
	Knowledge transferring capability	The extent to which an organization applies internal knowledge (e.g. its own technological knowledge) or internalise external knowledge (e.g. its IOS partner's knowledge) to serve its business objectives in different situations.	Simonin, 1997; Anand & Khanna, 2000; Brown, 1995.

3.1.1 Knowledge Base

The term *knowledge base* is used to analyze the form of knowledge and the focus of its accumulation (Metcalfe and Gibbons, 1989). Organizational uniqueness is defined by its knowledge bases and the processes of acquisition, articulation and enhancement of

its organizational knowledge over which it has control. In IOS context, knowledge base is referred to as the extent to which the richness and intelligence of an organization's knowledge relates to its own field (e.g. technical aspects), its trading partner, and IOS network. The richness and content of the firm's knowledge base have been viewed as a contributor to competitive advantage (King and Grover, 1991). The extent to which intelligence is embedded in the firm's existing databases, decision support system, and expert systems may determine its ability to exploit potential opportunities in the future (Sabherwal and King, 1991).

3.1.2 Knowledge identification Capability

"The challenge facing global companies is to identify, pool and deploy their knowledge resources"(Malhotra and Majchrzak 2004, p75). Knowledge identification capability is referred to as an organization's ability to identify/scan valuable knowledge for its survival and development from the external environment. According to Cohen and Levinthal (1990), an organization should have the ability to recognize the value of new, external information first if it has strong absorptive capability. Therefore, identifying or scanning valuable knowledge should be included in the learning capability construct. Knowledge identification capability can be demonstrated by an organization's ability to monitor new general technologies in its area such as production technology, or new network technology, identify what kind of knowledge for the organization to store for future survival or development etc.

3.1.3 Knowledge Sharing Capability

"Learning in an organization results from an accumulation of individual learning" (Calantone, et al. 2002, p517). Knowledge sharing is necessary to spread knowledge among different units and prevent the loss of knowledge because of employee turnover or transfer (Moorman and Miner, 1998; Calantone, et al. 2002).

Knowledge base is the foundation for learning; knowledge sharing can help employees within an organization leverage their knowledge between each other through communication, similar to the *information distribution* construct proposed by Huber (1991) and *communication network* proposed by Brown (1995). Knowledge sharing capability is the extent to which an organization disseminates its technical knowledge, its IOS related knowledge and knowledge about its trading partners within the organization such as different divisions, different processes, different places etc.

3.1.4 Knowledge Transfer Capability

Garvin (1993, p.80) observed that "a learning organization is an organization skilled at creating, acquiring and transferring knowledge and at modifying its behavior to reflect new knowledge". Knowledge transfer is the guarantee to absorb existing knowledge, create new knowledge and apply it to commercial ends. Knowledge base is related to previous experiences. Simonin (1997) suggests that experience alone was not sufficient for an organization to realize the greatest benefits from alliance. Instead, experience has to be internalized by an organization and then put to use in subsequent

activites. This implies the knowledge transfer process is an important component of an organization's learning capability

Knowledge transfer capability is referred to as the extent to which an organization applies internal knowledge (e.g. its own technological knowledge) or internalizes external knowledge (e.g. its IOS partner's knowledge) to serve its business objectives in different divisions, different processes, different places etc. Organizations form network through IOS. Theoretically, an alliance in IOS supply chain network is one complex organizational form that can be viewed as an incomplete contract between organizations, which leave much space for maneuver and interpretation (Anand & Khanna, 2000). Thus alliances typically involve knowledge transfer between participant organizations. This transfer process is fraught with ambiguity. Organizations with this capability do enjoy an advantage in an IOS context. Therefore knowledge transfer capability is another aspect of an organization's learning capability.

3.2 Supportive Leadership (SL)

Organizations need supply chain network to gain access to new resources for survival and growth (Gulati, 1998; Romano, 2003). Dynamic supply chain network provides opportunity and risk simultaneously. Therefore, top management involvement is necessary. Participants in supply chain network should formulate related strategy to meet new requirements (Harland, 1996). Strong learning orientation is necessary for any organization to improve continuously; commitment to organizational learning is an important aspect of learning orientation (Calantone et al., 2002).

According to Madhok (2000), from a strategic perspective, learning from an alliance requires supportive relationship-specific investments and resources to enhance and maitain the value-creation process. Effective operation of IOS supply chain network also need top management's commitment. Signal commitment to its trading partner represents an organization's long-term orientation toward partnership building in the network (Narus and Anderson, 1986; EI-Ansary, 1972), which help build the power in supply chain network.

Benjamin et al. (1990) use case studies to find that eight different EDI systems (one example of IOS) had relatively little impact on an organizational performance, largely because management had deliberately attempted to keep change at a minimum. The authors state that only by changing the way the company does business will it achieve real cost savings from EDI. This reflects that EDI implementation is closely related to top management support. Management increasingly recognizes the potential of supply management for the contribution to long-term competitive advantage.

Supportive leadership in IOS context is defined as the extent to which an organization's top management signals commitment to organizational learning and IOS supply network. For example, management commits resources to enhance and sustain IOS supply chain network such as committing the volume of business communications through IOS network and immersing in IOS network as a new way of doing business. In this study, supportive leadership is operationalized as the following sub-constructs: top

management commitment to organizational learning, top management commitment to IOS network.

Table 3.2.1 Key Constructs of Supportive Leadership

Variables		Definitions	Literature base
Supportive Leadership		The extent to which the management's commitment to organizational learning and IOS technology, and the degree of supportive relationship-specific investments and resources to enhance and sustain IOS alliances.	Madhok 2000; Narus and Anderson, 1986; EI-Ansary, 1972. Brown et al., 1995; Gulati, 1998; Romano, 2003
	Commitment to organizational learning	The extent to which the top management provides related environment and resource to encourage organizational learning	Goh and Richards 1997, 2003. Calantone et al., 2002; Harland, 1996
	Commitment to IOS supply chain network	The extent to which the top management commit related resources and investment to IOS network	Narus and Anderson, 1986; EI-Ansary, 1972. Brown et al., 1995; Gulati, 1998; Romano, 2003

3.2.1 Commitment to organizational learning

In inter-organizational context, learning motivation is strong and organizations learn from each other. Using case based research, Hamel (1991) shows that organizations possessing strong learning intents and creating an appropriate environment win the so-called 'Learning Race'. Here the strong learning intent and appropriate environment creation should be included into supportive leadership. In IOS context, leaders need to commit to the organizational learning: learning new knowledge, learning from IOS trading partners, learning how to cooperate with IOS trading partners, learning how to handle conflicts with IOS trading partners. The main objective of organizational learning

in IOS context is to maintain or obtain an organization's dominant position in IOS supply chain network and keep the awareness of IOS's impacts on its business.

3.2.2 Commitment to IOS supply chain network

Top management's commitment to IOS supply chain network is one important part of supportive leadership in IOS context (Hart and Saunders 1997, 1998). Strong commitment in IOS network means that 1) management treats IOS as a new way of doing business, not just as a new way of transmitting documents; 2) management makes effort to integrate IOS to its internal transaction processing systems; 3) management makes effort to achieve high volume of business communication through IOS.

3.3 IT Support Capability for Supply Management (ITSC)

IT as a powerful competitive weapon has been strongly supported by literature. The concept of IT capability has been discussed more frequently in practitioner-based literature than in academic journals. Of greater interest is the supposition that information accessibility, data availability, and network centrality are the underlying IT capabilities that drives structuring activities such as standardization, specialization, locus of decision making, and centralization of decision control. The IT capability available to an organization would define available choices in the operating environment (Mulligan, 2002). Ross et al. (1996, p31) define IT capability as " the ability to control IT-related costs, deliver systems when needed, and effect business objectives through IT applications". This capability grows from the persistent development of Human assets

(e.g. IT staff training), technical assets (e.g. shared hardware, software platform), and relationship assets (e.g. trust and respects between IT and line manager) (Ross et al, 1996). Another similar definition of IT capability is given by Bharadwaj (2000): the ability to mobilize and deploy IT-based resources in combination or co-present with other resources and capabilities. IT-based resources includes: IT infrastructure, human IT resource and IT–enabled intangibles.

Davenport and Short (1998) propose the universe of IT capability including 9 basic aspects: transactional, geographical, automational, analytical, informational, sequential, knowledge management, tracking, disintermediation. Based on literature review, Mulligan (2002) has identified 21 IT attributes as elements of IT capability. Empirical evidence indicates that four key attributes of IT capability: integration; system scope; system focus; and accessibility (Mulligan, 2002).

There are no consensus definition and measurement of IT capability in existing literature. Researchers examine IT capability from multiple perspectives, including work design, process transformation, power relationship, and coordination (Clark et al. 1997; Cross et al, 1997; Sambamurthy and Zmud 1994; Weill and Broadbent 1998). Today many companies have supply management department or similar functional department which manages the operation of information systems such as e-Procurement systems, B2B e-commerce, or EDI. This study mainly explores IT capability from the perspective of IT supporting supply chain management.

IT support capability for supply chain management is defined as an organization's IT infrastructure's connectivity and functionality within organization and between the organization and its trading partner and the organization's ability to utilize existing information systems managing supply chain function. IT support capability for supply management is operationalized as the following sub-constructs: IT Infrastructure Capability, IT Use Capability.

Table 3.3.1 Key Constructs of IT Support Capability

Variables	Definitions	Literature base
IT support capability for Supply management	An organization's IT infrastructure's connectivity and functionality within organization and between organization and its trading partner and the organization's ability to utilize existing information systems managing its supply function.	Weill and Broadbent 1998; Bharadwaj, 2000; Ross et al, 1996; Mulligan (2002) Clark et al. 1997; Cross et al, 1997; Sambamurthy and Zmud 1994
IT infrastructure capability	An organization's ability to connect to its different areas (IT infrastructure's connectivity) and to provide required service (IT infrastructure's functionality) using a set of shared, tangible IT resource as a foundation for business applications.	LaBelle and Nyce, 1987; von Simson 1990; Weill and Broadbebt, 1998; Wilder 1990
IT use capability	An organization's ability to utilize existing information systems managing its supply function	LaBelle and Nyce 1987; von Simson 1990; Wilder 1990

3.3.1 IT Infrastructure Capability

In the post-industrial economy, the main theme is not just to produce product efficiently, but also to process information effectively for decision-making (Huber, 1991). During the process of decision making, information processing capability is essential, which directly relates to the IT infrastructure capability. IT infrastructure capability is one of the main components of IT capability. According to Broadbent and Weill (1997), an IT infrastructure provides the shared foundation of IT capability for building business application such as: order entry, bank account opening, sales analysis, and purchasing systems. IT infrastructure provides building blocks of an organization's IT capability. Lack of an appropriate infrastructure hinders an organization's competitive positioning. The purpose of building IT infrastructure is to provide connectivity and functionality between different functional areas and between one organization and its trading partner to facilitate information sharing and functional integration (Darnton an Giacolette, 1992; Broadbent et al., 1999). The major components of IT infrastructure are hardware platforms, software platforms, communications technology, middleware and other capability that provides shared services to a range of applications and common handling mechanisms for different data types (Turnbull, 1991; Darnton an Giacolette, 1992).

The necessary infrastructure is a prerequisite for an organization to adopt a new technology and to implement it successfully. It determines the extent to which the organization can realize the full benefits of the technology (Cast et. al, 1992). Byrd and Turner (2001) explore the relationship between IT infrastructure and competitive

advantage within one organization, and conclude that unique characteristics of IT infrastructure determine its value to the organization, flexible IT infrastructure is positively related to the organizational competitive advantage (i.e. innovativeness, market position, mass customization and difficulty to duplicate) (Byrd and Turner, 2001).

Since IOS extends beyond traditional enterprise boundaries, it requires more complicated IT infrastructure. The value of an adaptive and flexible IT infrastructure is very apparent to researchers and practitioners alike (Byrd & Turner, 2001). In IOS context, strong IT infrastructure capability can contribute to the strategic value of the organization's information system. In this study, *IT infrastructure* is defined as the base foundation of the IT portfolio (including both technical and human assets), shared throughout the organization in the form of reliable services (Broadnent et al., 1996; McKay and Brockway 1989; Weill et al., 1996). *IT infrastructure capability* is defined as an organization's ability to connect to its different areas within organization and beyond organization (i.e. IT infrastructure's connectivity) and to provide required service (i.e. IT infrastructure's functionality) using a set of shared, tangible IT resource as a foundation for business applications.

3.3.2 IT Use Capability

IT use capability is referred to as an organization's ability to utilize existing information systems for its business objectives based on its IT infrastructure (LaBelle and Nyce 1987; von Simson 1990; Wilder 1990). Strong IT use capability means the organization can use existing IT infrastructure to analyze its competitive position,

analyze customer demand, facilitate the transaction with its trading partners and monitor the threats and opportunities from cooperating with its trading partners etc. IT use capability in IOS context is referred to as an organization's ability to utilize existing information systems managing its supply chain function when participating IOS network.

3.4 Power in IOS Supply Chain Network Context (POWER)

Research relating to the power in the IOS supply chain network context is limited. Fredriksson and Vigon (1996) claim that the power relations between trading partners are often neglected in IOS literature, and also in the development and management of IOS, creating unforeseen problems when the system is in use. Some researchers such as Webster (1995) explore the power imbalance in IOS supply chain network using the case study method. Although these arguments are case-based, they evoke the need for a deeper study of power in IOS context, which providing evidence in support of the importance of the power in that context. Ramsay (1995) explored purchasing power and Stannack (1996) explore purchasing power and supply chain management power theoretically. Munson et. al (1999) explored five aspects of interaction among distribution channel members: 1) pricing control; 2) inventory control; 3) operations control; 4) channel structural control; 5) information control. These previous researches offer valuable insights for the study of power in IOS context.

Empirical studies have established the relationship between structural sources of power and the relative power of the players in an organization (Salancik and Pfeffer,

1974). Those above studies are at the individual level, they emphasize the source of individual power in the organization. Early studies on the resources of power explored *personal attributes* (such as expert and referent power) and *positional attributes* (such as reward, coercive and legitimate power). These notions of power were originally applied to key decision makers and were later adapted to the organizational level of analysis (Munson et. al, 1999). In IOS context, at organizational level, *personal attributes* can be extrapolated as a company owns the adequate knowledge and expertise in the IT domain and alliance domain; *positional attributes* mean a company has control over a formal leverage, such as technical standard control relating to IOS.

Rather than theorizing about amounts of power, Aldrich (1979, p268) "theorize about organization's control over resources that form a possible basis of power in particular relationships". Power is context related. In different context, the content of power is different (Aldrich, 1979; Pfeffer and Salansick, 1978). In this research we will explore power in IOS context.

Theoretically, there are many sources of power such as: formal authority-position power; control over scarce resources; rules, structure, regulations, standard operating procedures; information, knowledge, or specialized (scarce) resources; ability to call on powerful resources etc. *Resources*, *interconnections* among actors in the organizational structures and *organizational position* are considered structural sources of power (Cendon and Jarvenpaa, 2001). Pfeffer and Salancik (1978) explored the interorganizational relationships from resource dependency theory.

In this study we combine *structural view of power* and *resource-dependence* view of power. The analysis of power in IOS context requires some attempts to map out the location of resources valuable to IOS trading partners, and the ability to control these valuable resources. In IOS context, information, electronic trading network are important resources and network structural bonding reflects the structural location of resources vital to IOS participants. Therefore, in this study, power is defined as the ability to control information, control electronic trading network, and control network structural bonding in IOS supply chain network context. These abilities influence the actions of other participants in the IOS network.

Table 3.4.1 Key Constructs of Power in IOS Supply Network

Variables	Definitions	Literature base
Power in IOS supply chain network context	The abilities to control information, electronic trading network, and network structural bonding in IOS supply chain network context. These abilities influence the actions of other participants in the IOS network	Salancik and Pfeffer, 1974; Munson et. al, 1999; Aldrich, 1979; Fredriksson and Vigon, 1996; Cendon and Jarvenpaa, 2001
Information control	The extent to which an organization can manipulate all the information allocation, access and use on IOS network, monitor data quality and encourage related trading partner to maintain, improve and update shared data in the IOS network.	Johnston and Vitale, 1988; Broadbent & Weill ,1997; Holland & Lockett, 1997
Electronic trading network control	The extent to which an organization can determine IOS related standards and rules; IOS network governance structure and the access to the IOS network.	Premkumar& Ramamurthy,1995 Dyer and Nobeoka, 2000
Networks Structural bonding control	the extent to which an organization participated in IOS network occupies a strategic position by virtue of being involved in many significant bonds.	Wilson & Jantrania ( ) Premkumar& amamurthy, 1995 Wasserman & Faust, 1994 Holland and Lockett, 1997

3.4.1 Information Control

Pettigrew (1972) explicitly proposed that information control serves as a source of power. Information has become the key driver of obtaining advantages from SCM. Supply chain network provides a useful source of information for organizations such as information about prices, availability of goods, and new source of supply, new technology, and new products. IOS provides new technical possibility for information distribution and utilization for IOS participants.

As information becomes a critical resource in managing IOS network, information plays essential role in the whole business processes, such as customization service for your customer, the tailoring of the offering involves providing real-time information and allowing customers to make trade-offs among price, features and product availability (Kopczak and Johnson, 2003, p33). However, how to leverage all the information from supply chain network into real competitive advantage is still a challenge for many companies (Davenport and Brooks, 2004).

Important issues relating to IOS include the accuracy of and its currency. Some researchers have already identified poor quality data in certain areas and realized the need to improve it continuously by related trading partner (case study, Allen et al., 1999). Nah et al., (1998) argue that without accurate and standardized data, transactions will not be able to take place.

Information resource management involves such activities as: planning database, acquiring data, protecting data from unauthorized access, ensuring reliability, coordinating flow among information systems, and eliminating duplication. In this study, information control is defined as the extent to which an organization controls/influences information resource management such as information use in IOS supply chain network, monitor data quality and encourage related trading partners to maintain, improve and update shared data in the IOS supply chain network. The higher level of information control means the higher level of capability to get more information from trading partner, protect your own sensitive operational information from leaking to your trading partner, leverage intense information into real competitive advantage (Johnston and Vitale, 1988; Broadbent & Weill, 1997; Davenport and Brooks, 2004).

3.4.2 Electronic Trading Network Control

Electronic trading networks control is defined as the extent to which an organization can determine IOS related standards and rules (e.g. network architecture, communications standards and protocols, message standards, product coding and information handling procedures), IOS network governance structure and the access to the IOS network.

3.4.3 Network Structural Bonding Control

Structure of an organization is viewed as the pattern of relationships among people (Gerwin, 1984). Structure of a supply chain network is viewed as the pattern of

relationships among organizations (Choi and Hong, 2002). According to Gulati et al. (2000), an organization's structure defines the expectations for each role and the connections between each role. Extrapolating to the context of inter-organizational relationship, structure can be interpreted as the way in which inter-organizational work is divided among the partnering organizations by assigning specific roles to them and the ways in which coordination is achieved.

Structural position within a specific social system is one important source of power and the resources which form the base of an actor's power are differently located by structural position (Pettigrew, 1972). Networks structural bonding control is similar to the concept of the network centrality in social network analysis literature. According to Wasserman & Faust (1994), network centrality is referred to as the position of an individual actor in the network, which indicates the extent to which the focal actor occupies a strategic position in the network by virtue of being involved in many significant relationships.

Network structural bonding is the relationship structure of IOS supply chain network formed by participating organizations. Network structure is formed as a direct result of participants' strategic choices in response to market and environment complexity (Hakansson, 1982; Holland and Lockett, 1997). Network structural bonding control is similar to the social network control. In social network analysis literature, social network analysis focuses on patterns of relationship between actors and examines the availability of resources and exchange of resources between these actors (Wasserman

& Faust, 1994). In this study, network structural bonding control is defined as the extent to which an organization participated in IOS supply chain network occupies a strategic position by virtue of being involved in many significant bonds. The organization which controls network structural bonding is less dependent on its IOS trading partners.

There has also been a lot of writing about collaborative relationship management from the operational perspective (Cox, 1999). However, thinking about the trading partner's relationship from strategic perspective is more important than from operational perspective. The notion of organizations positioning themselves strategically within an IOS supply chain network is an under-developed aspect in business strategy development process. Porter (1980) has realized the importance of buyer-supplier relationships in his five forces model. The strategic relationship management thinking should be the basis for sustainable business success (Porter, 1980).

3.5 Value Appropriation (VA)

The *value* a company creates is measured by the amount that buyers are willing to pay for a product or service (Porter & Miller, 1985). According to Porter (1980), in order to gain competitive advantage over its rivals, a company must either perform these activities at a lower cost or perform them in a way that leads to differentiation and a premium price (more value). A company's value chain is a system of interdependent activities, which are connected by linkage. Linkages require activities to be coordinated. A value chain for one company is embedded in whole value system in supply chain, which includes the value chain of the focal company's trading partner (i.e. upstream

value, focal firm value and downstream value). Cooperation creates the opportunities of value creation far beyond logistics and order processing.

An important role for IOS, such as in EDI, is to enable a consolidation of strategic benefits which strengthen long-term relationships between trading partners (Fearon and Philip, 1999). Brian Dearing(1990), the EDI market development manager for GE information services, considered EDI as a tool that could be used to slash inventory, improve cash flow, and streamline a company's operations and proposed that the potential benefits from EDI can be categorized into three classes: direct, indirect, and strategic. 1) Direct benefits stem from the fact that data are sent electronically from one application to another..., both companies benefit from reduction in errors and reduced human handling costs; 2) indirect benefits come from leveraging EDI to enable the technology to change the way one does business. GE Transportation Systems used EDI to quintuple the number of material releases that are issued to suppliers of parts used to manufacture GE locomotives—each release being for a much smaller quantities than before and eliminate an acre of warehouse space as a result. Better planning and electronic releases can also reduce line stoppages, stock-outs, and premium freight charges; 3) strategic benefits are more important. The sharing of information (e.g. demand schedules) with suppliers, co-design, and open communications can lead to a long-term low-cost producer market position and close ties with customers. Other long-term benefits of EDI include market share expansion through increased responsiveness and lower costs, strategic use of information now collected in a machine-processible format (e.g. consolidated purchasing), and even new businesses made possible by EDI.

For example, American Airlines' Sabre system is an independent profit center alongside the traditional transportation business.

To create more potential value (i.e. benefits) from IOS technology, IOS has to be adopted by a wide variety of trading partners and IOS requires that members of IOS network alter internal business processes, change inter-organizational business relationship and adopt new information technology. Many researchers demonstrated that more value can be created through IOS supply chain network than without it (Andrew & Hahn, 1998; Williams, 1997; Bakos, 1991; Kale et al., 2000). However, value creation is the prerequisite for value appropriation; value appropriation is the ultimate business goal. According to Kale et al. (2000, p222), trading partners "often specify what is core or proprietary to each party and develop informal and formal codes of conduct to restrict behavior or action that leads to the appropriation of such assets".

Essentially, business is about appropriating value for itself; it is not about passing value to customers unless the circumstances require the company to do so (Cox, 1999). Power is about the control of alternatives and action (Stannack, 1996); the controlled alternative and action must has some objectives, without objectives, control is meaningless (Otley and Berry, 1980). It can be argued that companies are only successful if they posses power over something or someone (Cox, 1999). Assuming economically rational behavior, trading partners must wish to appropriate more value for themselves when possible. Therefore, one objective of control is benefits capturing, in other word, value appropriation.

Based on case studies Kumar and Crook (1999) find that 1) Suppliers who operated an efficient EDI network benefit from increased businesses in the future; 2) EDI use often seems to be initiated by members which own a high degree of bargaining strength, and EDI helps to develop an awareness of competitive and market conditions by providing current information on sales. Through information sharing, suppliers will contribute to an manufacturer's performance improvement such as product quality, new product development support. In this study, value appropriation through IOS supply chain network is defined as the benefits that an organization captures from IOS supply chain network and value appropriation is operationalized as long-term value appropriation and short-term value appropriation

Table 3.5.1 Key Constructs of Value Appropriation

Variables	Definitions	Literature base
Value appropriation	the benefits an organization obtains from IOS network	Cox, 1999; Porter and Millar, 198; Porter,1995
Long-term value appropriation	Strategic benefits an organization obtains through participation of IOS network (e.g. EDI) such as: benefit got through locking-in your trading partners or building entry barriers.	Kettinger et.al. 1994; Kumar et al, 1992; Panzar and Willig 1981; Teece 1980; Sambamurthy & Zmud, 1999 Hibbard et al, 2001
short-term value appropriation	Transactional day-to-day operational benefits an organization obtains through IOS network (e.g. EDI) participation.	Sambamurthy & Zmud, 1999 Hibbard et al, 2001

3.5.1 Long-Term Value Appropriation

Long-Term Value Appropriation is referred to as strategic benefits an organization obtains through IOS participation, such as locking-in your partners and building entry barriers (Kettinger et.al. 1994; Kumar, Stern and Achrol, 1992; Panzar and Willig 1981; Teece 1980; Sambamurthy & Zmud, 1999). Long-term value appropriation focuses on the strategic benefits obtained through better solutions to the challenges when participating IOS supply chain network. Based on case studies Kumar and Crook (1999) find that suppliers who operated an efficient EDI-based IOS benefit from increased business in the future. According to Sambamurthy and Zmud (1999), economies of scope are one kind of strategic benefits arising from sharing of appropriate IT-related expertise, and investments across the enterprise.

3.5.2 Short-Term Value Appropriation

Short-Term Value Appropriation is defined as the benefits an organization obtains through the participation of IOS network from short-term perspective (i.e. transactional, day-to-day operational benefits). Short-term value appropriation focuses on executing current task design and improvement. The following benefit obtained from IOS network participation belong to short-term value appropriation: short-term purchasing cost reduction through IOS network; getting desired outcomes of negotiations on costs, prices, and reducing current data-processing time etc.

3.6 Relationship Quality (RQ)

There has been a growing interest in the exploration of inter-organizational relationship. Since organizations need to work with each other on a repeated base in many industries, handling inter-organizational relationship is becoming more important than before. An organization's previous behaviors will develop its reputation (negative or positive) which influence its future cooperation with others.

Although there is no consensus on the definition and measurement of relationship quality, the essence of relationship quality is a belief in the integrity and reliability of the other party (Crosby et al, 1990; Kumar et al, 1995; Jap, 2001). These beliefs are reflected in two aspects: 1) evaluation of the present relationship; 2) future expectations of the relationship. This study adapts Jap (2001)'s point of view, relationship quality is referred to as the extent to which an organization's perceived satisfaction with its trading partner, perceived outcome fairness about the cooperation through IOS and willingness to cooperate in the future.

Table 3.6.1 Key Constructs of Relationship Quality

Variables		Definitions	Literature base
Relationship Quality		the extent to which an organization perceives satisfaction with its trading partner, perceives fairness about the cooperation in IOS network and willingness to cooperate in the future	Jap, 2001; Crosby et al, 1990; Kumar, 1995; Geyskens et al, 1999
	Satisfaction with cooperation in IOS network:	A positive affective state resulting from the appraisal of all aspects of a working relationship.	Jap, 2001; Gaski, 1984; Geyskens et al, 1999
	Perceived outcome fairness	The organization's perception that it has received a fair share of expanded benefit from collaboration in IOS network.	Jap, 2001; Gaski, 1984; Geyskens et al, 1999
	Willingness to cooperate in the future	The degree to which an organization would be willing to engage in mutual endeavors again, should opportunities arise.	Jap, 2001; Gaski, 1984; Geyskens et al, 1999

3.6.1 Satisfaction with Cooperation in IOS Supply Chain Network

Crosby et al (1990) emphasize trust and satisfaction in the construct of relationship quality. Steenkamp (1995) add conflict, commitment, willingness to invest and expectations of continued cooperation to this construct, but does not include satisfaction. In the Marketing literature, satisfaction is an important element in understanding channel relationships (Ruekert and Churchill, 1984). Satisfaction affects channel member's incentive to participate in cooperative activities (Schul et al, 1985). Dyer (1980) views channel member satisfaction as the key to long-term channel viability.

3.6.2 Perceived Outcome Fairness

Research in economics examines outcome allocation among individuals. Economics literature indicated that relational concerns and norms of fairness often motivate allocations among participants (Roth et al. 1991). Rabin (1993) describes a fairness equilibrium in which players differentiate between an intentional act of meanness and an inadvertently mean act. If the player realizes the inequality is due to intentional act of meanness, this player will reject the outcome and revenge; in the later situation, this player will tolerate the inequality. It seems that people will not reject inequality but will punish unfairness (Blount, 1995). Here fairness is similar to equity. Equity means each member's payoffs are a function of its resources contribution, costs incurred and so forth—to the collaboration (Jap, 2001). In this study, perceived outcome fairness is defined as the organization's perception that it has received a fair share of expanded benefit from collaboration in IOS network.

3.6.3 Willingness to Cooperate in the Future

According to Jap (2001), Willingness to cooperate in the future is another aspect of relationship quality, which means the degree to which an organization would be willing to engage in mutual endeavors again, should opportunities arise. Literature on social exchange indicates the role of future expectations in determining the long-term relationship maintenance. Anderson and Weitz (1989) also emphasize the importance of willingness to cooperation in the future. This study adopts willingness to cooperate in the future as one element of relationship quality.

3.7 Hypothesis Development

3.7.1 Research Hypothesis 1 (SL→LC)

Many researchers (Dodgeson, 1993; Teece et al., 1990) describe that learning is a dynamic concept and its use emphasizes the continually changing nature of organizations. Learning is a key factor in the process by which companies accumulate technology in order to compete (Dodgson, 1993). To remain competitive, many organizations adopt continuous learning strategy (i.e. encouraging employees to learn new skills continuously, to be innovative and to try new processes and work methods to achieve the strategic business objectives of the organization) (Goh, 2003). Dynamic supply chain network provides opportunities and risks simultaneously, therefore top management involvement is necessary (Harland, 1996).

One important characteristic of the inter-organizational learning is that learning is a mutual behavior, which means you can learn from your partner and meanwhile you provide the learning opportunity for your partner. Kumar and van Dissel (1996) explored the problems with differential learning in alliances and point out that an alliance exposes a partner to strategic hazards due to the presence of learning opportunities. Co-opetion among IOS trading partners seems to occur with the presence of learning opportunities. Learning motive is strong between or among partners, the learning process can be characterized as a "race to learn" and internalizes the partner's skill or knowledge; organizations creating an appropriate environment with top management support and

possessing strong learning intents will have strong learning capability and win the so-called " learning race" (Hamel, 1991).

Since most learning takes place at the lowest levels of an alliance. Operating employees not only representing the front lines in an effective defense but also play a vital role in acquiring particular knowledge (Hamel and Prahalad, 1989). They must be well informed about the partner's strengths and weaknesses and understand how acquiring particular knowledge will strengthen their company's competitive position. Therefore, top management must be committed to enhance their organizations' learning capability. Learning is supposed to begin at the top level. Japanese firms place particular emphasis on learning (Pucik 1988), for example, NEC Company always tries to internalize the partner's knowledge during the alliance. This means supportive leadership is emphasized in Japanese firms. As described by Prahalad and Hamel (1994), core competence is "the collective learning of the organization". The collective learning process depends on the supportive leadership that contributes to the improvement of organizational learning capability. Therefore,

H1: An organization's supportive leadership positively influences its learning capability (H1: RQ→VA)

3.7.2 Research Hypothesis 2 (SL→ITSC)

Over the past two decades, IT has been promoted as one of the resources that organizations could use to gain competitive advantage. The competitive value of IT was thought to come from strategic information system (SIS) such as: American Airlines'

Sabre system (Hopper, 1990), Baxter's International ASAP system (Scott, 1988), Federal Express's tracking and sorting system (Stahl, 1995), Digital Equipment Corporation's XCON (Svioka, 1990). Some of these SISs are developed into IOS. Davenport and Linder (1994) state that the success of the few companies with SISs really derived from long-term, well-planned investments in IT infrastructure such as networks, databases, and skills, rather than ingenious individual application. This implies that IT capability is closely related to supportive leadership in the organization.

There are evidences that many organizations engage in high IT investments concerned about falling behind on the technology curve (Nolan, 1994). But IT investments do not directly become IT capability, it is just a necessary condition; not a sufficient condition. Supportive leadership is supposed to include commitment of investment in IT and other commitments such as IT personnel, consistent training, coordinating IT manager and line manager activities. Corporate culture (Barney, 1991) and corporate reputation etc will influence the transmission of IT investment to IT capability. In this study, IT capability was explored from IT supporting supply chain management perspective. IOS design and implementation involves technical issues. Considering IOS's potential impact on its business, top management need more commitment on IT investment in order to keep track of IT development (Broadbent and Weill, 1997; Byrd and Turner, 2001). In fact, many researchers (e.g. Bharadwaj, 2000; Bensaou, 1997) have realized that the strategies of IT group and the organization's strategies should be well aligned in order to fulfill IT effectiveness. The effective

alignment of organization strategy and IT strategies also related to supportive leadership in an organization. Therefore,

H2: An organization's supportive leadership positively influences its IT support capability for supply chain management (H2: SL→ITSC)

3.7.3 Research Hypothesis 3 (SL→Power)

In reality, management increasingly recognizes the potential contributions of supply chain management to long-term competitive advantage. IOS electronic trading network design and implementation is beyond technical perspective, it reflects the participant's strategic interests (Webster, 1995). The structure of IOS supply chain network will emerge over a period of time. It is the outcome of the actions of all the supply chain network participants (Choi et al., 2001). Therefore, top management involvement is necessary for the participation of IOS network.

Barrett and Konsynski (1982) point out that there are five levels of IOS usage, depending on how much the firm controls the system, how many of the firm's transactions are implemented through IOS, and how many trading partners participate in the IOS network. Higher level not only means more power, but also means more responsibility and more resource commitment. Organizations which want to be in a dominant position must contribute more to the IOS network than other trading partners. Riggins and Mukhopadhyay (1994) use the following areas to measure the management's commitment to IOS technology: the volume of business communications for which the firm uses IOS and the degree to which the firm becomes immersed in IOS as a new way

of doing business. For example, by continually adding trading partners, transaction sets, upgrades to the system and altering their internal process.

Initiating IOS electronic trading network by itself is like a one-handed clap: without trading partners' support, you can't make it worthwhile. Therefore, IOS initiator needs to show its intention to cooperate with your trading partners such as training your partner, problem resolution for your trading partners during their EDI implementation process, provide recommendation for hardware and software choice. If IT capability is the technical possibility for your powerful position, supportive leadership reflects the possibility you can really lead your trading partner in reality from behavioral perspective. Just trying to internalize your trading partner's related knowledge is not enough; cooperation is another aspect which needs to be emphasized. The reasons are as follows: as markets have become more competitive, organizations have started to abandon the heavy-handed use of power to coordinate inter-organizational relationship (Teece, 1992). Signaling commitment to its trading partners represents a long-term orientation toward the partnership (Narus and Anderson, 1986). These commitments from an organization's top management will strengthen the organization's dominant position in IOS network.

Supportive Leadership in IOS Context is referred to as the extent to which the management's commitment to continuous improvement and new technology adoption and the degree of relationship-specific investments and resources to enhance and sustain the relationship with its trading partners (e.g. the volume of business communications for which the firm uses IOS and the degree to which the firm becomes immersed in IOS as a

new way of doing business). Supportive leadership not only emphasizes the management's commitment to organizational learning, but also emphasizes the management's commitment to IOS supply chain network. Therefore,

H3: An organization's supportive leadership positively influences its power in IOS supply chain network context (H3: SL→POWER)

3.7.4 Research Hypothesis 4 (ITSC→LC)

The objectives of organizational learning are to keep in touch with new knowledge and develop its core capabilities continuously. Learning capability building involves knowledge base accumulation, knowledge identification, knowledge sharing and knowledge transferring. IT can contribute to all the above learning aspects (Andreu and Ciborra 1996; Malhotra and Majchrzak, 2004).

With the support of IT, organizations can achieve the following objectives which contribute to organizational learning capability improvement: 1) support for task coordination 2) support for external connectivity 3) support for distributed cognition and 4) support for interactivity (Malhotra and Majchrzak 2004). In other words, IT can support an organizational knowledge base building, facilitate coordination between different functional areas or between the organization and its trading partners, provide new opportunities to access external value knowledge and identify critical knowledge resources from outside such as supply network. Coordination support is defined as keeping people informed during the task implementation process (Faraj and Sproull, 2000). Effective communication and information exchange between different functional

areas or different branch area needs appropriate IT support (Malhotra and Majchrzak, 2004). Therefore,

H4: An organization's IT support capability for supply chain management positively influences its learning capability (H4: ITSC→LC)

3.7.5 Research Hypothesis 5 (ITSC→Power)

A North American EDI survey of 1,348 respondents across a number of industrial sectors reported that the primary reasons for using EDI, in ranked order were: as a result of a customer/supplier request; gain quick access to information; to cut costs; to increase the accuracy of data; to gain competitive advantage (Masson and Ferguson, 1991). And concluded that a large company can get the benefits resulting from EDI easier than small and mid-sized firm, because large companies can integrate EDI into their business system. While small company or mid-sized company may not reduce their transaction cost from using EDI. The degree of integration of EDI into company's business system depends on the company's IT capability.

IOS initiators are mostly at the higher level of the IOS network based on their strong IT capability. And strong IT capability can guarantee that they continually maintain and improve IOS network which implies the continuous control of the network and control of information, which further contribute to value appropriation in long-term run. The Ford Motor Company was one of the earliest innovators in inter-organizational technology. Based on its strong IT capability, Ford established a corporate network—Fordnet in the mid 1980s. The network, the software and file layouts are proprietary. EDI

handles all kinds of corporate data transfer with Ford and its trading partners. Ford requires its established suppliers and new suppliers to use EDI, Ford provided its trading partners with Fordnet software to run on IBM machines and with Fordnet training courses. Suppliers with incompatible systems or with no systems at all, were required to solve by themselves within required period. One basic objective of Fordnet is to lock in its suppliers and customers in onto its system and restrict competitors out of the system. From the above case, we observe that IT capability is essential to IOS design and implementation, which influences the power in IOS supply chain network.

Riggins, Kriebel & Mukhopadhyay (1994) enumerate the cost and the benefits of IOS network. From the cost perspective, costs are theorized to occur from the activities developing IOS, gathering information in a market and maintaining inter-firm relationship, these costs are directly influenced by IT capability (Bakos & Treacy, 1986), which is the main determinant of the initiation cost reduction and IOS maintenance and development cost. From the benefits perspective, organizations with strong IT capability can handle new information technology (e.g., IOS) with less resistance, higher degree of IT capability correspond to higher level of IT integration, and the higher level of IT infusion, strong IT capability means strong information processing capability, which contribute to information control and electronic trading network control.

IT capability available to an organization would define available choices in the operating environment (Mulligan, 2002). IOS is a relatively new technology. Without adequate IT capability, organizations are more likely to feel threatened by the complexity

of IOS and can't exploit IOS to its full potential use (Convey, 2000). The organization with strong IT capability can connect to its trading partners seamlessly, which means more interconnections in the relationship network (i.e. bonding network) than other trading partners. It can determine who is its primary partner; it can dissolve the relationship with relatively less cost; it is less dependent on its partner relating to sales with IOS partner; and it can switch to your partner's competitor easily (Premkumar& Ramamurthy, 1995). All of these illustrate that strong IT capability determine the dominant position in network. Therefore,

H5: An organization's IT support capability for supply chain management positively influences its power in IOS supply chain network context (H5: ITSC→POWER)

3.7.6 Research Hypothesis 6 (LC→Power)

Social control involves a dynamic competitive process during which each actor tries to control and influence other actors through controlling critical resources (Pfeffer and Salancik, 1978). IOS provide the foundation for timely information sharing among trading partners. However, information sharing is not free. According to Webster (1995), powerful firms may use this shared information as a tool with which to control their trading partners. Webster (1995) used the case study method to explore the problem of power in supply network in UK automotive industry, and concluded that small firms can't derive the strategic benefits of EDI and other network technologies, one reason is that they have been excluded from the telecommunications learning cycle, or they only achieved the first stage of the learning cycle (i.e. using IT to automate existing processes rather than reengineering business process) (Bar et al, 1989).

Computer reservation systems initiators in the airline industry could not be easily copied simply because at the time those systems were complex, which required time for other organizations to learn (Andreu and Ciborra, 1996). This statement is similar to Cohen and Levinthal's viewpoints: learning capability is path-dependent; the lack of investment in an area of expertise at an early period may foreclose the future development of a technical capability in that area. This implies that powerful participants in IOS network have already established the related knowledge base; and based on the prior knowledge base, powerful participants can transfer prior knowledge into different places, different areas which increase their ability to achieve corporate objective in a strategic manner (Webster, 1995). This illustrates that learning capability is one antecedent to achieve dominant position in IOS network.

Bates and Slack (1998) using case studies illustrate alternative scenarios where the suppliers clearly hold the dominant position in the relationship, but buying companies, through application of their proprietary knowledge, manage to obtain some leverage with the supplier and at the same time form a closer bond with the supplier. They suggest that small companies should capitalize on any unique specialist knowledge that is core to their business, to give some leverage with their supplier. The proprietary knowledge is related to firm's learning capability.

Incomplete contract theory also suggests that learning effects might be one important factor of value creation and value appropriation through alliance. Organizational learning changes the weaknesses and strengths of each IOS participant.

Companies that are confident of their learning capability may even prefer some ambiguity in the alliance's legal structure. More important thing is that the rate at which each partner learns from the other (Hamel et al., 1989). Learning capability determines the learning rate among IOS participants, which lead to position change in the network. In IOS context, strong learning capability implies the high level ability of an organaizaion to recognize the value of new, external information from IOS network; use shared information effectively and transfer the internal and external knowledge (e.g. IOS partner's knowledge) to serve its own business objectives. Therefore,

H6: An organization's learning capability positively influences its power in IOS supply chain network context (H6: LC→POWER)

3.7.7 Research Hypothesis 7 (Power→RQ)

In a laboratory test, Walker (1972) found that power led to dissatisfaction of the party subjected to it. When one firm perceives that another firm controls its behavior, it is less satisfied with its relationship in the channel than when it perceives that its behavior is not controlled (Gassenheimer et al., 1989; Keith et al., 1990). Based on literature review, Bigne and Blesa (2004) propose the following hypotheses: 1)manufacturer's *reward* power has positive effect on how satisfied the distributor is with the relationship; 2) manufacturer's *coercive* power has negative effect on how satisfied the distributor is with the relationship; 3) manufacturer's *expert* power has positive effect on how satisfied the distributor is with the relationship;4) manufacturer's *referent* power has positive effect on how satisfied the distributor is with the relationship. Above relationship is from distributor's perspective. In this study we define the relationship quality as the extent to

which an organization's perceived satisfaction with its trading partner, perceived fairness about the cooperation through IOS and willingness to cooperate in the future. This is from the focal organization's perspective not from its trading partner's perspective.

Effective communication between trading partner is vital for operational efficiency and better trading relations (Nakayama, 2002). Power in IOS context is necessary because a powerful company provides necessary governance structure. For example, powerful company can dictate IOS functioning: network architecture, communications protocols, message standards, product coding and information handling procedures, which contribute to effective communication between trading partners. Therefore, power can positively influence relational quality. The issue of trust in IOS is quite clearly affected by prevailing power structures (Allen et al., 1999).

In the current study, we will not discuss the way a powerful company exercises its power, we focus the relational and economic outcomes of power no matter how the power is exercised. Since a powerful organization has more influence on its trading partner, it has more chance to select its main trading partners and be satisfied by its trading partner's behavior (Gaski, 1986). Logically, an organization that has the capacity to influence the decisions of another partner will feel more satisfied with the relationship than if it did not have this capacity (Hunt and Nevin, 1974; Bigne and Blesa, 2004). The greater an organization's capacity to control or influence, the greater will be its level of satisfaction (Anderson and Narus, 1974). Therefore,

H7: An organization's power in IOS supply chain network context positively influences its relationship quality with its trading partner (H7: POWER→RQ)

3.7.8 Research Hypothesis 8 (POWER→VA)

Essentially business is about appropriating value for itself (Cox, 1999). Case studies show that companies can use IOS as powerful marketing tools because other firms want access to those systems. Nah et al., (1998) argue that without accurate and standardized data, transactions will not be able to take place. This reflects the necessity of the existence of powerful organizations which are more responsible for information quality, information updating than its trading partner.

Using case study, Hart and Saunders (1997) report EDI-based information exchange increased a firm's vulnerability because firms share sensitive operational information with trading partners, which increase the risk of information asymmetries and loss of resource controls. For these reasons, many retailers are reluctant to share detailed information with their suppliers. Economists have studied asymmetric information models (such as "principal-agent" models) that illustrate the resulting consequences when parties interact. IOS supply chain may be viewed as consisting of networks of principal-agent relationships. The use of information is a major determinant of power for both strong and weak participants in a power "game." When a party has the control of information, its power base can be increased. Alternatively, the information-receiving party may be empowered when information is shared.

In reality, the cost/benefits of sharing information is not equally distributed among trading partners. Information sharing benefits some powerful companies. For instance, Chrysler not only reduced transaction costs (e.g. document processing costs for ordering, invoice and payment) but also reduced shipping discrepancy and inventory level at its assembly plants by electronically linking its trading partner through EDI (Clark and Lee, 2000). But it is costly for some weak partners. According to Davis (1995), a 1994 survey by the EDI Group reported that 55% of respondents started using EDI because their main trading partner forced them to do so. From a strategic perspective, such companies have not well-aligned their business strategy with their IT strategy. To some degree, their internal network is not well-integrated with IOS network. This implies that sharing information for some companies is costly.

Stern and Kaufmann (1985) found that the majority of EDI users they surveyed believed that their trading partner benefits more from the IOS network than themselves. In the absence of a well-defined mechanism for distribution of the benefits of IOS, unequal benefits have been shown to be unavoidable. In a field study of the consumer package goods industry, Clemons and Row (1992) show that many retailers believe that the technology will result in an overall weaker bargaining position and therefore lower profits, even though it was widely believed the increase of economic welfare of the industry as a whole because of IOS. The weaker bargaining position results from the loss of vital resource control such as the loss of information control.

Although IOS connects separate organizations together, it does not mean that each organization will realize identical benefits from IOS network. Early uses of EDI by companies such as American Hospital Supply Corporation (Harvard Business School Case No.9-186-005, 1985) and the McKesson Drug Company (Clemons and Row, 1988) were supplier-initiated systems where much of the benefits from the IOS linkage accrued to those suppliers. The benefits from electronic relationship seem to favor the initiator. The reasons that IOS network initiator benefits more than its follower are as follows: Since the organizations initiate the IOS network, they have the advantage to determine the standards of IOS, and the compatibility and connectivity with their existing IS will be in the high level. Allen et al. (1999) argued that standards play a critical role in the evolution of IOS, where shared protocols establish the rules of the systems. Konsynski (1992: 53) has the similar statement "The presence of standards affect the ability of the system to provide the high levels of market-specific information necessary to 'lubricate' transactions". Control of the standards relating to IOS was at the heart of the power relations in the TransLease (one IOS sytem) Community (Allen et al., 1999). Konsynski (1992) also found that if a standard became pervasive among suppliers linked by IOS, it most likely benefited the buyers. The imbalance of power in TransLease case is emphasized by the fact that the lease companies who determined the rules of trade. Further more, certain lease companies were directly observed to take a forceful approach to ensuring that repair agents to use the IOS system. And repair agents felt that they are tied them into a system that would reinforce and amplify existing power structures and powerful company uses the rules of trade to control other trading partners.

In the automobile industry, three automotive manufacturers achieve cooperation with one another through the Automotive Industry Action Group. After this cooperation, the three automotive manufacturers mandated suppliers' adoption of X.12 standard as a prerequisite for continuing to do business in that industry. Sears, Wal-Mart, and K-Mart, J.C. Penney threatened to stop doing business with any suppliers that does not begin allowing the transmission of purchase orders using EDI by certain time. Such examples illustrate that through electronic trading network control, powerful organization can build an entry/exit barrier to its industry. Once some organizations are "hooked" or locked-in an IOS network, the switching costs can be substantial because of the disruption and retraining required (Porter and Millar 1985).

American Hospital Supply quickly dominated its markets with the help of its electronic ordering system, which includes inventory management software for its customers. Hospitals enjoyed easy purchasing procedures; once they became accustomed to the American Hospital Supply system, they didn't want to learn other systems (Munson et al., 1999). In addition, the organization gained negotiating power with its vendors because its system provided more information about the hospital supply market that the vendors could obtain. This relates to electronic trading networks control as well as the information control. This represents one kind of strategic benefits obtained from IOS network (i.e. long-term value appropriation).

Electronic trading networks themselves crystallize this power imbalance; proprietary networks by their very nature confer advantage upon their proprietors and

disadvantages upon the non-owners. With the number of participating organizations in the network accrues, the network benefits will increase. The division of the increased network benefit depends on the relative power of each participant, which determines the value appropriation of expended benefits.

By examining relationship network in which partners are embedded, Gulati et al., (2000) contended that an organization's relationship networks potentially provide the organization with access to information, resources, markets, and technologies; with advantages from learning, scale economy and scope economy. Parise and Henderson (2001) argues that network positioning influences an organization's performance. The capability of managing the organization's relationship network (i.e. structural bonding network) is referred to as alliance capability by Kale, Singh and Perlmutter (2000). Gnyawali and Madhavan (2001) develop a conceptual model explaining how the structure of the network influences the flow of assets, information, and status among network members.

Resource asymmetries among network members occur because of the differential flow of resources, as well as their differential ability to control such flows. They conclude that organizations are embedded in networks of cooperative relationships and differentiated structural positions lead to asymmetries and influence firms' competitive behavior towards others in the network. Gulati et al (2000) argue that one of the traditional sources of differential returns to firms in strategy research is the position in the network. McEvily and Zaheer (1999) also have a similar argument that a firm's position

in a relationship network contributes to its acquisition of new competitive capabilities. Networks structural bonding control is related to the central position in the relationship network. A central position in the network implies greater access to external assets from alliance partners, more opportunity to receive new and confluent information, which means the more power in the network Therefore, a participant with network structural bonding control can benefit from a positive resource asymmetry.

Moon & Lado (2000) using the empirical method recognize that a firm's bargaining power is directly related to rent generation, and from resource-based perspective, a firm's bargaining power is determined by firm-specific resources such as: Managerial resources; Technological know-how; and Reputation. In general, having power in IOS network means the control of the supply process, which leads to the more benefit from network from operational level and strategic level such as purchasing savings through automating many transactions or better solutions to supply challenges. Therefore

H8: An organization's power in IOS supply chain network context positively influences its value appropriation. (H8: POWER→VA)

3.7.9 Research Hypothesis 9 (RQ→VA)

Holmlund (2001) explores relationship quality from technical, social and economic perspectives. In this study, relationship quality just concerns the perception of social interactions between IOS trading partners. Relationship quality itself will lead to some economic results, i.e. relationship benefits and relationship costs, which will be

reflected in the value appropriation process. In reality, cooperation is vital to the value creating process. Without trading partners' cooperation, IOS network will yield limited benefits to the powerful company (Dearing, 1990).

From the literature review as well as business practice, it is clear that different types of economic aspects are significant from a relationship viewpoint. According to Holmlund (2001), five different main relationship benefits types and three main relationship costs were developed in a business relationship. When an organization evaluates its relationship quality with its trading partners, it will refer to the cooperation process and the cooperation outcome. Based on the above evaluation, an organization will perceive the degree of satisfaction with the cooperation, outcome fairness and the willingness to cooperate in the future. Good relationship quality will lead to relationship benefits or relationship revenue such as profitability increase, productivity enhancement, relationship awards arise from stickiness and exclusiveness in the relationship (Storbacka, 1994); poor relationship quality will lead to relationship rupture which leads to relationship cost. The extent of conflicting versus cooperative actions by powerful firms reflects their long-term/short-term orientations. Long-term, stable and fair relationship is the foundation of the long-term benefit for both powerful and weak network members (Munson et al., 1999). Therefore, in order to get high degree of value appropriation, maintaining high level relationship quality between trading partners is necessary.

H9: An organization's relationship quality with its trading partner positively influences its value appropriation (H9: RQ→VA)

CHAPTER 4 RESEARCH METHODOLOGY AND PILOT STUDY

One of the primary objectives of this study is to develop valid and reliable instruments to measure "Learning Capability" (LC), Supportive Leadership (SL), IT Support Capability for Supply Management (ITSC), Power in IOS Supply Chain Network Context (POWER), Value Appropriation (VA), and Relationship Quality (RQ). In this chapter, the instruments for this research are developed and tested.

The process of developing measures is based on commonly accepted methods for developing standardized instruments (Nunnally, 1978; Churchill, 1979).The development of the instruments for the above constructs was carried out in three phases: (1) item generation, (2) pilot study, and (3) instrument validation and large-scale data analysis. First, an extensive and comprehensive literature review was conducted to identify the content domain of the constructs in the research model. Initial items and the definition of each construct were generated from the literature review. An extensive literature review ensures that the research model is built on strong theoretical foundation. Second, the pilot study was conducted using the Q-sort method. The objective of the Q-sort method is to pre-assess the convergent and discriminant validity of the scales by examining how the items were sorted into various target construct categories. The third phase was large scale questionnaire administration (discussed in later chapter). Research hypotheses were then tested based on the large-scale data analysis.

4.1. Item Generation

Proper generation of measurement items of a construct is a prerequisite condition for the validity and reliability of empirical research. The basic requirement for a good measure is *content validity*. Content validity refers to an effective instrument that covers the major content domain of each construct (Churchill, 1979). Content validity is usually achieved through comprehensive literature review and interviewing practitioners and academic experts.

A list of initial items for each construct was generated based on a comprehensive review of relevant literature. Items designed to measure *learning capability* were developed from a review of organizational learning literature, IT learning literature. Items designed to measure *supportive leadership* were developed from a review of the IS strategic planning literature, strategic alliance literature. Items designed to measure *IT support capability* for supply management were developed from IT infrastructure literature, IT use literature, IOS literature. Items designed to measure *power in IOS supply chain network context* were developed from power literature in marketing area, social network analysis literature, political science literature, strategic alliance network literature and relationship management literature. *Value appropriation* items were developed from value chain literature, supply chain management literature, purchasing literature. Items designed to measure relationship quality were adapted from Jap (2001). All items were measured on a five-point Likert scale.

To provide additional support for content validity, items were grouped according to their theoretical construct and presented to six experienced faculty members and several Ph.D. students in related area. In order to refine the definitions and constructs, structured interviews were conducted with the six faculty who were asked to comment on the clarity of construct definition, appropriateness of the research construct and the wordings of each item. Each item was identified as accept, need to modify and delete. The focus was to check the relevance of each construct's definition and the clarity of wordings of sample questionnaire items. Based on the feedback from academicians, redundant and ambiguous items were either modified or eliminated; some useful items were recommended to add to the original item pools.

To further ensure the content validity, the measurement items generated from literature reviews and modification based on the faculties' comments were re-evaluated through structured interviews with two supply chain managers and two purchasing managers. Through above procedure, the final items in each pool entering Q-sort analysis.

4.2. Pilot Study Using Q-sort Method

The pilot study was implemented using Q-sort method. The objective of Q-sort analysis is to assess initial construct validity and reliability. The measurement items entering Q-sort are shown in Appendix A. The total constructs and related items numbers in each construct are shown in table 4.2.1.

The Q-sort method is an iterative process in which the degree of agreement between judges forms the basis of assessing construct validity and reliability. The method consists of two stages. In the first stage, two judges are requested to sort the questionnaire items to different constructs according to similarities and differences among items and the definition of each constructs, based on which the inter-judge agreement is measured. In the second stage, questionnaire items that were identified as being too ambiguous, as a result of the first stage, are reworded or deleted in an effort to improve the agreement between the judges. The process is carried out repeatedly until a satisfactory level of agreement is reached.

4.2.1 Q-sort Procedure

The Q-Sort methodology is a manual factor sorting technique (Moore and Benbasat, 1991) and is conducted as follows: First, each item was printed on a 3 x 5 -inch index card. The cards were shuffled into random order for presentation to the judges. The definitions of the entire construct and each of its sub-dimensions were also presented. Each judge sorted the cards into categories. A "not applicable" category was included to ensure that the judges did not force any item into a particular category. If an item fell under a different dimension from previously conceived, questions were further examined for possible clarification. During the process, the practitioners could also suggest combining two possible overlapping dimensions. The interview results from all practitioners were then carefully analyzed and a common pattern of thinking was recognized, which formed the basis for further modification of measurement items and construct dimensions.

In this research, items placed in a common pool were subjected to three Q-sort rounds with two independent judges per round. Since purchasing professionals who are familiar with supply chain network will be the potential respondents for large-scale survey, purchasing managers acted as judges. Six purchasing managers who have good understanding of the IOS supply chain network were contacted and agreed to be a judge.

Table 4.2.1.1 the Constructs and the # of Items Entering Q -Sort

Constructs		# of items for each construct
IT Support Capability		
	IT Infrastructural Capability	5
	IT use Capability	6
Supportive Leadership		12
Learning Capability		
	Knowledge Base	9
	Knowledge Identification Capability	5
	Knowledge Sharing Capability	6
	Knowledge Transferring Capability	5
Power in IOS supply chain network		
	Information Control	8
	Electronic Trading Network Control	7
	Structural Bonding Control	6
Value Appropriation		
	Short-term Value Appropriation	6
	Long-term Value Appropriation	7
Relationship Quality		
	Satisfaction with Cooperation	5
	Willingness to Cooperate in the Future	3
	Outcome Fairness	3
		Total Items : 93

When Q-sort was used for pilot study, three different measures were used to assess inter-judge agreement level: First, for each pair of judges in each sorting step, the *inter-judge raw agreement scores* were calculated. This was done by counting the

number of items both judges agreed to place in a certain category. An item was considered as an agreed item, though the category in which the item was sorted together by both judges may not be the originally intended category. Second, the level of agreement between the two judges in categorizing the items was measured using *Cohen s Kappa* (Cohen, 1960). This index is a method of eliminating chance agreements, thus evaluating the true agreement score between two judges. Landis and Koch (1977) have provided a more detailed guideline to interpret Kappa by associating different values of this index to the degree of agreement beyond chance. A description of the Cohen s Kappa concept and methodology is included in Appendix B. Third, *item placement ratios* were calculated by counting all the items that were correctly sorted into the target category by each of the judges and dividing them by twice the total number of items. The higher the percentage of items placed in the target construct, the higher the degree of inter-judge agreement across the panel.

4.2.2 First Round Q-sort Results

In the first round, the inter-judge raw agreement scores averaged as 0.78 (Table 4.2.2.1), the initial overall placement ratio of items within the target constructs i.e hit ratio was 87% (Table 4.2.2.2), and the Kappa scores averaged 0.77. The calculations for the Cohen's Kappa coefficient are shown below.

$$k = \frac{N_i X_{ii} - \sum_i (X_{i+} X_{+i})}{N_i^2 - \sum_i (X_{i+} X_{+i})} = \frac{(93)(73) - 728}{(93^2) - 728} = 0.77$$

The calculation of the k is based on Table 4.2.2.1. N_i is the number of total items (93); X_{ii} is the total number of items on the diagonal (that is, the number of items agreed on by two judges); X_{i+} is the total number of the items on the i^{th} row of the table; and X_{+i} is the total number of items on the i^{th} column of the table.

Item placement ratios were calculated by counting all the items that were correctly sorted by counting all the items that were correctly sorted into the target construct by each of the judges and dividing them by twice the total number of items

Table 4.2.2.1 Inter-judge Raw Agreement Scores: First Sorting Round

Judge 2 \ Judge 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	NA
1	5															
2		12														
3	1		5													
4				9												
5					4	1										
6				1		3	2									
7				3	1		1									
8								5	2	2						
9								1	5	1						
10										6						
11											1	5				
12												7		1		
13											1		4		1	
14														3		
15															3	
NA																0

Total Items Placement: 93 | Number of Agreements: 73 | Inter raw Agreement Ratio: .78

1. IT Infrastructural Capability
2. Supportive Leadership
3. IT use Capability
4. Knowledge Base
5. Knowledge Identification Capability
6. Knowledge Sharing Capability
7. Knowledge Transferring Capability
8. Information Control
9. Electronic Trading Network Control
10. Structural Bonding Control
11. Short-term Value Appropriation
12. Long-term Value Appropriation
13. Satisfaction with Cooperation
14. Willingness to Cooperate in the Future
15. Outcome Fairness

NA. Not applicable

Table 4.2.2.2 Items Placement Ratios: First Sorting Round

THEORATICAL CATEGORIES	ACTUAL CATEGORIES																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	NA	T	TG %
	1	11		1														12	91
	2		24															24	100
	3			10														10	100
	4				18													18	100
	5					9	1											10	90
	6				2		8	2										12	67
	7				3	1		4										8	50
	8								11	3	2							16	69
	9								1	12	1							14	86
	10										12							12	100
	11											7	5					12	58
	12												16					16	100
	13											1		8		1		10	80
	14														6			6	100
	15															6		6	100
Total Items Placement:186									Hits: 162					Overall Hit Ratio: 87%					

1. IT Infrastructural Capability
2. Supportive Leadership
3. IT use Capability
4. Knowledge Base t
5. Knowledge Identification Capability
6. Knowledge Sharing Capability
7. Knowledge Transferring Capability
8. Information Control
9. Electronic Trading Network Control
10. Structural Bonding Control
11. Short-term Value Appropriation
12. Long-term Value Appropriation
13. Satisfaction with Cooperation
14. Willingness to Cooperate in the Future
15. Outcome Fairness

4.2.3 Second Round Q-sort Results

In order to further improve the agreement scores and Cohen's Kappa coefficient, an examination of the off-diagonal entries in the placement matrix was conducted. Items sorted into a construct different from the target construct were identified and reworded. The reworded items were entered into second sorting round. In the second round, the inter-judge raw agreement scores averaged 0.86 (Table 4.2.3.1), the initial overall placement ratio of items within the target constructs was 92% (Table 4.2.3.2), and the Kappa scores averaged 0.85. The calculations for the Cohen's Kappa coefficient are shown below.

$$k = \frac{N_i X_{ii} - \sum_i (X_{i+} X_{+i})}{N_i^2 - \sum_i (X_{i+} X_{+i})} = \frac{(93)(80) - 619}{(93^2) - 619} = 0.849$$

The calculation of the k is based on Table 4.2.3.1. N_i is the number of total items (93); X_{ii} is the total number of items on the diagonal (that is, the number of items agreed on by two judges); X_{i+} is the total number of the items on the i^{th} row of the table; and X_{+i} is the total number of items on the i^{th} column of the table

Table 4.2.3.1 Inter-judge Raw Agreement Scores: Second Sorting Round

Judge 2 \ Judge 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	N/A
1	6															
2		11	1													
3			5													
4				9												
5					5											
6						5	1									
7							4									
8								5	2							
9								1	6							1
10										6						
11											4				1	1
12												7				1
13													3		1	1
14														3		
15															3	

Total Items Placement: 93 | Number of Agreements: 80 | Agreement Ratio: .86

1. IT Infrastructural Capability
2. Supportive Leadership
3. IT use Capability
4. Knowledge Base t
5. Knowledge Identification Capability
6. Knowledge Sharing Capability
7. Knowledge Transferring Capability
8. Information Control
9. Electronic Trading Network Control
10. Structural Bonding Control
11. Short-term Value Appropriation
12. Long-term Value Appropriation
13. Satisfaction with Cooperation
14. Willingness to Cooperate in the Future
15. Outcome Fairness

Table 4.2.3.2 Items Placement Ratios: Second Sorting Round

THEORATICAL CATEGORIES	ACTUAL CATEGORIES																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	NA	T	TG %
	1	12																12	100
	2		23	1														24	96
	3			10														10	100
	4				18													18	100
	5					10												10	100
	6						11	1										12	92
	7							8										10	80
	8								13	3								16	81
	9								1	12							1	14	86
	10										12							12	100
	11											7		1		1	3	12	58
	12												15				1	16	94
	13													8		1	1	10	80
	14														6			6	100
	15															6		6	100
Total Items Placement:186									Hits: 172					Overall Hit Ratio: 92%					

1. IT Infrastructural Capability
2. Supportive Leadership
3. IT use Capability
4. Knowledge Base t
5. Knowledge Identification Capability
6. Knowledge Sharing Capability
7. Knowledge Transferring Capability
8. Information Control
9. Electronic Trading Network Control
10. Structural Bonding Control
11. Short-term Value Appropriation
12. Long-term Value Appropriation
13. Satisfaction with Cooperation
14. Willingness to Cooperate in the Future
15. Outcome Fairness

4.2.4 Third Round Q-sort Results

After first two sorting rounds, in order to further improve the agreement scores and Cohen's Kappa coefficient, an examination of the off-diagonal entries in the placement matrix was conducted. Some items sorted into a construct different from the target construct were identified and removed. In the third round, the inter-judge raw agreement scores averaged 0.92 (Table 4.2.4.1), the initial overall placement ratio of items within the target constructs was 92% (Table 4.2.4.2), and the Kappa scores averaged 0.91. The calculations for the Cohen's Kappa coefficient are shown below.

$$k = \frac{N_i X_{ii} - \sum_i (X_{i+} X_{+i})}{N_i^2 - \sum_i (X_{i+} X_{+i})} = \frac{(86)(79) - 531}{(86^2) - 531} = 0.912$$

The calculation of the k is based on Table 4.2.4.1. N_i is the number of total items (93); X_{ii} is the total number of items on the diagonal (that is, the number of items agreed on by two judges); X_{i+} is the total number of the items on the i^{th} row of the table; and X_{+i} is the total number of items on the i^{th} column of the table.

A summary of inter-judge agreement indices for all three sorting rounds is shown in Table 4.2.4.3. The final refinement of the scales for the large scale survey was the slight modification of the third sorting round. The final measurement instrument from the three sorting rounds for large-scale survey is shown in Appendix C. The number of items remaining for each construct after the third round of Q-sort was shown in Table 4.2.4.4

Table 4.2.4.1 Inter-judge Raw Agreement Scores: Third Sorting Round

Judge 2 \ Judge 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	N/A
1	5		1													
2		11														
3			4													
4				7	1											
5					5											
6						6	1									
7							4									
8								6								
9								1	5							
10									1	5						
11											4	1				
12											1	6				
13													5			
14														3		
15															3	

Total Items Placement: 86 | Number of Agreements: 79 | Agreement Ratio: .92

1. IT Infrastructural Capability
2. Supportive Leadership
3. IT use Capability
4. Knowledge Base t
5. Knowledge Identification Capability
6. Knowledge Sharing Capability
7. Knowledge Transferring Capability
8. Information Control
9. Electronic Trading Network Control
10. Structural Bonding Control
11. Short-term Value Appropriation
12. Long-term Value Appropriation
13. Satisfaction with Cooperation
14. Willingness to Cooperate in the Future
15. Outcome Fairness

Table 4.2.4.2 Items Placement Ratios: Third Sorting Round

THEORATICAL CATEGORIES	ACTUAL CATEGORIES																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	NA	T	TG %
	1	10																10	100
	2		22															22	100
	3		2	8														10	80
	4				14	2												16	88
	5					10												10	100
	6						12											12	100
	7						1	8	1									10	80
	8								12	1	1							14	86
	9								1	10	1							12	84
	10										10							10	100
	11											8		1			1	10	80
	12												12	1	1			14	86
	13													10				10	100
	14														6			6	100
	15															6		6	100
Total Items Placement:172									Hits: 158					Overall Hit Ratio: 92%					

1. IT Infrastructural Capability
2. Supportive Leadership
3. IT use Capability
4. Knowledge Base
5. Knowledge Identification Capability
6. Knowledge Sharing Capability
7. Knowledge Transferring Capability
8. Information Control
9. Electronic Trading Network Control
10. Structural Bonding Control
11. Short-term Value Appropriation
12. Long-term Value Appropriation
13. Satisfaction with Cooperation
14. Willingness to Cooperate in the Future
15. Outcome Fairness

Table 4.2.4.3 Summary of Inter-Judge Agreements

Agreement Measure	Round 1	Round 2	Round 3
Raw Inter-judge Agreement	**78%**	**86%**	**92%**
Cohen's Kappa	**77%**	**85%**	**91%**
Placement Ratio Summary			
IT Infrastructural Capability	91%	100%	100%
Supportive Leadership	100%	96%	100%
IT use Capability	100%	100%	80%
Knowledge Base	100%	100%	88%
Knowledge Identification Capability	90%	100%	100%
Knowledge Sharing Capability	67%%	92%	100%
Knowledge Transferring Capability	50%	80%	80%
Information Control	69%	81%	86%
Electronic Trading Network Control	86%	86%	84%
Network Structural Bonding Control	100%	100%	100%
Short-term Value Appropriation	58%	58%	80%
Long-term Value Appropriation	100%	94%	86%
Satisfaction with Cooperation	80%	80%	100%
Willingness to Cooperate in the Future	100%	100%	100%
Outcome Fairness	100%	100%	100%
Average	**87%**	**92%**	**92%**

Table 4.2.4.4 the Constructs and the # of Items for Large-scale Survey (After Third Round Q –Sort)

Constructs		# of items for each construct
IT Support Capability		
	IT Infrastructural Capability	5
	IT use Capability	5
Supportive Leadership		11
Learning Capability		
	Knowledge Base	8
	Knowledge Identification Capability	5
	Knowledge Sharing Capability	6
	Knowledge Transferring Capability	5
Power in IOS supply chain network		
	Information Control	7
	Electronic Trading Network Control	6
	Network Structural Bonding Control	5
Value Appropriation		
	Short-term Value Appropriation	5
	Long-term Value Appropriation	7
Relationship Quality		
	Satisfaction with Cooperation	5
	Willingness to Cooperate in the Future	3
	Outcome Fairness	3
		Total Items : 86

CHAPTER 5 INSTRUMENT DEVELOPMENT AND VALIDATION

5.1 Survey Methods and Sample Characteristics

5.1.1 Survey Methods

A large-scale survey was conducted to collect data for this dissertation. This study sought to choose respondents who can be expected to have best knowledge about the inter-organizational relationship between his/her organization and its trading partners during the process of participating supply chain network linked by IOS technology. The sampling frame was obtained from Institute for Supply Management (ISM). The companies with the following SIC code (Table 5.1.1.1) were selected to test the model.

Table 5.1.1.1 SIC Codes

SIC Code	Industries	Frequency	Percent
39	Misc. Manufacturing Industries	2479	49.58
28	Chemicals and Allied Products	650	13
34	Fabricated Metal Products	509	10.18
20	Food and Kindred Products	398	7.96
50	Wholesale Trade-Durable Goods	257	5.14
30	Rubber and Misc. Plastic Products	207	4.14
51	Wholesale Trade-Nondurable Goods	187	3.74
25	Furniture and Fixtures	95	1.9
29	Petroleum and Coal Products	92	1.84
52	Building Materials & Garden Supplies	48	0.96
24	Lumber and Wood Products	43	0.86
55	Automotive Dealers & Service Station	35	0.7

The initial mailing list had 5,000 addresses. The mailing list included the following information: First name, Last name, Job title, Company name, Address, City, State, Country, Phone, Zip code, E-mail address. Before the large-scale survey was conducted, the mailing list was refined through the following steps: 1) names without organization affiliations or without job title were removed; 2) names without e-mail address were also removed. These refinements resulted in a list of 4,500 addresses.

Request to fill up the online survey was sent to these 5000 addresses. 96 responses were received. During the first mailing, 1502 e-mail addresses were found to be undeliverable and 148 individuals declined to participate in the research due to various reasons like not using EDI, technology, company policy restrictions, tired of responding to survey etc. Therefore, 1650 names were removed from mailing list for the second reminder emailing. Two weeks later, a follow-up letter was sent out and 78 responses were received. The third and final reminders were sent to non-respondents and we received 66 more responses. In all, 240 responses were received. Out of the 240, 12 questionnaires were removed due to missing data, which resulted in 228 usable responses constituting an effective response rate of 6.92%.

5.1.2 Sample Characteristics of the Respondents

As shown in Table 5.1.2.1 and Figure 5.1.2.1, 52 percent of the respondents are purchasing professionals; 10 percent of respondents are vice presidents/executives and 38 percent of respondents are other managerial positions. The other sample characteristics of respondents are shown in Table 5.1.2.2—5.1.2.7.

Table 5.1.2.1 Respondents Managerial Positions

Position	Frequency	Percent
Purchasing Professionals	119	52%
Vice Presidents/ Executives	22	10%
Others	87	38%
Total	228	100%

Figure 5.1.2.1 Respondents Managerial Positions—Pie Chart

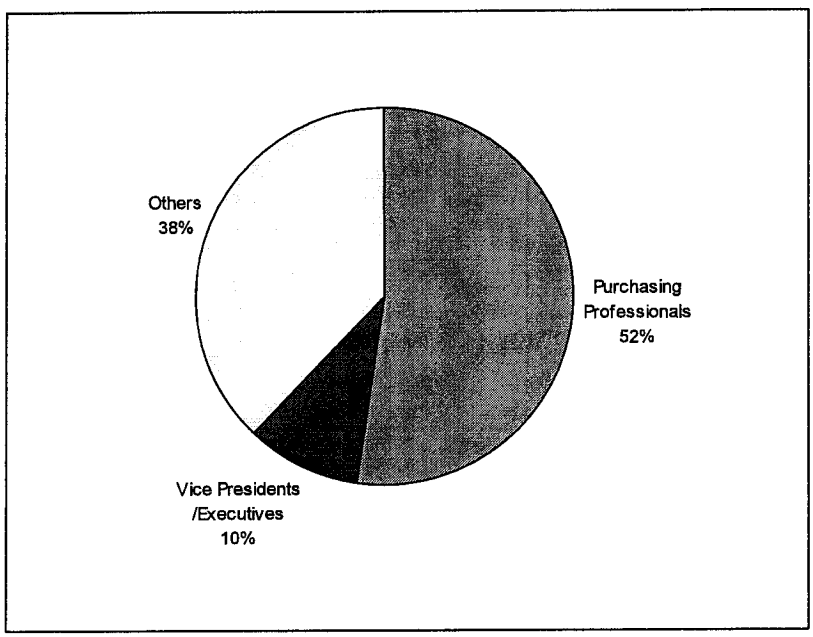


Table 5.1.2.2 Industry

Industry	Frequency	Percent
Manufacturing	184	81
Service	31	14
Others	13	5
Total	228	100

Table 5.1.2.3 Firm Size

Number of Employees	Frequency	Percent
100 - 249	32	14
250 - 499	28	12
500 - 999	29	13
1000 - 2499	29	13
2500 and over	92	40
others	18	8
Total	228	100

Table 5.1.2.4 Number of Purchasing Employees

Number of Purchasing Employees	Frequency	Percent
less than 10	88	39
10 - 25	44	19
26 - 50	19	8
51 - 100	17	7
101- 200	21	9
over 200	39	17
Total	228	100

Table 5.1.2.5 Sales Volume

Annual Sales ($ in millions)	Frequency	Percent
less than 10	9	4
10 – 49.9	31	14
50 – 99.9	22	10
100 – 499.9	39	17
500 – 1000	25	11
over 1 billion	102	45
Total	228	100

Table 5.1.2.6 IOS Initiator

IOS Initiator	Frequency	Percent
your trading partner	30	13
your organization	87	38
a third party	29	13
your organization and your trading partner	61	27
your organization and a third party	14	6
others	7	3
Total	228	100

Table 5.1.2.7 Type of IOS

Type of IOS	Frequency	Percent
is a part of an electronic market with many suppliers and many buyers	80	35
is one to one connection between one buyer and one supplier	65	29
has one buyer and many suppliers	57	25
has one supplier and many buyers	18	8
others	8	4
Total	228	100

5.2 Large Scale Instrument Assessment Methodology

In Chapter 3, theoretical model was proposed with many theoretical constructs that cannot be observed directly. These theoretical construct or factors must be measured by observed variables or indicators. In the large-scale survey, each question serves as an indicator. The well-known statistical procedure for investigating relations between sets of observed and unobserved (i.e., latent) variables is the factor analysis method. There are two basic types of factor analyses: (1) Exploratory Factor Analysis (EFA); (2) Confirmatory Factor Analysis (CFA). EFA is designed for the situation where relationships between the observed and latent variables are unknown or uncertain. In contrast to EFA, CFA is used when the researchers has prior knowledge of the underlying

latent variable structure. Based on the knowledge of theory, empirical research or both, relations between the observed indicators and the latent factors are postulated and then tests this hypothesized structure statistically. "EFA or CFA focuses solely on how, and the extent to which, the observed variables are linked to their underlying latent variables (i.e., factor). CFA model focuses solely on the link between latent factors and their measured variables, within the framework of SEM, it represents what has been termed a measurement model" (Byrne, 2001, p6). Given this necessary bridging process between observed variable and unobserved variable, measures should be carefully selected and assessed.

Once the data were collected, the survey instruments used in the large-scale study were submitted to rigorous reliability and validity assessment using the 228 responses. Although reliability and validity are both criteria for evaluating the quality of a measurement procedure, these two factors are partially related and partially independent. A measure cannot be valid unless it is reliable, but a measure can be reliable without being valid. Following the guidelines of Bagozzi (1980) and Bagozzi and Phillips (1982), the important properties for measurements to be reliable and valid should include content validity, reliability, convergent validity (unidimensionality), discriminant validity and predictive validity. SPSS software was used to reliability analysis and predictive validity analysis; AMOS software (one of Structural Equation Modeling software) was used to convergent validity and discriminant validity analysis.

5.2.1 Content Validity

Content validity is the representativeness or sampling adequacy of the content of a measuring instrument. Nunnally (1978) stated "*content validity* rests mainly on appeals to reason regarding the adequacy with which important content has been sampled and on the adequacy with which the content has been cast in the form of test items". A representative collection of items and a sensible method of test construction are regarded as important criteria for ensuring content validity (Nunnally, 1978). Content validity can be assessed by the following processes. First, a comprehensive review of the literature was conducted to make sure that measurement items were well covered the domain of the construct being measured and requests comments from academicians and practitioners on appropriateness, completeness of items. Modifications to the items were followed based on the comments from academicians and practitioners. Second, a Q-sort method was conducted to clarify a description of the hypothesized constructs.

5.2.2 Convergent Validity

Convergent validity is defined as the extent to which the measurement items are converged into a theoretical construct. The traditional method employed for evaluation of construct validity of measurement scales is confirmatory factory analysis (CFA). Using AMOS (i.e. Analysis of Moment Structure or Analysis of Mean and covariance structure) software (one of SEM software), it is possible to specify, test, and modify the measurement model.

In this study, using AMOS software, a single factor measurement model is specified for each sub-dimension of the constructs in the conceptual model. Following Sethi and King (1994), iterative modifications were made for each of dimensions by examining modification indices (MI) and coefficients to improve key model fit indexes. As recommended by Joreskog and Sorbom (1989) and Byrne (2001), only one item was altered or only one correlation between items at a time was changed in order to avoid over-modification of the model. The iterative process continued until all model parameters and key model fit indexes meet recommended criteria. First-order CFA and Second-order CFA are conducted later on. Model-data fit was evaluated based on multiple model fit indexes.

The overall model fit indexes include goodness of fit index (GFI), adjusted goodness of fit index (AGFI), comparative fit index (CFI), normed-fit index (NFI), and root mean square residual (RMR) and root mean square error of approximation (RMSEA). The GFI indicates the relative amount of variance and covariance jointly explained by the model. GFI and AGFI values range from 0 to 1, with higher values indicating better fit (Byrne, 2001). The AGFI differs from GFI in that it adjusts for the number of degree of freedom in the model. GFI and AGFI scores in the 0.80-0.89 range are generally interpreted as representing reasonable fit; scores of 0.90 and above represent good fit (Joreskog and Sorbom, 1989; Doll et al., 1995). The NFI assesses the fit of the model that is being studied in comparison to the fit of the null model (Bentler and Bonnet, 1980). It indicates the practical significance of the model in explaining the data. CFI avoids the underestimation of fit often noted in small samples for NFI. Many

researchers interpret these index scores (CFI, NFI) in the range of .80-.89 as representing reasonable fit; scores of .90 or higher are considered as evidence of good fit (Joreskog and Sorbom, 1989). The RMR indicates the average discrepancy between the elements in the sample covariance matrix and the model-generated covariance matrix. RMR values range from 0 to 1, with smaller values indicating better model; values less than .05 indicate good fit (Byrne, 2001). (For more detailed discussions of the various indexes of model fit provided by the AMOS program, see Byrne 2001).

5.2.3 Reliability Analysis

The reliability is referred to as the extent to which an experiment, test, or any measuring procedure yields the same results on repeated trials. Reliability values indicate the degree to which operational measures are free from random error and measure the construct in a consistent manner. It is the accuracy or precision of a measuring instrument. Reliability can be explained by using the component of variance:

Total variance=true variance + error variance

Reliability coefficient= true variance/ total variance

Reliability is used to test internal consistency of measurement. Reliability is a necessary but not sufficient condition of the value of research results in interpretation. The reliability of the items comprising each dimension was examined using Cronbach's alpha (1951). Following the guideline established by Nunnally (1978), an alpha score of higher than .70 is generally considered to be acceptable.

To ensure the reliability of the measurement instrument, corrected-item total correlations (CITC) have been used extensively for items purification. CITC refers to a correlation of an item or indicator with the sum of the others in its category. CITC less than 0.5 are usually candidates for elimination in further analysis. If all the items in a measure are drawn from the domain of a single construct, responses to those items should be highly inter-correlated (Churchill, 1979). The item inter-correlation matrices provided by SPSS10.0 were utilized to drop items if they did not strongly contribute to Cronbach's alpha for the construct under consideration (Tracey et al., 1999).

5.2.4 Discriminant validity

Discriminant validity refers to the uniqueness and the independence of the dimensions (Bagozzi and Phillips, 1982). Discriminant validity can be assessed using structural equation modeling methodology (Bagozzi and Phillips, 1982). It can be done by taking two constructs at a time. The constructs are considered to be distinct if the hypothesis that the two constructs together form a single construct is rejected. To test this hypothesis, a pair-wise comparison of models was performed by comparing the a single factor model (Figure 5.2.4.2 Model 2) with a correlated model (Figure 5.2.4.1 Model 1). A difference between the χ^2 value (df = 1) of the two models that is significant at $p < 0.05$ level would indicate support for the discriminant validity criterion (Joreskog, 1971). Comparing to model 2, Model 1 has one more parameter was to estimate, thereby using up one degree of freedom (i.e one less degree of freedom). In other words, model 1 (correlated) has one less degree of freedom than the model 2 (a single factor model).

The general first-order CFA model and second-order CFA model are shown in the figure Figure 5.2.4.3 and Figure 5.2.4.4 respectively.

Figure 5.2.4.1 General Correlated Model—Model 1

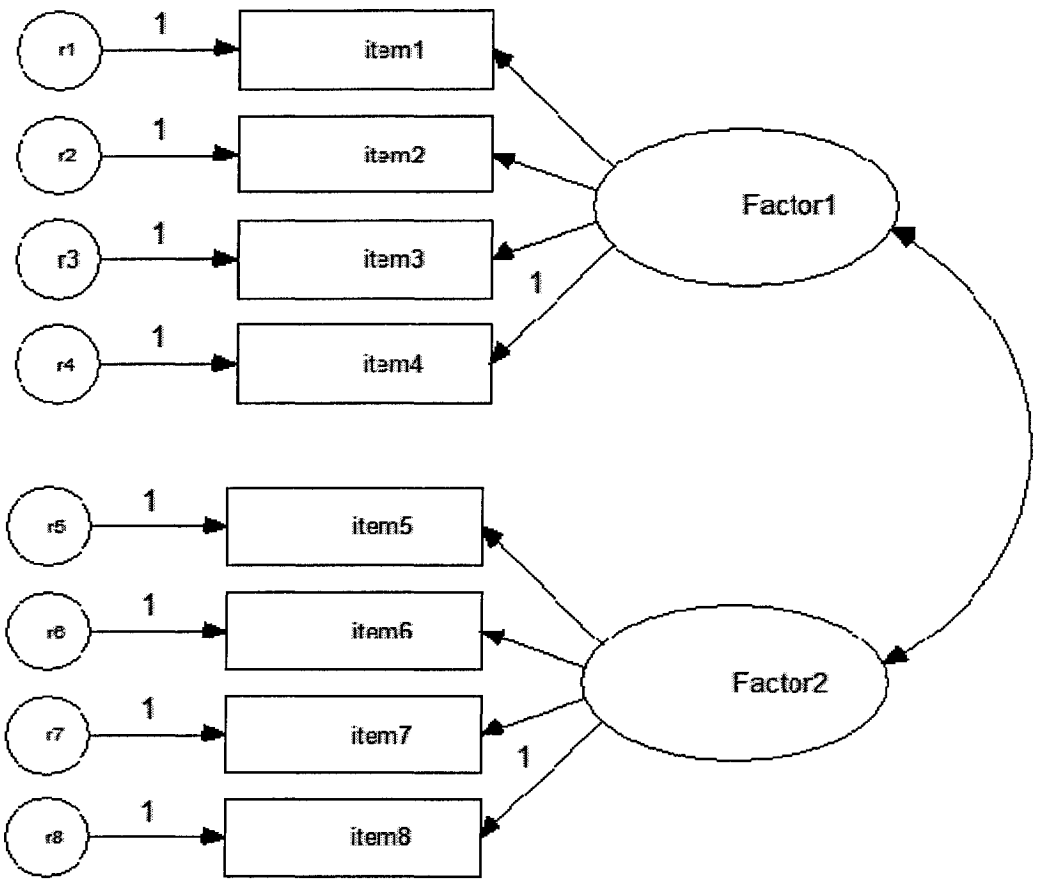
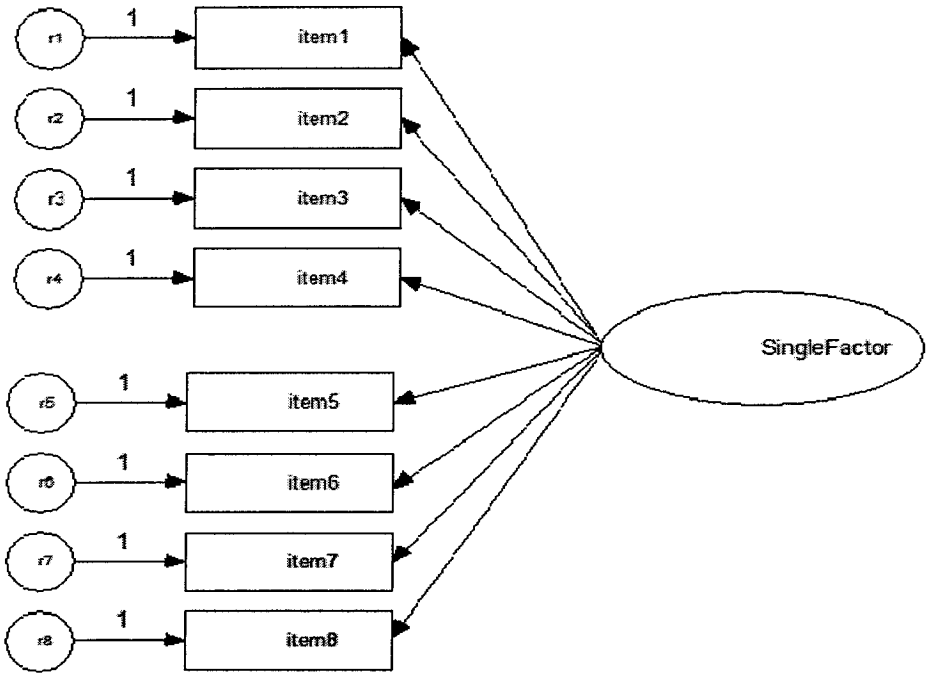


Figure 5.2.4.2 General a Single Factor Model—Model 2



5.2.5 Validation of the Second-order Construct: T-Coefficient

The second-order factor is explaining the covariation among first-order factors in a more parsimonious way. Therefore, even when the higher-order model is able to explain the factor covariations, the goodness-of-fit of the higher order model can never be better than the corresponding first-order model (Segars and Grover, 1998).

The efficacy of second-order model can be assessed through examination of T-coefficient (T), which is the ratio of the chi-square of model A (Figure 5.2.5.1) to chi-square of Model B (Figure 5.2.5.2) (Marsh and Hocevar, 1985). T-coefficient indicates the percentage of variation in the first order factors in the Model A explained by the

second-order in the model B. The T coefficient higher than .80 indicates the existence of a second-order construct since most of the variation shared by the first-order factors is explained by the single second-order factor.

There is one limitation to use T-coefficient to validate the second-order construct. It can be used only when the number of first-order factors is 4 or more than 4. In this study, we use T-coefficient to validate that learning capability is a second order construct. For other second order constructs, we check the factor loadings (i.e., standardized coefficient λ) of first order factors loaded on the second-order factor and the statistical significance. Standardized coefficient λ over 0.5 is an indicative of the existence of a second-order construct.

Figure 5.2.5.1 General First-order CFA model (Model A)

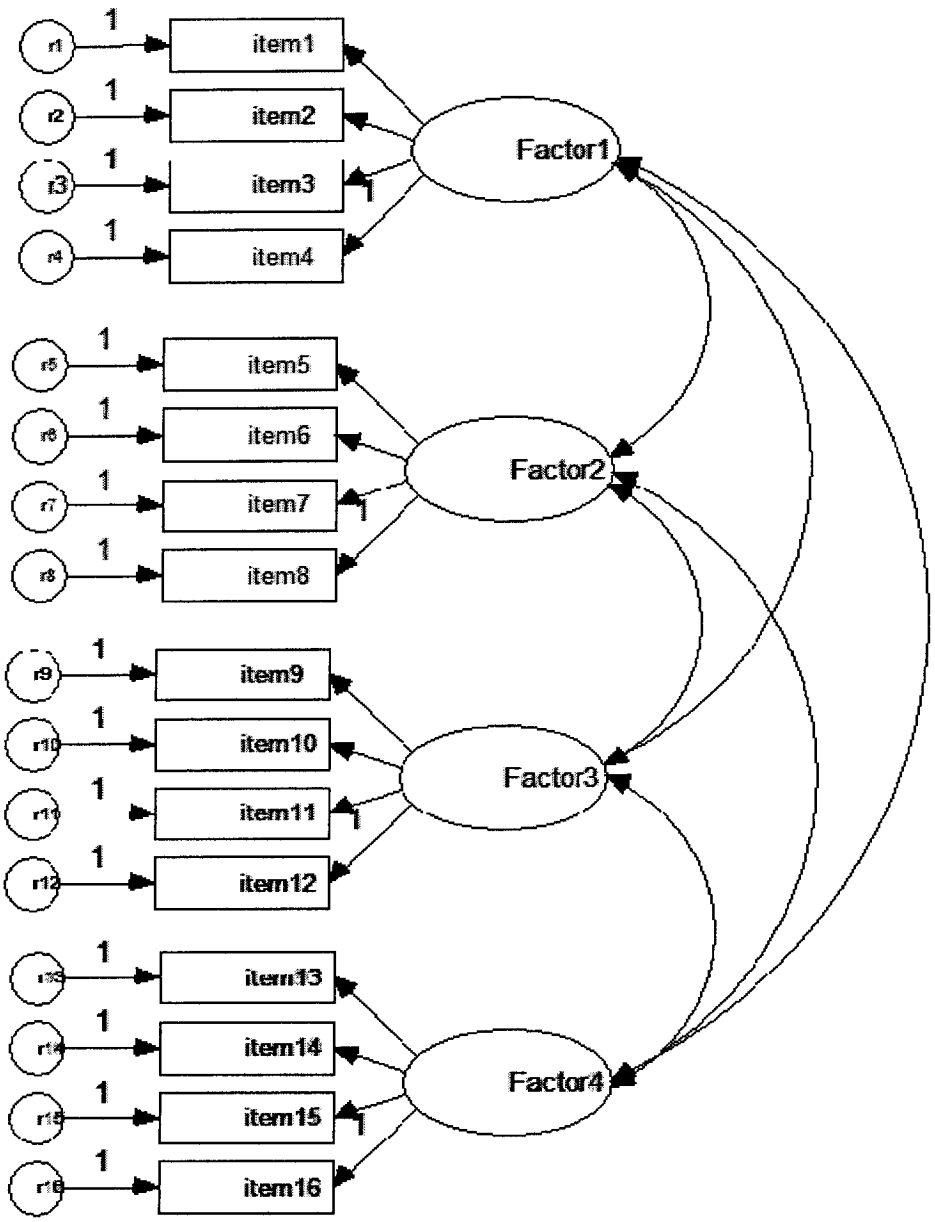
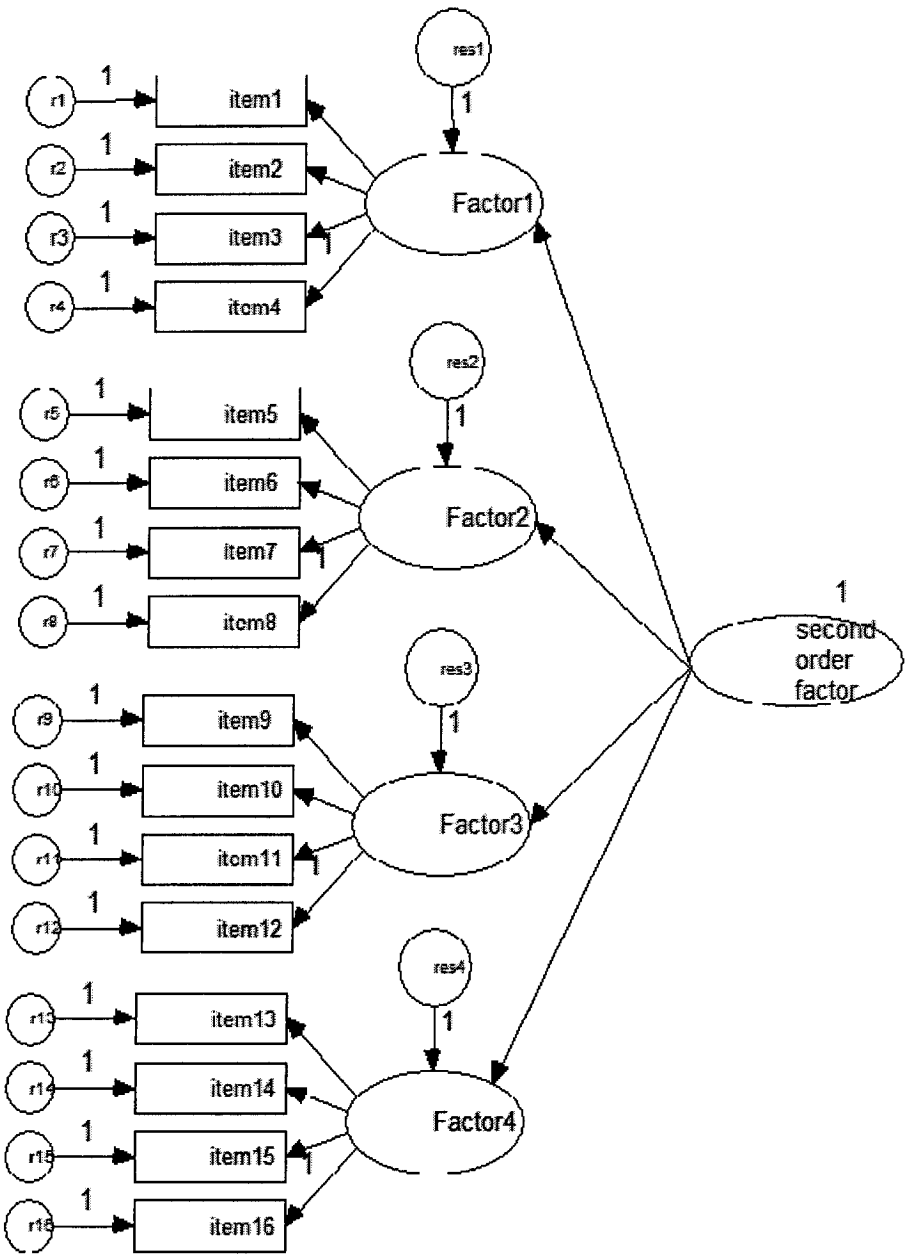


Figure 5.2.5.2 General Second-order CFA model (Model B)



5.2.6 Predictive Validity

This criterion seeks to find support for the validity of the construct by investigating whether it exhibits relationships with other constructs that are in accordance with theory. According to Fornell (1982) and Bagozzi and Pillips (1991), the conceptual meaning of a construct should be determined not only by its definition and operationalization but also by its relationships to antecedents and consequences. In other words, the predictive validity of the measurement instruments was also examined by linking the independents variables with their relevant dependent variables. To check for the predictive validity of the resulting measurement instruments, a composite score for each construct was calculated by taking the average of all remaining items in the construct. Pearson correlation coefficients among these composite construct measures were then calculated to determine the significance of hypothesized relationships.

5.3 Large-Scale Measurement Results

5.3.1 Learning Capability

The Learning Capability (LC) construct was initially represented by 4 dimensions and 24 items, including Knowledge Base (KB) which includes 8 items-KB1, KB2, KB3, KB4, KB5, KB6, KB7 and KB8; Knowledge Identification Capability (KIC)(5 items), Knowledge Sharing Capability (KSC) (6 items) and Knowledge Transfer Capability (KTC) (5 items).

Convergent Validity: In this step, using AMOS, the initial 24 LC items were then submitted to a measurement model analysis to check model fit indexes for each sub-construct KB, KIC, KSC and KTC (Table 5.3.1.1).

The initial model fit indexes for KB consist of GFI = .883, AGFI = .700 and RMR = .054. These indexes show nowhere near a reasonable fit; therefore, further model modification was conducted based on modification indexes (MI). MI represents both measurement error correlations and item correlations (multicolinearity). MI shows evidence of misfit between the default model and the hypothesized model. MI is conceptualized as a chi-square statistic with one degree of freedom (Joreskog & Sorbom, 1989). High MI represents error covariances meaning that one item might share variance explained with another item (commonality) and thus they are redundant. The remedial action for error covariances is to delete such an item which has high error variance or to correlate such items.

Based on the modification indexes, 2 items (KB7, KB8) were highly correlated. Since these two items represent two different aspects, the items are kept for further analysis. The new model fit indexes improved significantly to GFI = .903, AGFI = .817, and RMR = 0.049.

The initial model fit indexes for KIC consist of GFI = .911, AGFI = .732 and RMR = .041. These indexes are indicative of not a very good fit of model. After review of the MIs, the covariance of error items of KIC4 and KIC5 is very high (32.827), which means a high degree of overlap in item KIC4 and KIC5. However, KIC4 and KIC5

represent different aspects, these two items are kept and correlate them for further analysis, the final model fix index are as follows: GFI = .911, AGFI = .898 and RMR = 0.022.

The initial model fit indexes for KSC consist of GFI = .917, AGFI = .806 and RMR = .040. These indexes are indicative of not a very good fit of model. To assist us in pinpointing possible areas of misfit, we also examine the MIs. Baseed on the MIs, the covariance of error of item KSC5 and KSC6 is very high (22.289). Since KSC6 item can be included in KSC4, KSC6 is removed, then the model indexes improve a little bit GFI = .959, AGFI = .878 and RMR = .028. MIs were examined again, the covariance of error item of KSC4 and KSC5 is still high (10.467). However, KSC4 and KSC5 represent different aspects of the construct; these two items are kept and correlated for further analysis. After removing item KSC6 and correlating KSC4 and KSC5, the final model indexes are as follows: GFI = .979, AGFI = .922 and RMR = .018.

The initial model fit indexes for KTC consist of GFI = .935, AGFI = .806 and RMR = .031. These indexes are indicative of not a very good fit of model. After review of the MIs, the covariance of error items of KTC3 and KTC4 is very high (20.722), which means a high degree of correlation between item KTC3 and KTC4. However, KTC3 and KTC4 represent different aspects; these two items are kept and correlated for further analysis. The final model fix indexes are as follows: GFI = .984, AGFI = .939 and RMR = 0.014.

Table 5.3.1.1 Learning Capability Convergent Validity Assessment

Coding	Items	Initial Model Fit	Final Model Fit (After deleting * items and corrected some items)
Knowledge Base (KB)			
	We have knowledge about		
KB1	our strengths comparing with our trading partner	**GFI =.883 AGFI =.700 RMR =.054**	**GFI =.903 AGFI =.817 RMR =.049** (KB7&KB8 correlated)
KB2	the products of our trading partners		
KB3	the strengths of our trading partners		
KB4	how to handle the conflicts with our trading partners		
KB5	how to use computer systems to connect with our trading partners		
KB6	the market position (leader or follower) of our trading partners		
KB7	how to use the information through IOS network		
KB8	how to analyze potential threats/opportunities from our partners through IOS network		
Knowledge Identification Capability (KIC)			
	We have the ability to …		
KIC1	monitor new purchasing tools/techniques	**GFI =.911 AGFI =.732 RMR =.041**	**GFI =.973 AGFI =.898 RMR =.022** (KIC4&KIC5 correlated)
KIC2	monitor new information technology used in purchasing area		
KIC3	identify what kind of knowledge we need to retain in purchasing area		
KIC4	identify valuable knowledge for our business from our trading partners		
KIC5	identify valuable knowledge for our business from our competitors		
Knowledge Sharing Capability (KSC)			
	Among different functional areas, we have the ability to…		
KSC1	share our functional area knowledge with each other (e.g. cross-functional team work)	**GFI =.917 AGFI =.806 RMR =.040**	**GFI =.979 AGFI =.922 RMR =.018** (KSC4&KSC5 Correlated KSC6 deleted)
KSC2	communicate with each other through our internal network		
KSC3	share ideas relating to work improvement		
KSC4	share failure as well as success stories relating to our work		
KSC5	share useful work processes (e.g., formal seminar)		
***KSC6**	share computer network related knowledge routinely		

Knowledge Transfer Capability (KTC)			
	In our organization, we have ability to... 0.014 0.984 0.939		
KTC1	assimilate new general knowledge (e.g. new technique/tools/ new basic skills)	**GFI =.935 AGFI =806 RMR =.031**	**GFI =.984 AGFI =.939 RMR =.014** (KTC3&KTC4 correlated)
KTC2	assimilate new network knowledge to promote our purchasing process		
KTC3	assimilate our partner's knowledge to serve our objectives		
KTC4	assimilate our competitor's knowledge to serve our objectives		
KTC5	apply our general knowledge to different tasks		

Reliability Analysis The analysis began with purification using CITC analysis. An initial reliability analysis was done for each of the four Learning capability dimensions. The Corrected Item-Total Correlation (CITC) scores for all items in KB, KIC, KSC and KTC dimensions were above 0.50. CITC less than 0.5 are usually candidates for elimination in further analysis. According to Nunnally (1978), an alpha score of higher than .70 is generally considered to be acceptable. The final Cronbach's Alpha scores for each dimension and The CITC for each item, its corresponding code name, and the reliability analysis results are shown in Table 5.3.1.2.

Table 5.3.1.2 Learning Capability Reliability and CITC Assessment

Coding	Items	CITC	Cronbach's Alpha (α)
Knowledge Base (KB)			
	We have knowledge about ...		
KB1	our strengths comparing with our trading partner	**.7670**	**α= .9141**
KB2	the products of our trading partners	**.7191**	
KB3	the strengths of our trading partners	**.7753**	
KB4	how to handle the conflicts with our trading partners	**.6963**	
KB5	how to use computer systems to connect with our trading partners	**.6245**	
KB6	the market position (leader or follower) of our trading partners	**.7552**	

KB7	how to use the information through IOS network	**.7580**	
KB8	how to analyze potential threats/opportunities from our partners through IOS network	**.6949**	
Knowledge Identification Capability (KIC)			
	We have the ability to ...		
KIC1	monitor new purchasing tools/techniques	**.8066**	**α= .9195**
KIC2	monitor new information technology used in purchasing area	**.7916**	
KIC3	identify what kind of knowledge we need to retain in purchasing area	**.8260**	
KIC4	identify valuable knowledge for our business from our trading partners	**.7972**	
KIC5	identify valuable knowledge for our business from our competitors	**.7413**	
Knowledge Sharing Capability (KSC)			
	Among different functional areas, we have the ability to...		
KSC1	share our functional area knowledge with each other (e.g. cross-functional team work)	**.7754**	**α= .8980**
KSC2	communicate with each other through our internal network	**.6628**	
KSC3	share ideas relating to work improvement	**.8586**	
KSC4	share failure as well as success stories relating to our work	**.7668**	
KSC5	share useful work processes (e.g., formal seminar)	**.7360**	
***KSC6**	share computer network related knowledge routinely	**.7419**	
Knowledge Transfer Capability (KTC)			
	In our organization, we have ability to...		
KTC1	assimilate new general knowledge (e.g. new technique/tools/ new basic skills)	**.7455**	**α= .8903**
KTC2	assimilate new network knowledge to promote our purchasing process	**.7788**	
KTC3	assimilate our partner's knowledge to serve our objectives	**.8135**	
KTC4	assimilate our competitor's knowledge to serve our objectives	**.7016**	
KTC5	apply our general knowledge to different tasks	**.6377**	

Discriminant validity: Table 5.3.1.3 shows the results from discriminant analysis. The differences between χ^2 values from every pairs are statistically significant at the $p < 0.0001$ level thus indicating high degree of discriminant validity among constructs. The

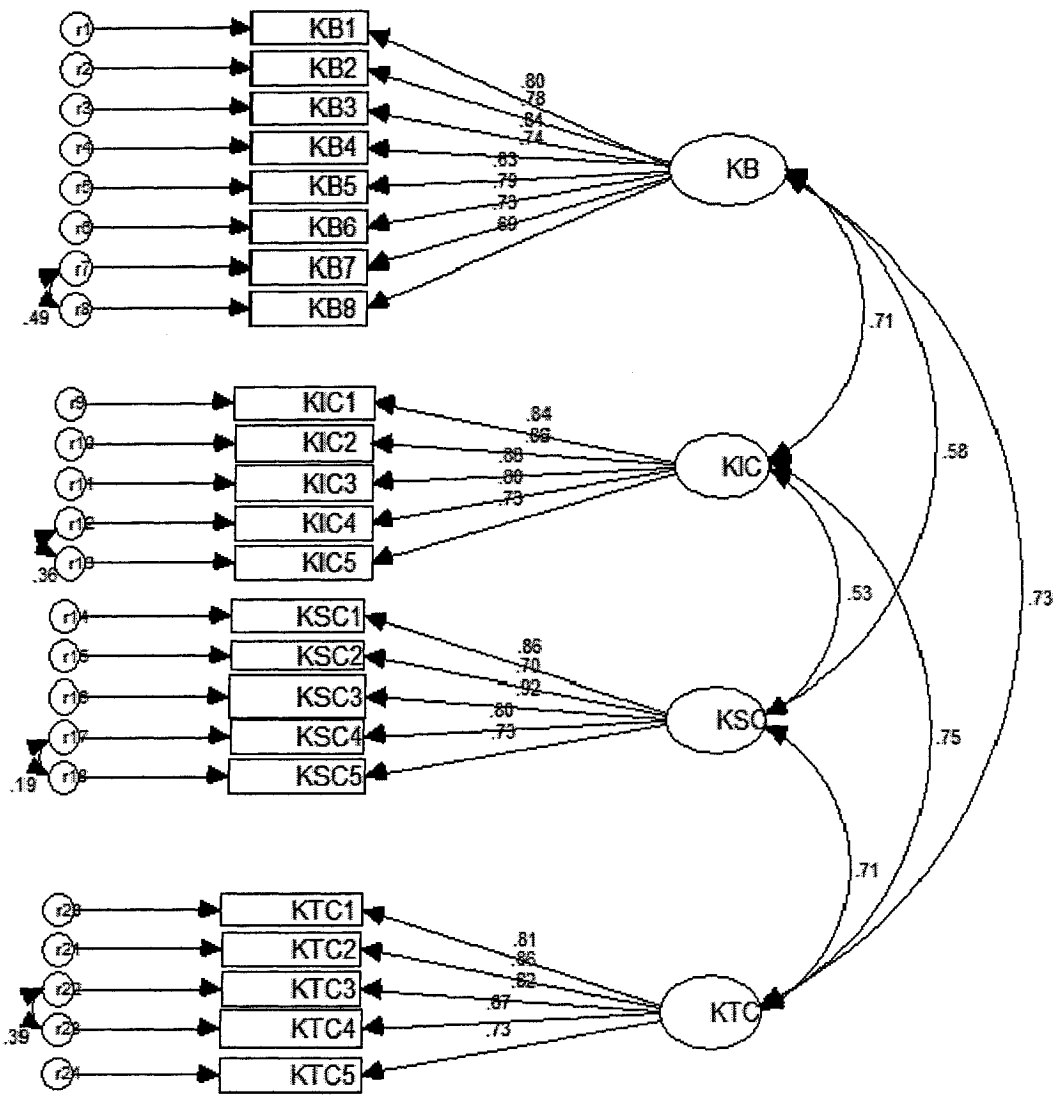
results prove that the constructs are theoretically and statically different from each other as hypothesized in the measurement development section.

Table 5.3.1.3 Learning Capability Discriminant Validity Assessment (Pairwise comparison of $\chi 2$ values)

Construct	KIC(χ^2)			KSC(χ^2)			KTC(χ^2)		
	Correlated	Single Factor	**Dif.**	Correlated	Single Factor	**Dif.**	Correlated	Single Factor	**Dif.**
KB	238	305	**67**	174	248	**74**	197	278	**81**
KIC				69	141	**72**	142	216	**74**
KSC							85	150	**65**
KTC									

First-Order CFA model Assessment The initial results of first-order CFA model for LC are shown in Figure 5.3.1.1. The initial results indicate acceptable coefficients λ being greater than 0.5, the value of GFI= 0.807 and CFI=0.907 are indicative of a marginally adequate fit of the model.

Figure 5.3.1.1 the Results of First-Order CFA Model for LC



χ^2/df = 2.678; RMR = 0.058; GFI = 0.807; AGFI = 0.758; NFI = 0.893; CFI = 0.907

Second-Order CFA model Assessment

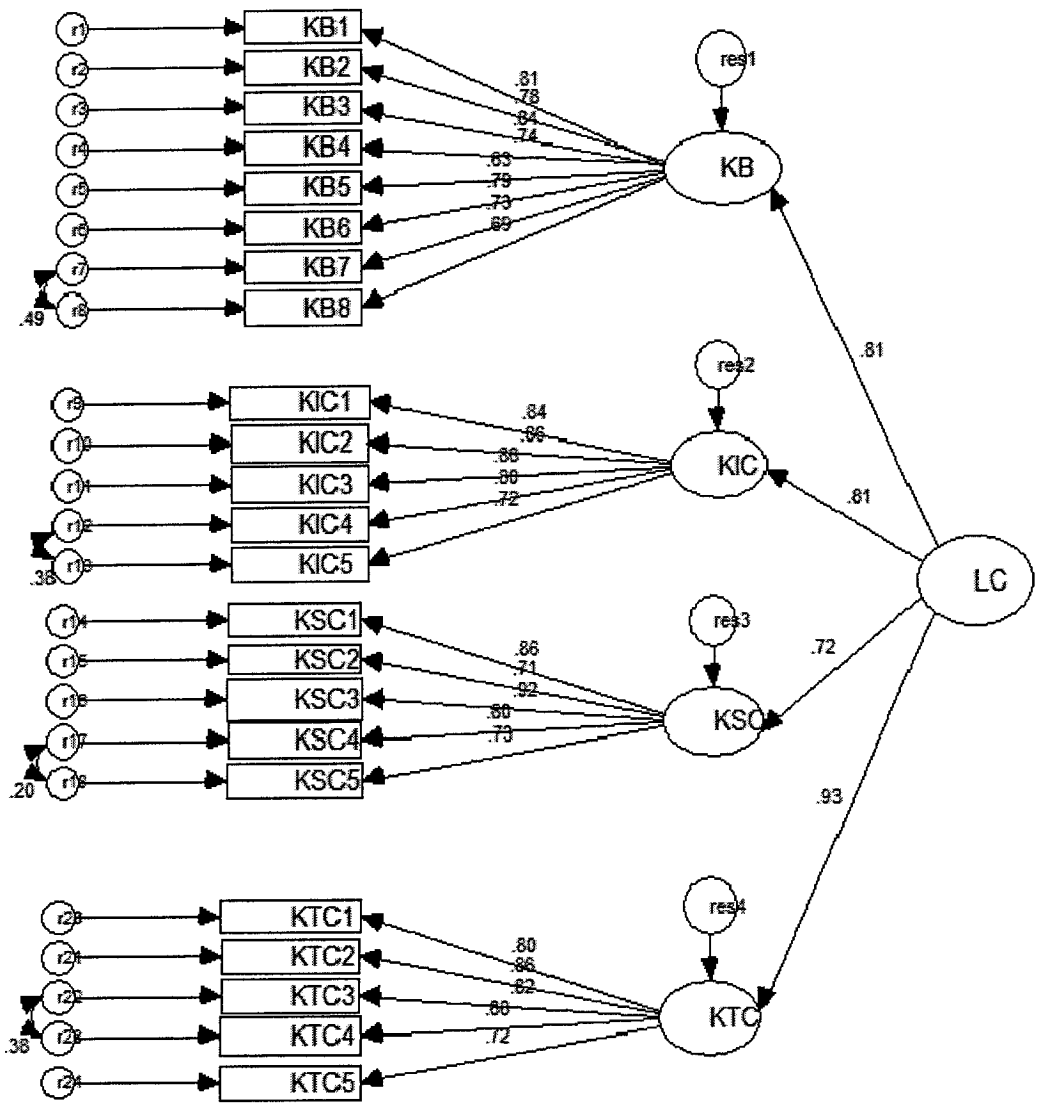
The second-order factor is explaining the covariation among first-order factors in a more parsimonious way (i.e., one that requires fewer degrees of freedoms). Therefore, even when the higher-order model is able to explain the factor covariations, the goodness-of-fit of the higher order model can never be better than the corresponding first-order model (Segars and Grover, 1998). In this sense, the first-order model provides a target or optimum fit for the higher-order model. It has been suggested that the efficacy of second-order model be assessed through examination of target (T) coefficient (where T= χ^2 of first-order model/χ^2 of second-order model) (Marsh and Hocevar, 1985). The T coefficient .80 to 1.0 indicates the existence of a second-order construct. Using T coefficient can only estimate the existence of second-order construct which includes 4 or more than 4 first-order factors. If first-order factors are just 2 or 3, the existence of second-order construct can be estimated by overall model fit index of second-order CFA model and the standardized coefficients between first-order factors and the second-order construct.

The initial results of second-order CFA model for LC are shown in Figure 5.3.1.2. The initial results indicate acceptable coefficients λ being greater than 0.5, the value of GFI= 0.807 and CFI=0.905 are indicative of a marginally adequate fit of the model. The calculated target coefficient between first-order CFA and second-order CFA for LC is as follows:

T_{LC}=589.2/598.6=98.4%

The target coefficient for learning capability is 98.4%, which means the existence of second-order construct for *Learning Capability.*

Figure 5.3.1.2 the Results of Second-Order CFA Model for LC



χ^2/df = 2.696; RMR = 0.061; GFI = 0.807; AGFI = 0.760; NFI = 0.839; CFI = 0.905

5.3.2 Supportive Leadership

Convergent Validity: In this step, the initial 11 SL items were then submitted to a measurement model analysis to check model fit indexes for each sub-construct SLF1 and SLF2 (Table 5.3.2.1). The initial model fit indexes for SLF1 consist of GFI = .843, AGFI = .685 and RMR = .068. These indexes show nowhere near a reasonable fit; therefore, further model modification was conducted based on modification indexes (MI). MI is conceptualized as a chi-square statistic with one degree of freedom (Joreskog & Sorbom, 1989).

After a review of MIs for the regression weights (i.e., factor loadings), we see clear evidence of misspecification associated with the pairing of items SL1 and SL2. After examining the items SL1 and SL2, these two items represent different aspects. Therefore, we correlate these two items to conduct further analysis, the model fit indexes are improved as: GFI = .952, AGFI = .897 and RMR = .045. The above model fit indexes represent an adequate fit to the data.

The initial model fit indexes for SLF2 consist of GFI = .961, AGFI = .803 and RMR = .021 which means the hypothesized measurement model fit the sample data fairly well. Therefore we keep all the 4 items for SLF2.

Table 5.3.2.1 Supportive Leadership Convergent Validity (Model Fit Index) Assessment

Coding	Items	Initial Model Fit	Final Model Fit
Commitment to organizational learning (SLF1)			
	In our organization, top management...		
SL1	encourages an experimental mind-set	**GFI =.843 AGFI = .685 RMR =.068**	**GFI =.977 AGFI =.930 RMR = .032** (SL1&SL2 correlated)
SL2	encourages an experimental risk-taking		
SL3	encourages open communication environment		
SL4	provides regular employee training programs		
SL5	encourages knowledge storage (e.g. central knowledge database building)		
SL6	encourages employees to share ideas freely with each other		
SL7	facilitates the communication among different functional areas		
Commitment to IOS supply chain network (SLF2)			
	In our organization, top management...		
SL8	encourages business communications through IOS network (e.g. EDI)	**GFI =.961 AGFI = .803 RMR =.021**	**GFI =.961 AGFI = .803 RMR =.021**
SL9	commits the resources for the IOS development and maintenance		
SL10	commits the resources for the reliability of IOS network		
SL11	commits the resources for security of IOS network		

Reliability Analysis The analysis began with purification using CITC analysis. The Corrected Item-Total Correlation (CITC) scores for all items were above 0.50. The CITC and Cronbach's Alpha scores are shown in Table 5.3.2.2.

Table 5.3.2.2 Supportive Leadership Reliability and CITC Assessment

Coding	Items	CITC	Cronbach's Alpha (α)
Commitment to organizational learning (SLF1)			
	In our organization, top management...		
SL1	encourages an experimental mind-set	.7248	α= .8657
SL2	encourages an experimental risk-taking	.6281	
SL3	encourages open communication environment	.6883	
SL4	provides regular employee training programs	.5661	
SL5	encourages knowledge storage (e.g. central knowledge database building)	.5889	
SL6	encourages employees to share ideas freely with each other	.7340	
SL7	facilitates the communication among different functional areas	.6565	
Commitment to IOS supply chain network (SLF2)			
	In our organization, top management...		
SL8	encourages business communications through IOS network (e.g. EDI)	.7810	α= .9425
SL9	commits the resources for the IOS development and maintenance	.8992	
SL10	commits the resources for the reliability of IOS network	.9028	
SL11	commits the resources for security of IOS network	.8709	

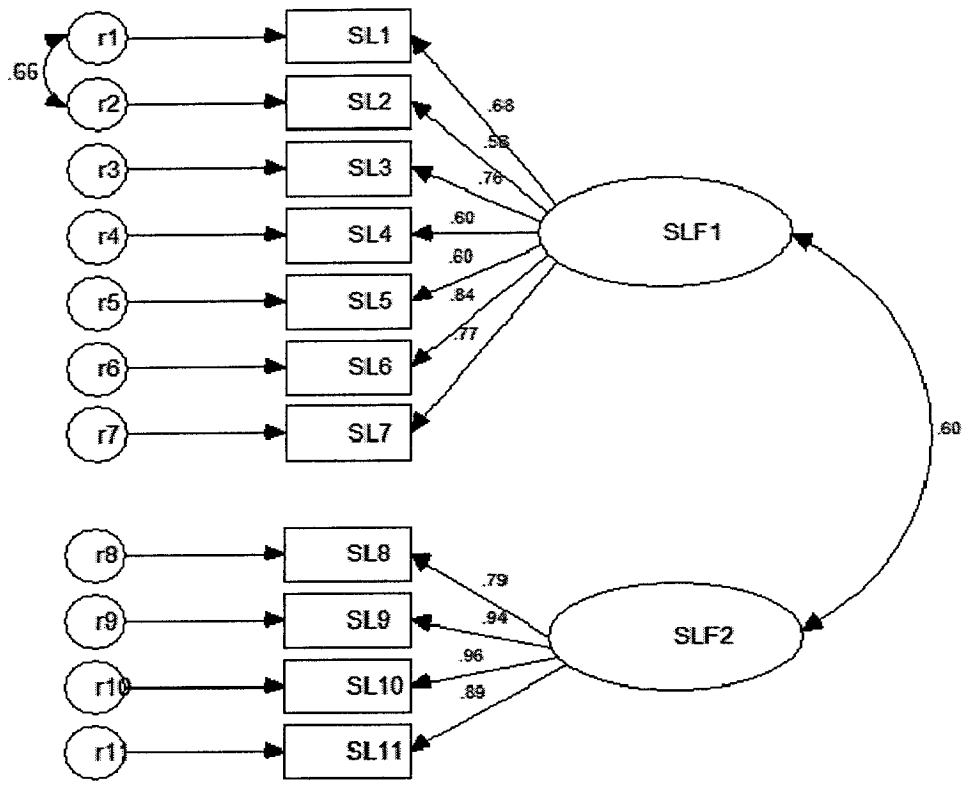
Discriminant validity: Table 5.3.2.3 shows the results from discriminant analysis. The differences between χ^2 values from every pairs are statistically significant at the $p < 0.0001$ level thus indicating high degree of discriminant validity among constructs.

Table 5.3.2.3 Supportive Leadership Discriminant Validity Assessment (Pairwise comparison of χ^2 values)

Paired Construct	Chi-Square(χ^2)		
	Correlated	Single Factor	Difference
SLF1-SLF2	121	429	308

First-Order CFA model Assessment The initial results of first-order CFA model for SL are shown in Figure 5.3.1.1. The initial results indicate acceptable coefficients λ being greater than 0.5, the value of GFI= 0.915 and CFI=0.957 are indicative of a reasonably adequate fit of the model.

Figure 5.3.2.1 the Results of First-Order CFA Model for SL

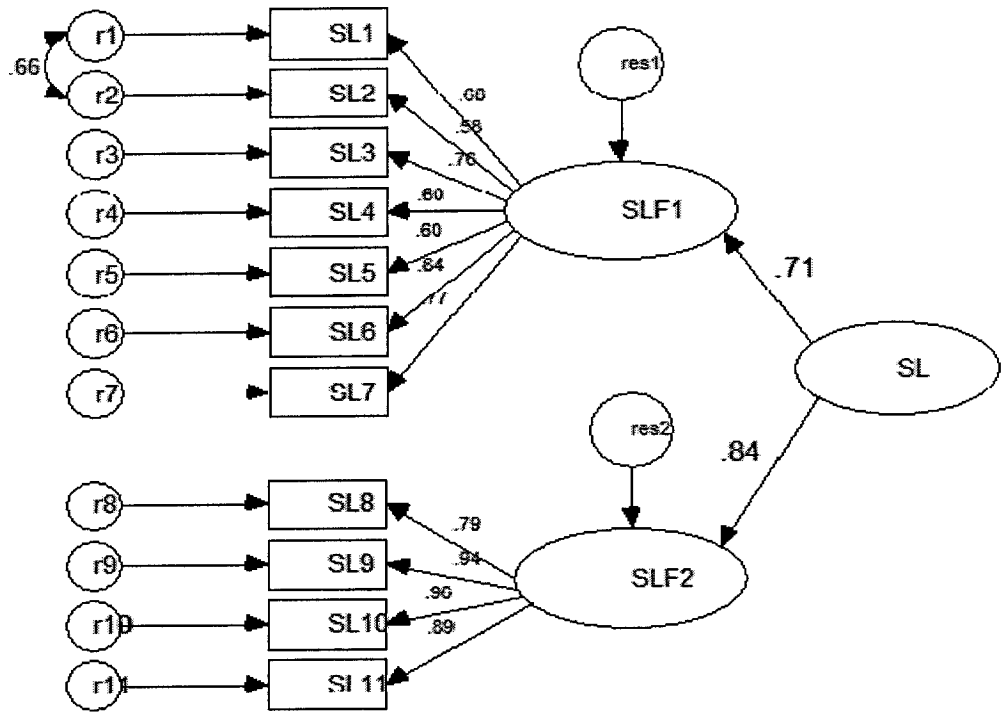


χ^2/df = 2.878; RMR = 0.059; GFI = 0.915; AGFI = 0.866; NFI = 0.936; CFI = 0.957

Second-Order CFA model Assessment The results of second-order CFA model for LC are shown in Figure 5.3.1.2. The results indicate acceptable coefficients λ being greater than 0.5, the values of GFI= 0.915 and CFI=0.957 are indicative of an

adequate fit of the model. The overall model fit indexes and the standardized coefficients also indicate the existence of second-order construct for supportive leadership.

Figure 5.3.2.2 the Results of Second-Order CFA Model for SL



χ^2/df = 2.878; RMR = 0.059; GFI = 0.915; AGFI = 0.866; NFI = 0.936; CFI = 0.957

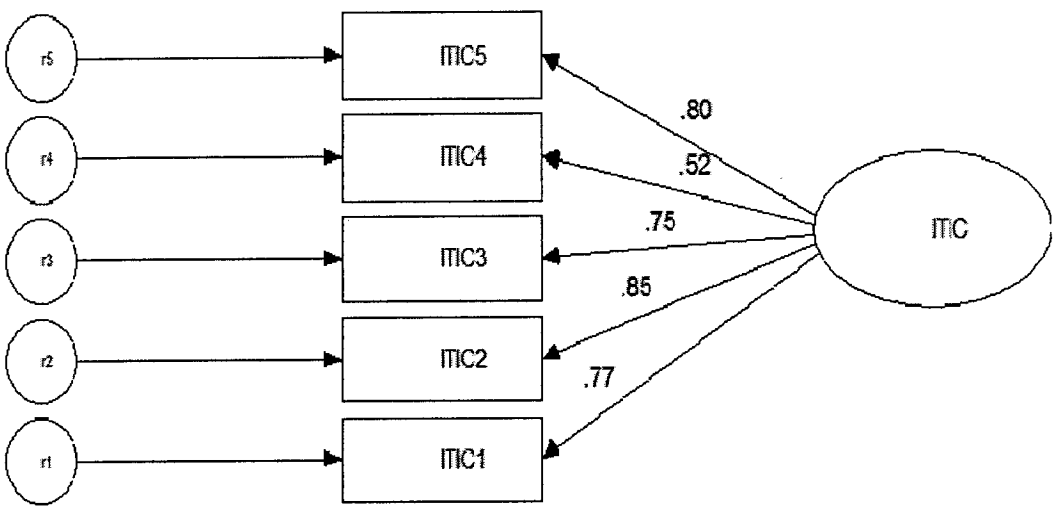
5.3.3 IT Support Capability

Convergent Validity: In this step, using AMOS, we follow similar procedure for the previous construct, the initial 10 ITSC items were then submitted to a measurement model analysis to check model fit indexes for each sub-construct ITIC and ITUS.

The initial model for ITIC construct results was shown in Figure 5.3.3.1. The initial model fit indexes for ITIC consist of GFI = .968, AGFI = .904 and RMR = .035.

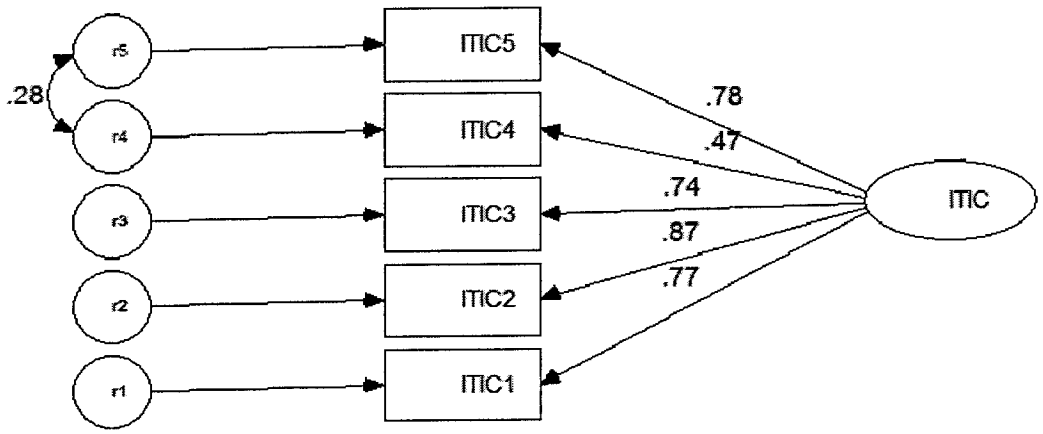
These indexes are indicative of reasonable fit of model. In reviewing the AMOS output of the covariance of the error items, the MI for pair items of ITIC4 and ITIC5 is pretty high (11.885). One possibility for high MI is that these two items highly overlap; one of them is supposed to delete. After we examine these two items, we think these two items represents two different aspects. Therefore these two items were kept for further analysis and were correlated. Then the final model fit indexes improve as: GFI = .990, AGFI = .963 and RMR = .018.

Figure 5.3.3.1 the Initial Model for ITIC Construct Results



χ^2/df = 3.773; RMR = 0.035; GFI = 0.968; AGFI = 0.904; NFI = 0.964; CFI = 0.973

Figure 5.3.3.2 the Final Model for ITIC Construct Results



χ^2/df = 1.406; RMR = 0.018; GFI = 0.990; AGFI = 0.963; NFI = 0.989; CFI = 0.997

The similar procedure was applied to ITUC construct. The initial model fit indexes for ITUC consist of GFI = .831, CFI = .841 and RMR = .112. These indexes show nowhere of reasonable fit; therefore, further model modification was proceeded based on modification indexes (MI) and examination of the item itself. The content of ITUC1 and ITUC2 are highly overlapped. Therefore, ITUC1 can be represented by ITUC2. After the item ITUC1 was deleted, the final model indexes for ITUC improved as: GFI =.996 AGFI =.981 RMR =.014 (Table 5.3.3.1).

Table 5.3.3.1 IT Support Capability (ITSC) Convergent Validity (Model Fit Index) Assessment

Coding	Items	Initial Model Fit	Final Model Fit
IT Infrastructural Capability (ITIC)			
	Our IT infrastructure (IT facility) is used to ...		
ITIC 1	connect different functional areas/branches together	**GFI = .968 AGFI =.904 RMR =.035**	**GFI =.990 AGFI =.963 RMR =.018** (ITIC4&5 correlated)
ITIC 2	offer a wide variety of information to end users		
ITIC 3	offer organization-wide communication		
ITIC 4	connect to our trading partners		
ITIC 5	manage and maintain large scale data/information		
IT Use Capability (ITUC)			
	We have the ability to use IT to...		
***ITUC1**	analyze our marketing position	**GFI =.831 AGFI =.593 RMR =.112**	**GFI =.996 AGFI =.981 RMR =.014** (ITUC1 deleted)
ITUC2	analyze our competitive position		
ITUC3	analyze our supplier capability		
ITUC4	facilitate decision-making (e.g. make-or-buy decision)		
ITUC5	make transactions with our trading partners		

* Deleted items

Reliability Analysis The analysis began with purification using CITC analysis. An initial reliability analysis was done for each of the two IT Support Capability (ITSC) dimensions. The Corrected Item-Total Correlation (CITC) scores for all items in ITIC and ITUC dimensions were above 0.50 except ITIC4 item. CITC less than 0.5 are usually candidates for elimination in further analysis. However, we think item ITIC4 is important and its CITC is very close to .50. We keep it for later further analysis. The final Cronbach's Alpha scores for each dimension and The CITC for each item, its corresponding code name, and the reliability analysis results are shown in Table 5.3.1.2.

An alpha score of higher than .70 is generally considered to be acceptable (Nunnally 1978).

Table 5.3.3.2 IT Support Capability (ITSC) Reliability and CITC Assessment

Coding	Items	CITC	Cronbach's Alpha (α)
IT Infrastructural Capability (ITIC)			
	Our IT infrastructure (IT facility) is used to ...		
ITIC 1	connect different functional areas/branches together	.6788	**α=.8473**
ITIC 2	offer a wide variety of information to end users	.7333	
ITIC 3	offer organization-wide communication	.6799	
ITIC 4	connect to our trading partners	.4975	
ITIC 5	manage and maintain large scale data/information	.7468	
IT Use Capability (ITUC)			
	In our organization, top management...		
***ITUC1**	analyze our marketing position	.6825	**α=.8653**
ITUC2	analyze our competitive position	.7467	
ITUC3	analyze our supplier capability	.6600	
ITUC4	facilitate decision-making (e.g. make-or-buy decision)	.7257	
ITUC5	make transactions with our trading partners	.6274	

* Deleted items

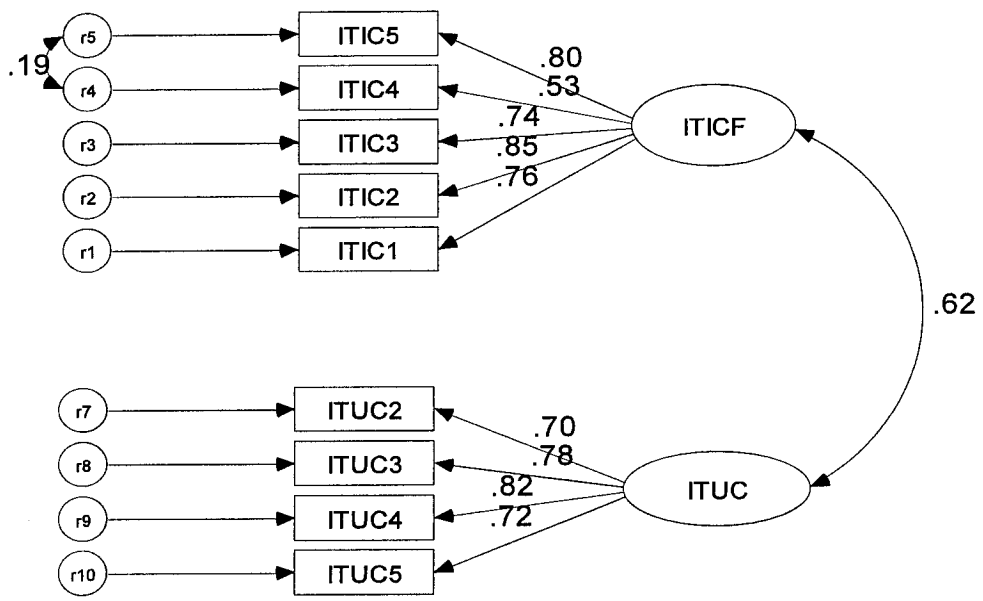
Discriminant validity: Table 5.3.3.3 shows the results from discriminant analysis. The differences between χ^2 values from every pairs are statistically significant at the $p < 0.0001$ level thus indicating high degree of discriminant validity among constructs.

Table 5.3.3.3 IT Support Capability (ITSC) Discriminant Validity Assessment
(Pairwise comparison of χ^2 values)

Paired Construct	Chi-Square(χ^2)		
	Correlated	Single Factor	Difference
ITIC-ITUC	40	101	61

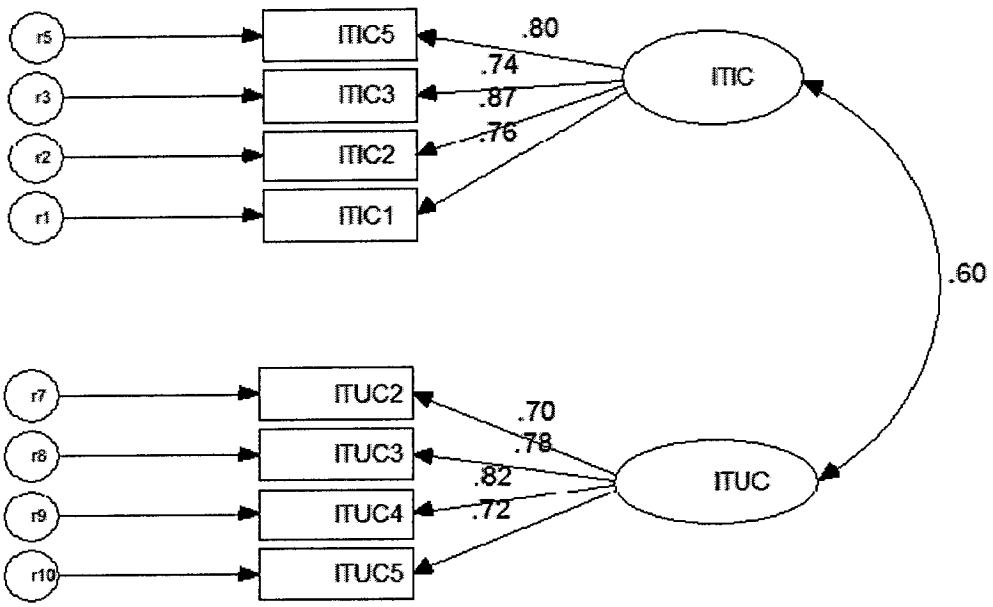
First-Order CFA model Assessment The initial results of first-order CFA model for ITSC are shown in Figure 5.3.3.3. The initial results indicate acceptable coefficients λ being greater than 0.5, However, the value of GFI= 0.904 and AGFI=0.828 RMR=0.104 are indicative of an poor fit of the model. In reviewing of AMOS output MIs, ITIC4 highly cross-load on ITIC construct and ITUC construct. Item ITIC4 need to be removed. After removing ITIC4 item, the final results of first-order CFA model for ITSC was shown in Figure 5.3.3.4. Demonstrating good model fit with RMR = 0.041; GFI = 0.958; AGFI = 0.921.

Figure 5.3.3.3 the Initial Results First-Order CFA Model for ITSC



χ^2/df = 4.849; RMR = 0.104; GFI = 0.904; AGFI = 0.828; NFI = 0.886; CFI = 0.906

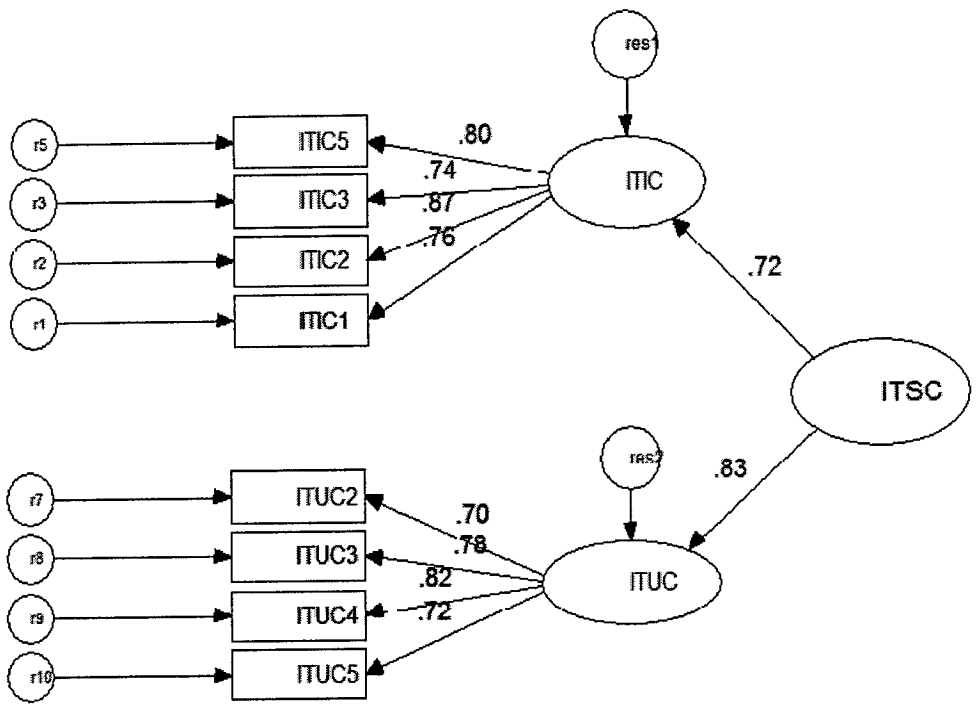
Figure 5.3.3.4 the Final Results First-Order CFA Model for ITSC



χ^2/df = 2.090; RMR = 0.041; GFI = 0.958; AGFI = 0.921; NFI = 0.956; CFI = 0.976

Second-Order CFA model Assessment The results of second-order CFA model for ITSC are shown in Figure 5.3.3.5. The initial results indicate acceptable coefficients λ being greater than 0.5, the value of GFI = 0.958; AGFI = 0.921; RMR = 0.041; NFI = 0.956; and CFI=0.976 are indicative of an adequate fit of the model. The overall model fit indexes and the standardized coefficients also indicate the existence of second-order construct for IT support capability.

Figure 5.3.3.5 the Second-Order CFA Model for ITSC



χ^2/df = 2.090; RMR = 0.041; GFI = 0.958; AGFI = 0.921; NFI = 0.956; CFI = 0.976

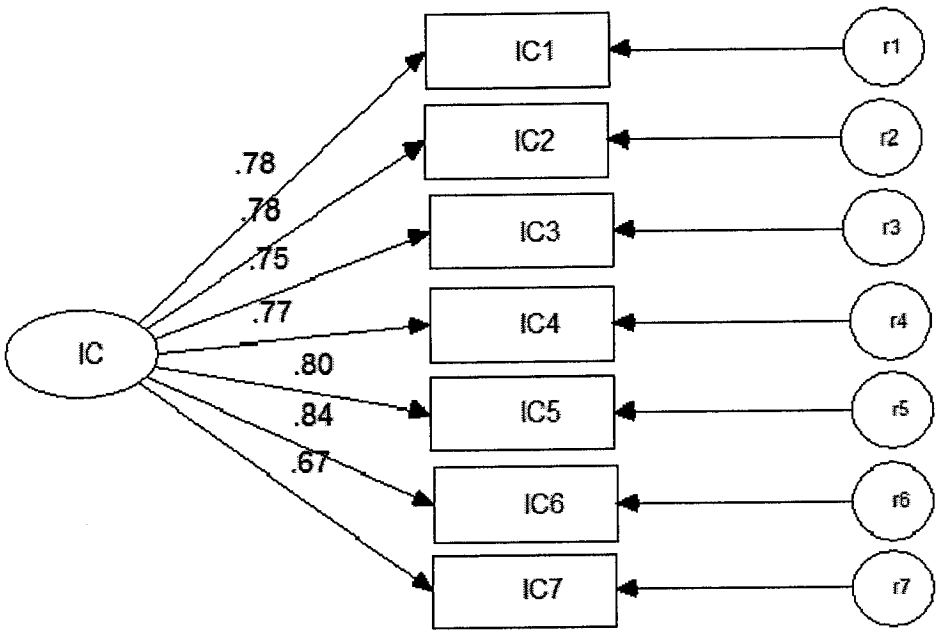
5.3.4 Power in IOS Supply Chain Context

The Power in IOS context (POWER) construct was initially represented by 3 dimensions and 18 items: *Information Control (IC)* which includes 7 items-IC1, IC2, IC3, IC4, IC5, IC6 and IC7; *Electronic Trading Network Control (ETNC)* which includes 6 items-ETNC1, ETNC2, ETNC3, ETNC4, ETNC5, ETNC6; and *Network Structural Bonding Control (NSBC)* which includes 5 items—NSBC1, NSBC2, NSBC3, NSBC4, NSBC5.

Convergent Validity: In this step, using AMOS, the initial 18 POWER items were then submitted to a measurement model analysis to check model fit indexes for each sub-construct IC, ETNC and NSBC (Table 5.3.1.1).

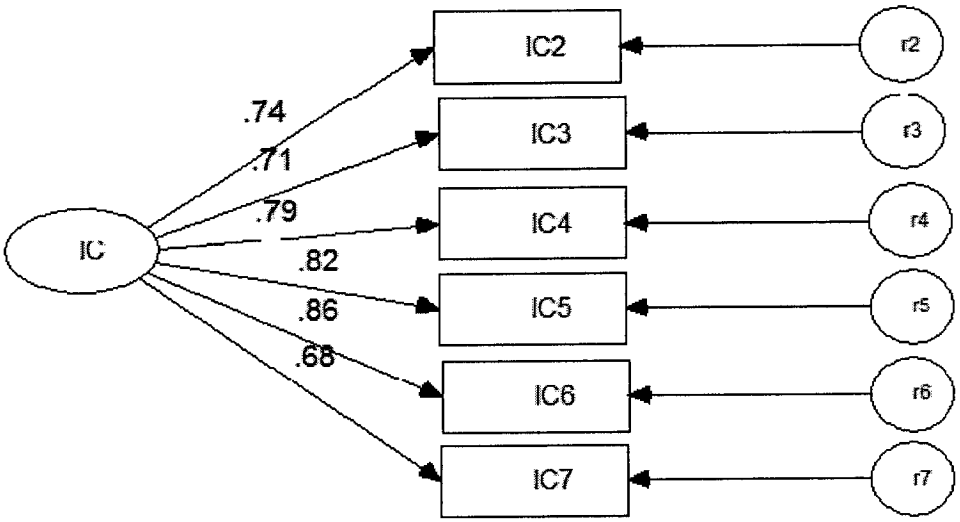
The initial model fit indexes for IC consist of GFI = .906, AGFI = .813 and RMR = .037. These indexes are marginally adequate at best; in reviewing the AMOS output of covariance of error items, the MIs of error items of item IC1&IC2 (19.481)and IC1&IC3 (20.584) are pretty high, After examining the items IC1, IC2 and IC3, we think that IC1 can be represented by IC2 and IC3. Therefore, IC1 was removed. "It is important that once we have determined that the hypothesized model represents a poor fit to the data (i.e., the null hypothesis has been rejected), and subsequently embark in post hoc model fitting to identify areas of misfit in the model, we cease to operate in a confirmatory mode of analysis. All model specification and estimation henceforth represent exploratory analyses." (Byrne, 2001).The final model fit indexes are GFI = .967, AGFI = .923 and RMR = .023, which represent an adequate fit to the data. The initial model results and the final model results for IC were shown in Figure 5.3.4.1 and Figure 5.3.4.2 respectively.

Figure 5.3.4.1 the Initial Model for IC Construct Results



χ^2/df = 5.661; RMR = 0.037; GFI = 0.906; AGFI = 0.813; NFI = 0.919; CFI = 0.932

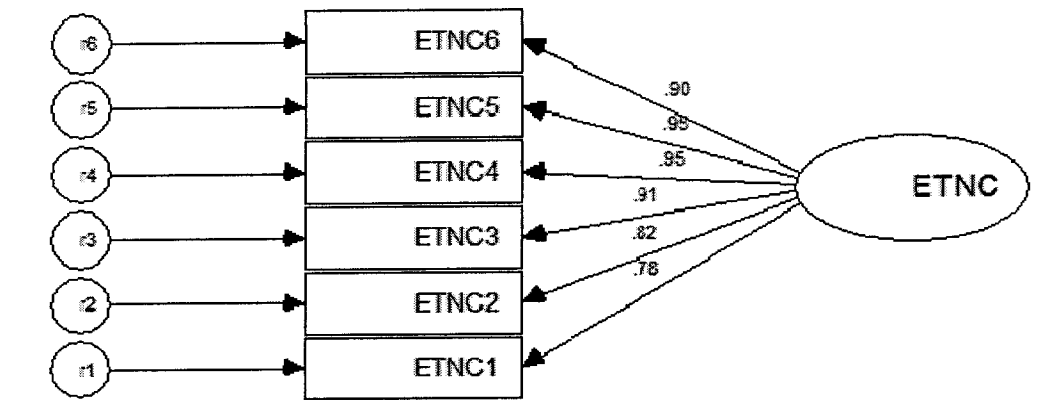
Figure 5.3.4.2 the Final Model for IC Construct Results



χ^2/df = 2.687; RMR = 0.023; GFI = 0.967; AGFI = 0.923; NFI = 0.968; CFI = 0.979

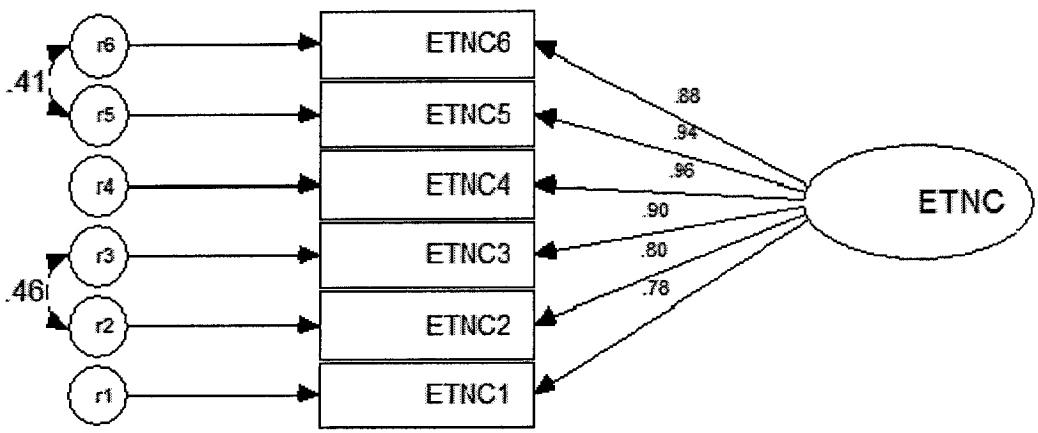
The initial results of ETNC model was shown in figure 5.3.4.3. The Standardized Regression Weights (i.e., factor loading for each item) is pretty good. However, the initial model fit indexes for ETNC consist of GFI = .879, AGFI = .717 and RMR = .027, which are indicative of a poor fit of model to data. In reviewing the AMOS output of covariance of error items, the MI of covarariance for the error items r2 / r3 is very high (47.361), so the questions of ETNC2 and ETNC3 were examined. We think ETNC2 and ETNC3 represented two different aspects of ETNC, so we correlated these two items and re-run the model. The revised model fit indexes improved. However, the MI of covariance for r5/r6 is still high (11.307). Instead of removing one of them, we correlated them and re-run the model. Then the after correlating ETNC2 and ETNC3, ETNC5 and ETNC6, the final model indexes improved as: GFI = .955, AGFI = .866 and RMR = .022, which still are indicative of a marginally adequate fit to the data. However, after delete ETNC5, the model fit indexes improve significantly as follows: GFI = .974, AGFI = .923 and RMR = .015, which represents the best fitting model of ETNC construct. The final model for ETNC construct was shown in Figure 5.3.4.4

Figure 5.3.4.3 the Initial Model for ETNC Construct Results



χ^2/df = 10.064; RMR = 0.027; GFI = 0.879; AGFI = 0.717; NFI = 0.943; CFI = 0.948

Figure 5.3.4.4 the Final Model for ETNC Construct Results

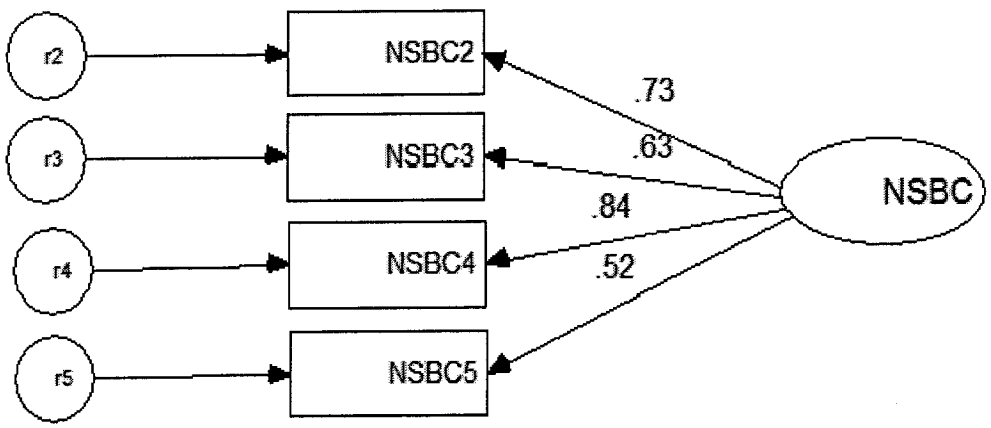


χ^2/df =2.570; RMR = 0.015; GFI = 0.974; AGFI = 0.923; NFI = 0.989; CFI = 0.993

Since CITC for NSBC1 is below 0.5, this item was removed when do the convergent validity analysis. The first 4 items (NSBC 2, NSBC3, NSBC4 and NSBC5) were used to analyze. The initial results of NSBC model was shown in figure 5.3.4.5. However, the

initial model fit indexes for **NSBC** consist of GFI = .989, AGFI = .944 and RMR = .029, which are indicative of very good fit of model to data.

Figure 5.3.4.5 the Final Model for NSBC Construct Results



χ^2/df = 2.665; RMR = 0.029; GFI = 0.989; AGFI = 0.944; NFI = 0.943; CFI = 0.948

The initial and final model fit indexes for each construct IC, ETNC and NSBC are shown in table 5.3.4.1.

Table 5.3.4.1 Power in IOS Context (POWER) Convergent Validity (Model Fit Index) Assessment

Coding	Items	Initial Model Fit	Final Model Fit
Information Control (IC)			
	Our organization can…		
*IC1	control the ways in which our trading partner can access our sensitive information	**GFI =.906 AGFI =.813 RMR =.037**	**GFI =.967 AGFI =.923 RMR =.023** (IC1 deleted)
IC2	control the ways in which our trading partners use shared information		
IC3	protect our proprietary information from leaking to our trading partner		
IC4	monitor the accuracy of shared information		
IC5	require related IOS trading partner to update information		
IC6	control the vulnerability caused by information exchange with our partners		
IC7	provide more information relating to our industry to our partners through IOS than they can get without IOS		
Electronic Trading Network Control (ETNC)			
	We have the ability to …		
ETNC1	determine who can access the IOS trading network and under what conditions	**GFI =.879 AGFI =.717 RMR =.027**	**GFI = .974 AGFI =.923 RMR =.015** (ETNC2&3 And ETNC5&6 are correlated)
ETNC2	determine the specification of transaction price through IOS trading network		
ETNC3	lay down the rules and procedures for order processing through IOS trading network		
ETNC4	decide on the rules and regulations for IOS trading network		
ETNC5	decide on the format and standard for IOS trading network		
ETNC6	decide the mechanism for establishing the standards/protocols for IOS network		
Network Structural Bonding Control (NSBC)			
	In our organization, we have ability to		
*NSBC1	can determine who is our primary trading partner	**GFI = .989 AGFI =.944 RMR =.029** (NSBC1 deleted after CITC purification)	**GFI = .989 AGFI =.944 RMR =.029**
NSBC2	can dissolve the relationship with our partners inexpensively		
NSBC3	is less dependent on our partners relating to our business (e.g. sales, profits) than our partner is dependent on us		
NSBC4	can switch to our partners' competitors easily, in general		
NSBC5	can provide IOS related technical support to our partners		

* Deleted items

Reliability Analysis The analysis began with purification using CITC analysis. An initial reliability analysis was done for each of the three dimensions. The Corrected Item-Total Correlation (CITC) scores for all items in all three dimensions were above 0.50. CITC less than 0.5 are usually candidates for elimination in further analysis. According to Nunnally (1978), an alpha score of higher than .70 is generally considered to be acceptable. The final Cronbach's Alpha scores for each dimension and The CITC for each item, its corresponding code name, and the reliability analysis results are shown in Table 5.3.4.2.

Table 5.3.4.2 Power in IOS Context (POWER) Reliability and CITC Assessment

Coding	Items	CITC	Cronbach's Alpha (α)
Information Control (IC)			
	Our organization can		
***IC1**	control the ways in which our trading partner can access our sensitive information	.7439	**α= .9101**
IC2	control the ways in which our trading partners use shared information	.7407	
IC3	protect our proprietary information from leaking to our trading partner	.7152	
IC4	monitor the accuracy of shared information	.7297	
IC5	require related IOS trading partner to update information	.7573	
IC6	control the vulnerability caused by information exchange with our partners	.7811	
IC7	provide more information relating to our industry to our partners through IOS than they can get without IOS	.6300	
Electronic Trading Network Control (ETNC)			
	We have the ability to ...		
ETNC1	determine who can access the IOS trading network and under what conditions	.7708	**α= .9557**
ETNC2	determine the specification of transaction price through IOS trading network	.8140	
ETNC3	lay down the rules and procedures for order processing through IOS trading network	.9028	
ETNC4	decide on the rules and regulations for IOS trading network	.9101	
ETNC5	decide on the format and standard for IOS trading network	.9094	
ETNC6	decide the mechanism for establishing the standards/protocols for IOS network	.8640	
Network Structural Bonding Control (NSBC)			
	In our organization, we have ability to...	initial / final	
***NSBC1**	can determine who is our primary trading partner*	***.3452***	α= .7628 (initial)
NSBC2	can dissolve the relationship with our partners inexpensively	.6149 / **.5998**	
NSBC3	is less dependent on our partners relating to our business (e.g. sales, profits) than our partner is dependent on us	.5543 / **.5713**	α= .7753 (final)
NSBC4	can switch to our partners' competitors easily, in general	.6427 / **.6863**	
NSBC5	can provide IOS related technical support to our partners	.5019 / **.5631**	

***deleted item**

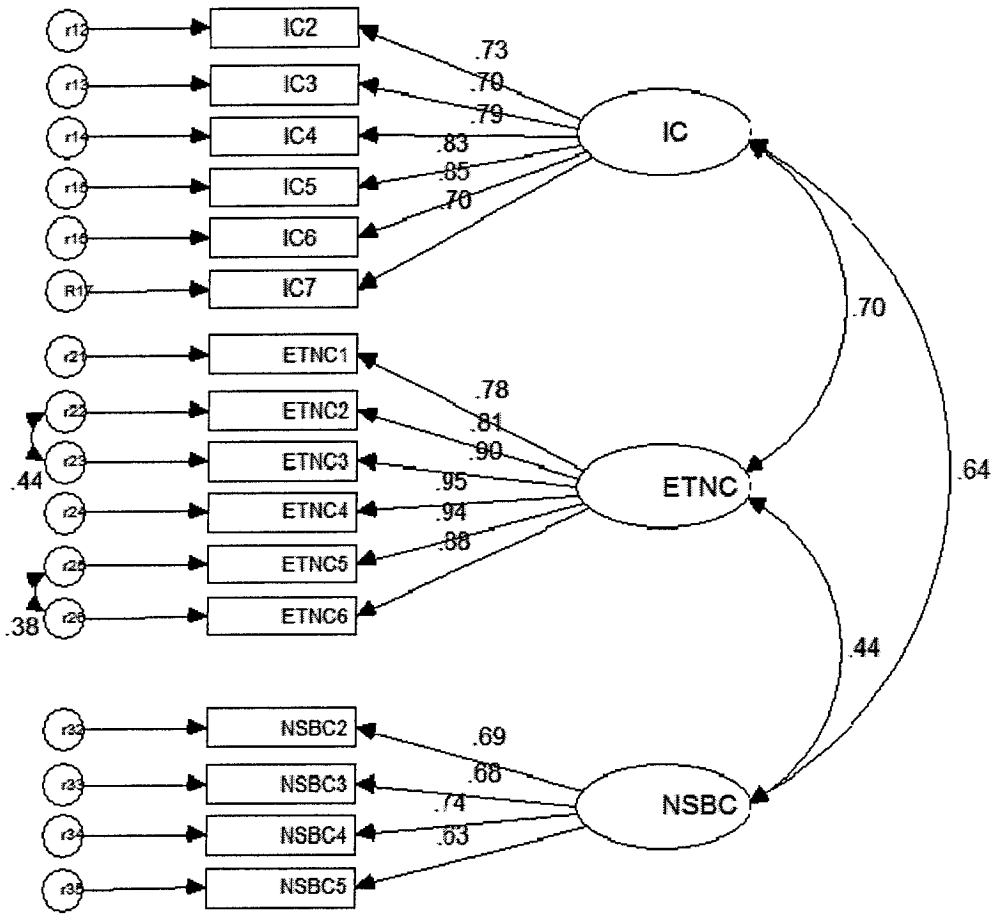
Discriminant validity: Table 5.3.4.3 shows the results from discriminant analysis. The differences between χ^2 values from every pairs are statistically significant at the $p < 0.0001$ level thus indicating high degree of discriminant validity among constructs. The results prove that the constructs are theoretically and statically different from each other as hypothesized in the measurement development section.

Table 5.3.4.3 **Power in IOS Context (POWER) Discriminant Validity Assessment**
(Pairwise comparison of χ^2 values)

Paired Construct	Chi-Square(χ^2)		
	Correlated	Single Factor	Difference
IC-ETNC	171(51*)	499 (52*)	**328**
IC-NSBC	140 (34*)	214 (35*)	**74**
ETNC-NSBC	146 (32*)	286 (33*)	**140**

First-Order CFA model Assessment The initial results of first-order CFA model for POWER are shown in Figure 5.3.4.4. The initial results indicate acceptable coefficients λ being greater than 0.5, indicating a marginally adequate fit of the model.

Figure 5.3.4.6 the Initial Results of First-Order CFA Model for POWER

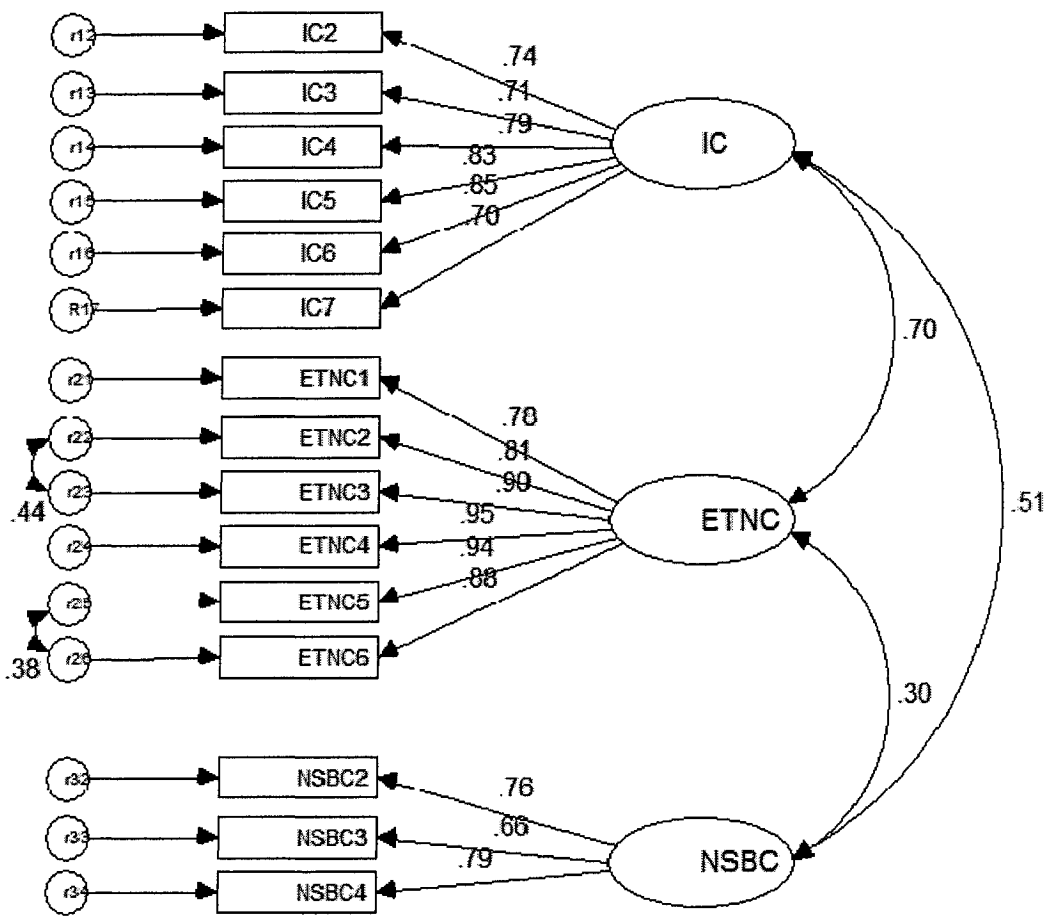


χ^2/df = 3.496; RMR = 0.089; GFI = 0.845; AGFI = 0.787; NFI = 0.888; CFI = 0.917

However, χ^2/df = 3.496; RMR = 0.087, GFI = 0.845; AGFI = 0.787; NFI = 0.888; CFI = 0.917 indicate a poor fit of model. Thus, it is apparent that some modification in specification is needed in order to determine a model that better represents the sample data. Based on the CFA model, large MIs would argue for the presence of factor cross-loadings (i.e., a loading on more than one factor) and error covariance, respectively. The

examination of modification indexes, NSBC5 item is highly cross loaded on IC construct and ETNC construct. Therefore, NSBC5 is removed. The model with the removal of NSBC5 showed a good model fit indices: RMR = 0.058; GFI = 0.881; AGFI = 0.832; NFI = 0.918; CFI = 0.945.

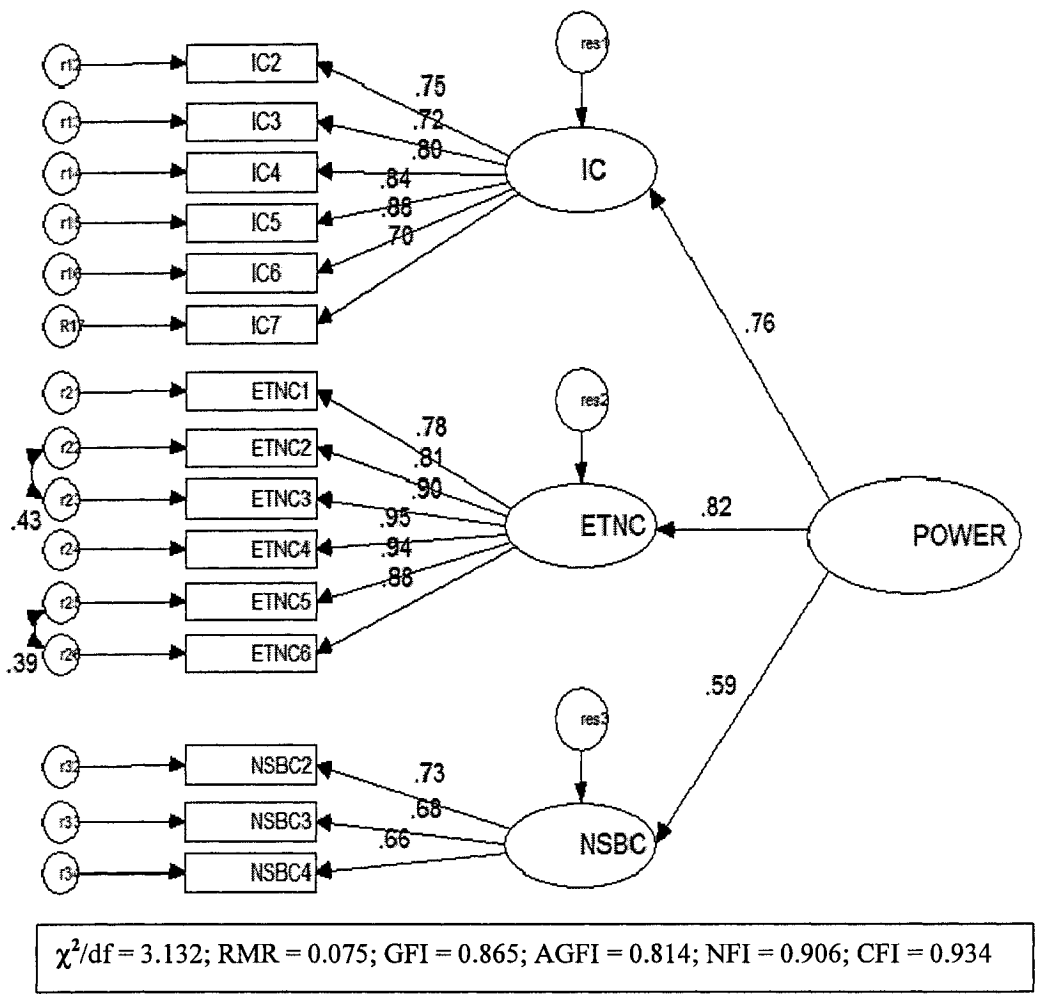
Figure 5.3.4.7 the Final Results of First-Order CFA Model for POWER



Second-Order CFA model Assessment The results of second-order CFA model for POWER are shown in Figure 5.3.4.8. The results indicate acceptable

coefficients λ being greater than 0.5, the value of GFI= 0.865 and CFI=0.934 are indicative of a marginally fit of the model. The overall model fit indexes and the standardized coefficients also indicate the existence of second-order construct for Power in IOS context.

Figure 5.3.4.8 the Results of Second-Order CFA Model for POWER



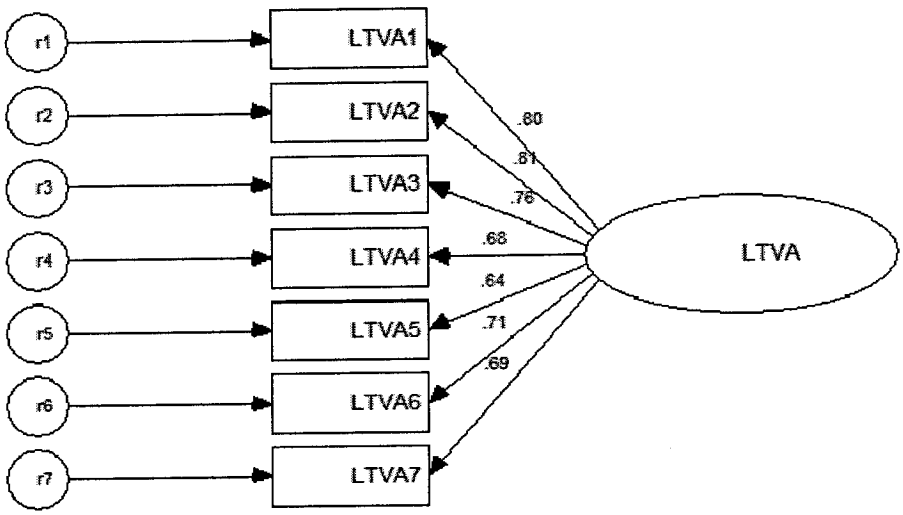
5.3.5 Value Appropriation

The Value Appropriation (VA) construct was initially represented by 2 dimensions and 12 items, including Long-term Value Appropriation (LTVA) which includes 7 items; and Short-term Value Appropriation (STVA) which includes 5 items.

Convergent Validity: In this step, using AMOS, we follow similar procedure for the previous construct, the initial 12 VA items were then submitted to a measurement model analysis to check model fit indexes for each sub-construct LTVA and STVA,

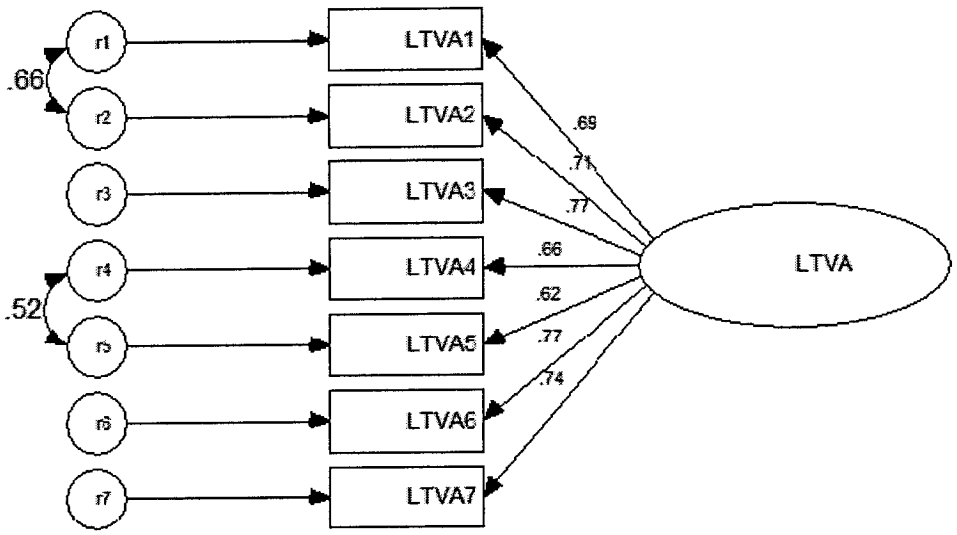
The initial model fit indexes for LTVA consist of GFI = .793, AGFI = .586 and RMR = .062. These indexes show nowhere near a reasonable fit, indicating a possibility of error correlation. Therefore, further model modification was processed based on modification indexes (MI). Modification indexes indicated a high error correlation between LTVA1 and LTVA2 (83.297). After examining these two items, we think they represent different aspects of LTVA construct. Therefore, we decide to correlate them instead of remove one of them. After correlating items LTVA1 and LTVA2, the model fit indexes improve with GFI = .891, AGFI = .764 and RMR = .045. The model fit indexes still cannot meet the recommended criteria, indicating more modification based on MI is needed. After examining MIs, the error correlation between items LTVA4 & LTVA5 is still high (48.894). We correlate them instead of removing one of them since these two items represent two different aspects. After correlating them, RMR = 0.027; GFI = 0.956; AGFI = 0.897; NFI = 0.961; CFI = 0.979 which represent a reasonable fit to the data. The initial model results and the final model results for IC were shown in Figure 5.3.5.1 and Figure 5.3.5.2 respectively.

Figure 5.3.5.1 the Initial Model for LTVA Construct Results



χ^2/df = 14.414; RMR = 0.062; GFI = 0.793; AGFI = 0.586; NFI = 0.782; CFI = 0.792

Figure 5.3.5.2 the Final Model for LTVA Construct Results



χ^2/df =3.034; RMR = 0.027; GFI = 0.956; AGFI = 0.897; NFI = 0.961; CFI = 0.979

Similar procedure for STVA construct was conducted. The initial model fit indexes and final model indexes of LTVA and STVA are shown in Table 5.3.5.1.

Table 5.3.5.1 Value Appropriation Convergent Validity (Model Fit Index) Assessment

Coding	Items	Initial Model Fit	Final Model Fit
Long Term Value Appropriation(LTVA)			
	In our organization, top management...		
LTVA 1	achieves our partners' compliance to our requirements	**GFI =.793 AGFI =.586 RMR =.062**	**GFI =.956 AGFI =.897 RMR =.027** (LTVA1& LTVA2 correlated, LTVA4 &LTVA75 correlated)
LTVA 2	achieves our partner's cooperation with us		
LTVA 3	retains our partner by providing IOS related training or required software		
LTVA 4	builds entry barriers to our industry for non-IOS participants		
LTVA 5	sets up exit barriers for our IOS trading partners		
LTVA 6	shares our resources across multiple products/services		
LTVA 7	increases the opportunity for exploring new IT-related benefits		
Short Term Value Appropriation(STVA)			
	In our organization, top management...		
STVA 1	achieves short-term purchasing cost reduction	**GFI =.807 AGFI =.422 RMR =.083**	**GFI =.979 AGFI =.894 RMR =.020** (STVA2 deleted)
***STVA 2**	gets short-term desired outcomes on costs, prices from our trading partners		
STVA 3	improves our current on-time delivery		
STVA 4	improves daily operational efficiency		
STVA 5	improves response time to process document directly		

* Deleted items

Reliability Analysis The analysis began with purification using CITC analysis. An initial reliability analysis was done for each of the two Value Appropriation dimensions. The Corrected Item-Total Correlation (CITC) scores for all items in all three dimensions were above 0.50. CITC less than 0.5 are usually candidates for elimination in further analysis. According to Nunnally (1978), an alpha score of higher than .70 is

generally considered to be acceptable. The final Cronbach's Alpha scores for each dimension and The CITC for each item, its corresponding code name, and the reliability analysis results are shown in Table 5.3.5.2.

Table 5.3.5.2 Value Appropriation Reliability and CITC Assessment

Coding	Items	CITC	Cronbach's Alpha (α)
Long Term Value Appropriation(LTVA)			
	In our organization, top management...		
LTVA 1	achieves our partners' compliance to our requirements	.6999	**α=.8884**
LTVA 2	achieves our partner's cooperation with us	.7231	
LTVA 3	retains our partner by providing IOS related training or required software	.7203	
LTVA 4	builds entry barriers to our industry for non-IOS participants	.6629	
LTVA 5	sets up exit barriers for our IOS trading partners	.6355	
LTVA 6	shares our resources across multiple products/services	.6863	
LTVA 7	increases the opportunity for exploring new IT-related benefits	.6443	
Short Term Value Appropriation(STVA)			
	In our organization, top management...		
STVA 1	achieves short-term purchasing cost reduction	.7191	**α=.9041**
***STVA 2**	gets short-term desired outcomes on costs, prices from our trading partners	.7357	
STVA 3	improves our current on-time delivery	.7562	
STVA 4	improves daily operational efficiency	.7776	
STVA 5	improves response time to process document directly	.8108	

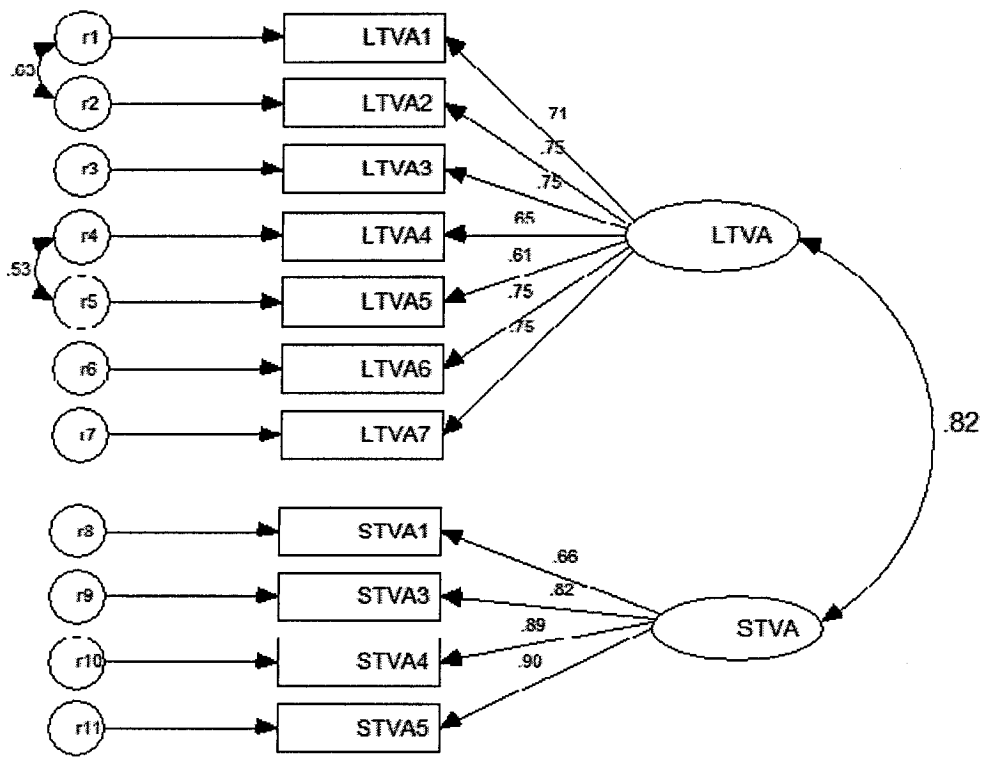
Discriminant validity: Table 5.3.5.3 shows the results from discriminant analysis. The differences between χ^2 values from every pairs are statistically significant at the $p < 0.0001$ level thus indicating high degree of discriminant validity among constructs. The results prove that the constructs are theoretically and statically different from each other as hypothesized in the measurement development section.

Table 5.3.5.3 Value Appropriation Discriminant Validity Assessment

Paired Construct	Chi-Square(χ^2)		
	Correlated	Single Factor	Difference
LTVA-STVA	104	190	86

First-Order CFA model Assessment The initial results of first-order CFA model for VA are shown in Figure 5.3.5.3. The initial results indicate acceptable coefficients λ being greater than 0.5, the value of GFI= 0.923 and CFI=0.962 are indicative of a reasonable adequate fit of the model.

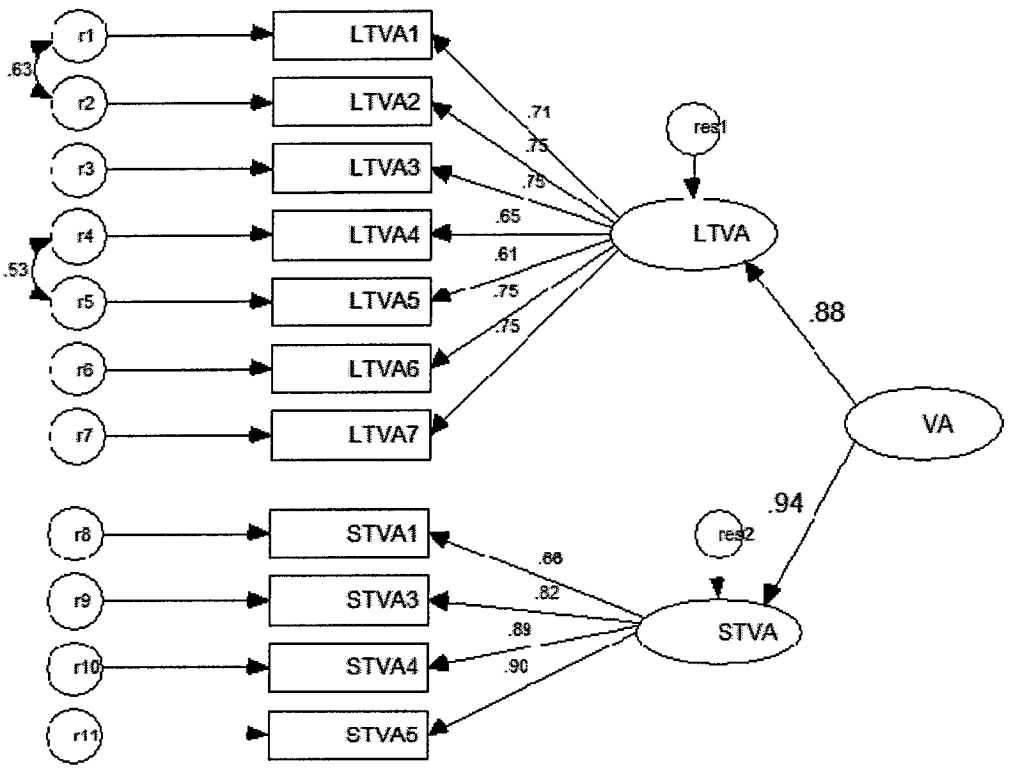
Figure 5.3.5.3 the Results of First-Order CFA Model for VA



χ^2/df = 2.543; RMR = 0.039; GFI = 0.923; AGFI = 0.877; NFI = 0.940; CFI = 0.962

Second-Order CFA model Assessment The results of second-order CFA model for VA are shown in Figure 5.3.5.4. The initial results indicate acceptable coefficients λ being greater than 0.5, the value of GFI= 0.923 and CFI=0.962 are indicative of a reasonable fit of the model. The overall model fit indexes and the standardized coefficients also indicate the existence of second-order construct for Value Appropriation.

Figure 5.3.5.4 the Results of Second-Order CFA Model for VA



χ^2/df = 2.543; RMR = 0.039; GFI = 0.923; AGFI = 0.877; NFI = 0.940; CFI = 0.962

5.3.6 Relationship Quality

The Relation Quality (RQ) construct was initially represented by 3 dimensions and 11 items, including Satisfaction with Cooperation (RQF1), which includes 7 items; Perceived Outcome Fairness (RQF2) including 3 items and Willingness to Cooperation In the Future (RQF3)which including 3 items. This construct was adopted from Jap (2001), only reliability and unidimensionality analysis and first-order CFA and second-order CFA are analyzed in this study.

Convergent Validity: If the constructs have less than four items, model fit statistics could not be obtained. In these cases, two-factor model was tested by adding the items of another construct. The items of another construct are added only to provide a common basis for comparison and to keep items in sufficient number so that model fit indexes could be obtained.

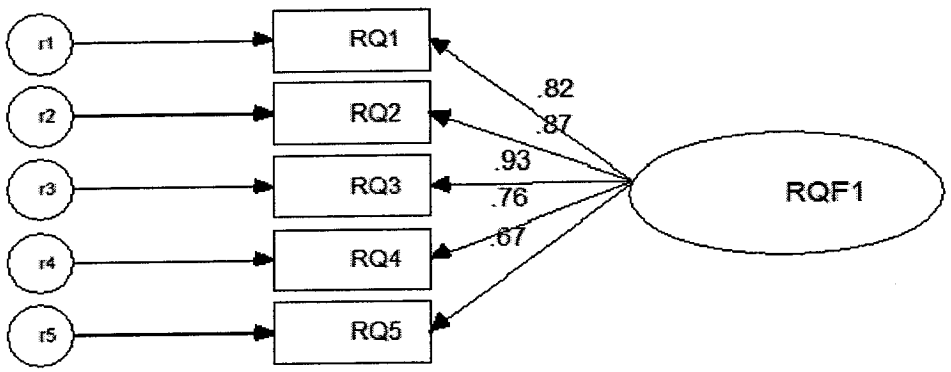
The initial model fit indexes for RQF1 consist of GFI = .992, AGFI = .976 and RMR = .009 which means the hypothesized measurement model fit the sample data fairly well. Therefore we keep all the 5 items for RQF1 for further analysis. The final model for RQF1 construct was shown in Figure 5.3.6.1.

Since RQF2 only has 3 items, 5 items of RQF1 were added to form two-factor model. The items of RQF1 only provided a common basis for comparison and keep items in sufficient number in order to get related model fit index. The initial results of the two-factor model were shown in figure 5.3.6.2. The model fit indexes of this two-factor

model consist of GFI = .934, AGFI = .876 and RMR = .030 which means the hypothesized measurement model fit the sample data reasonably. Therefore we keep all the 3 items for RQF2 for further analysis.

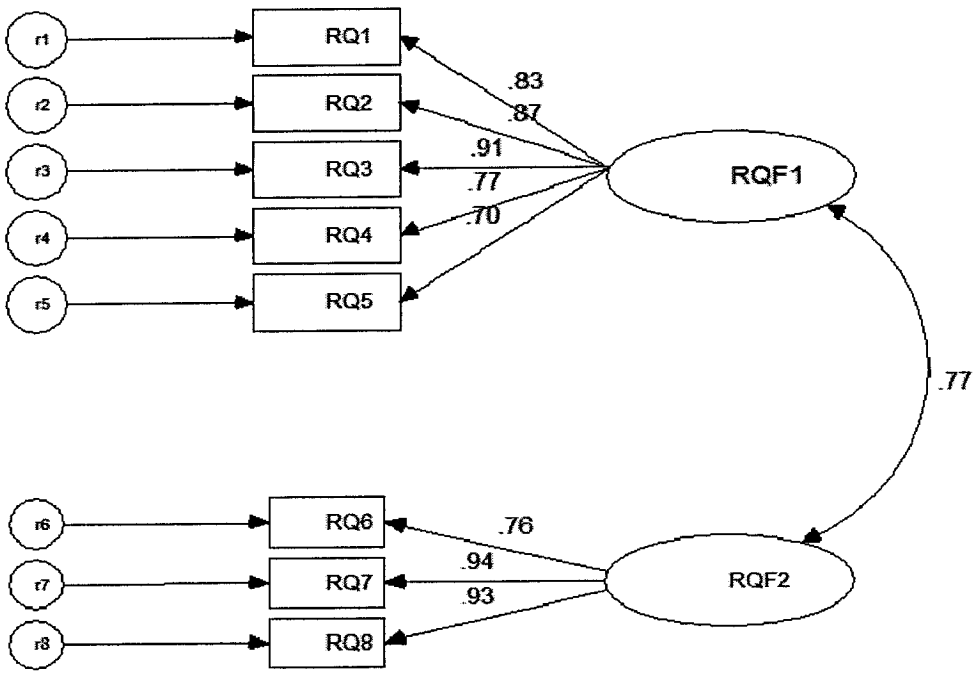
For RQF3, similar procedure to RQF2 was followed, 5 items of RQF1 were added to form two-factor model. The initial results of this two-factor model were shown in figure 5.3.6.3. The initial model fit indexes for RQF3 consist of GFI = .967, AGFI = .938 and RMR = .024 which means the hypothesized measurement model fit the sample data fairly well. Therefore we keep all the 3 items for RQF1 for further analysis.

Figure 5.3.6.1 the Final Model for RQF1 Construct Results



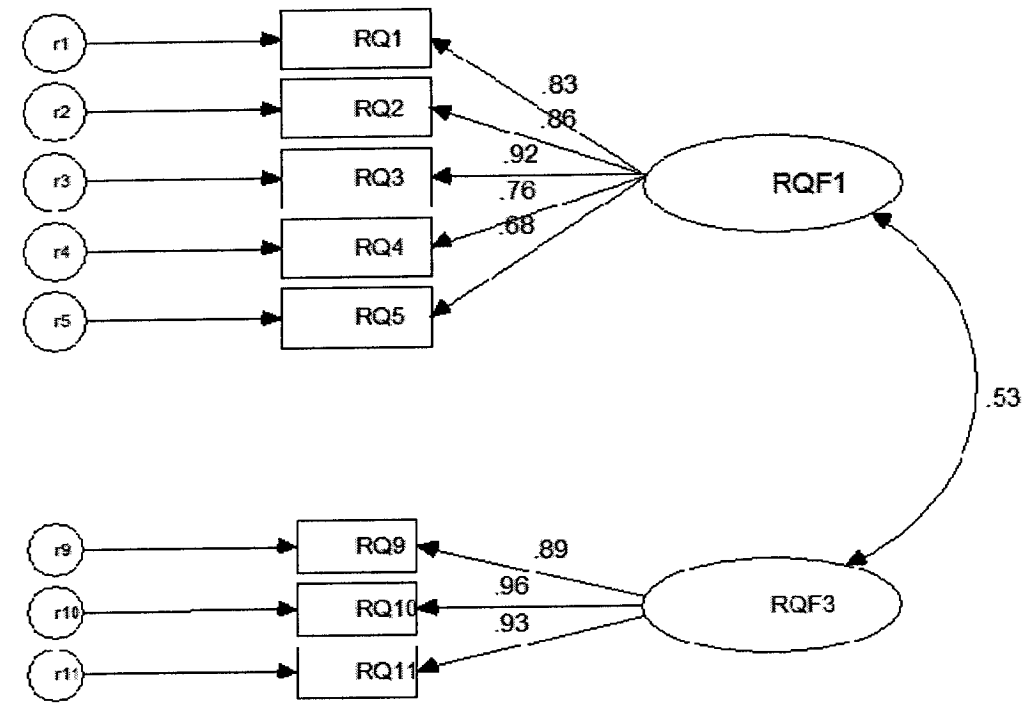
χ^2/df = 0.889; RMR = 0.009; GFI = 0.992; AGFI = 0.976; NFI = 0.994; CFI = 1.000

Figure 5.3.6.2 the Final Model for RQF2 Construct Results (adding 5 items of RQF1 form two-factor model)



χ^2/df = 3.554; RMR = 0.030; GFI = 0.934; AGFI = 0.876; NFI = 0.954; CFI = .966

Figure 5.3.6.3 the Final Model for RQF3 Construct Results (adding 5 items of RQF1 form two-factor model)



χ^2/df = 1.672; RMR = 0.024; GFI = 0.967; AGFI = 0.938; NFI = 0.979; CFI = .991

The final model fit indexes for each construct RQF1, RQF2 and RQF3 are shown in table 5.3.6.1.

Table 5.3.6.1 Relationship Quality (RQ) Convergent Validity (Model Fit Index) Assessment

Coding	Items	Initial Model Fit	Final Model Fit
Satisfaction with Cooperation (RQF1)			
RQ1	Our collaboration with partner through IOS is successful	**GFI =.992 AGFI =.976 RMR =.009**	**GFI =.992 AGFI =.976 RMR =.009**
RQ2	Our collaboration with partner through IOS has more than fulfilled our expectations		
RQ3	We are satisfied with the outcomes from this collaboration through IOS		
RQ4	Our trust in our trading partner has increased through IOS network		
RQ5	We are satisfied that our conflicts with our partner are well managed		
Perceived Outcome Fairness (RQF2)			
RQ6	Our outcomes received from the collaboration through IOS are fairly divided	**GFI =.934 AGFI =.876 RMR =.030**	**GFI =.934 AGFI =.876 RMR =.030**
RQ7	The benefits of collaboration with partner through IOS have been fair		
RQ8	Our gains from the collaboration through IOS is fair		
Willingness to Cooperation In the Future (RQF3)			
RQ9	We would welcome the possibility of additional collaboration in the future through IOS network	**GFI = .967 AGFI =.938 RMR =.024**	**GFI = .967 AGFI =.938 RMR =.024**
RQ10	We would be willing to work with our trading partners again in the future through IOS network		
RQ11	We would be willing to collaborate with our trading partners again through IOS network, should the opportunity arise		

Reliability Analysis The analysis began with purification using CITC analysis. An initial reliability analysis was done for each of the two Value Appropriation dimensions. The Corrected Item-Total Correlation (CITC) scores for all items in all three dimensions were above 0.50. CITC less than 0.5 are usually candidates for elimination in further analysis. According to Nunnally (1978), an alpha score of higher than .70 is generally considered to be acceptable. The final Cronbach's Alpha scores for each

dimension and The CITC for each item, its corresponding code name, and the reliability analysis results are shown in Table 5.3.6.2.

Table 5.3.6.2 Relationship Quality Reliability and CITC Assessment

Coding	Items	CITC	Cronbach's Alpha (α)
Satisfaction with Cooperation (RQF1)			
RQ1	Our collaboration with partner through IOS is successful	**.7673**	**α= . 9053**
RQ2	Our collaboration with partner through IOS has more than fulfilled our expectations	**.8103**	
RQ3	We are satisfied with the outcomes from this collaboration through IOS	**.8588**	
RQ4	Our trust in our trading partner has increased through IOS network	**.7299**	
RQ5	We are satisfied that our conflicts with our partner are well managed	**.6490**	
Perceived Outcome Fairness (RQF2)			
RQ6	Our outcomes received from the collaboration through IOS are fairly divided	**.7316**	**α=.9056**
RQ7	The benefits of collaboration with partner through IOS have been fair	**.8593**	
RQ8	Our gains from the collaboration through IOS is fair	**.8490**	
Willingness to Cooperation In the Future (RQF3)			
RQ9	We would welcome the possibility of additional collaboration in the future through IOS network	**.8598**	**α=.9471**
RQ10	We would be willing to work with our trading partners again in the future through IOS network	**.9160**	
RQ11	We would be willing to collaborate with our trading partners again through IOS network, should the opportunity arise	**.8932**	

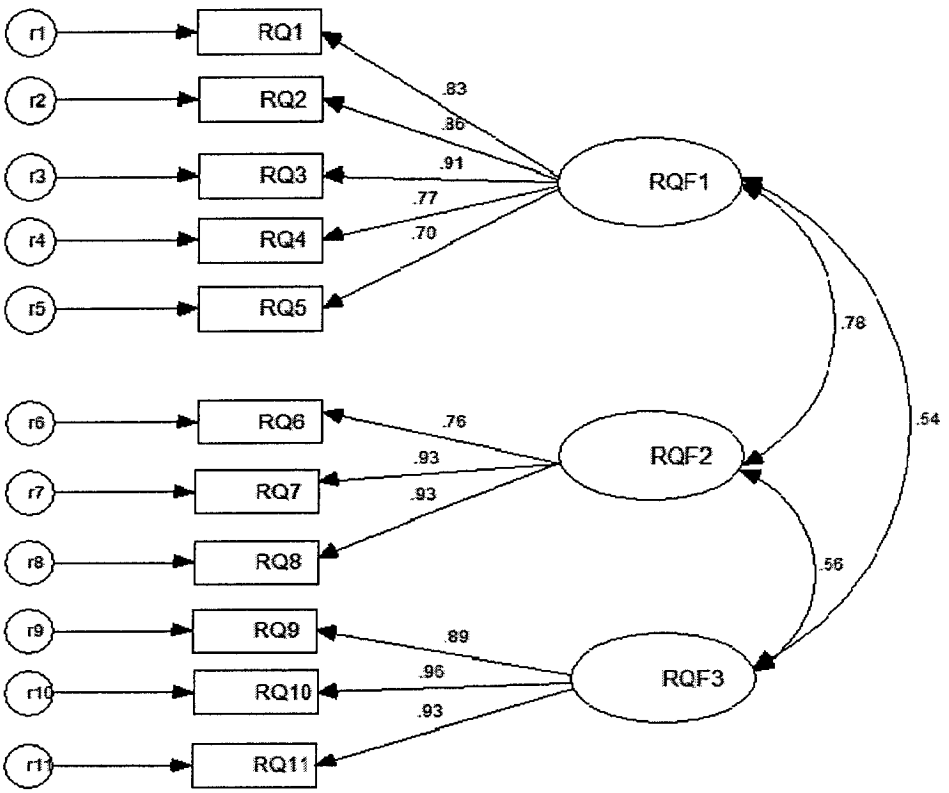
Discriminant validity: Table 5.3.4.3 shows the results from discriminant analysis. The differences between χ^2 values from RQF1-RQF2 and RQF1-RQF3 are statistically significant at the $p < 0.0001$ level thus indicating high degree of discriminant validity among constructs. The results prove that the constructs are theoretically and statically different from each other as hypothesized in the measurement development section.

Table 5.3.6.3 **Relationship Quality (RQ) Discriminant Validity Assessment**
(Pairwise comparison of χ^2 values)

Paired Construct	Chi-Square(χ^2)		
	Free	Fix	Difference
RQF1—RQF2	73	180	**107**
RQF1—RQF3	32	130	**98**
RQF2—RQF3	6.6	--	--

First-Order CFA model Assessment The initial results of first-order CFA model for RQ are shown in Figure 5.3.6.4. The initial results indicate acceptable coefficients λ being greater than 0.5, GFI=0.935, CFI=0.975 indicating an adequate fit of the model.

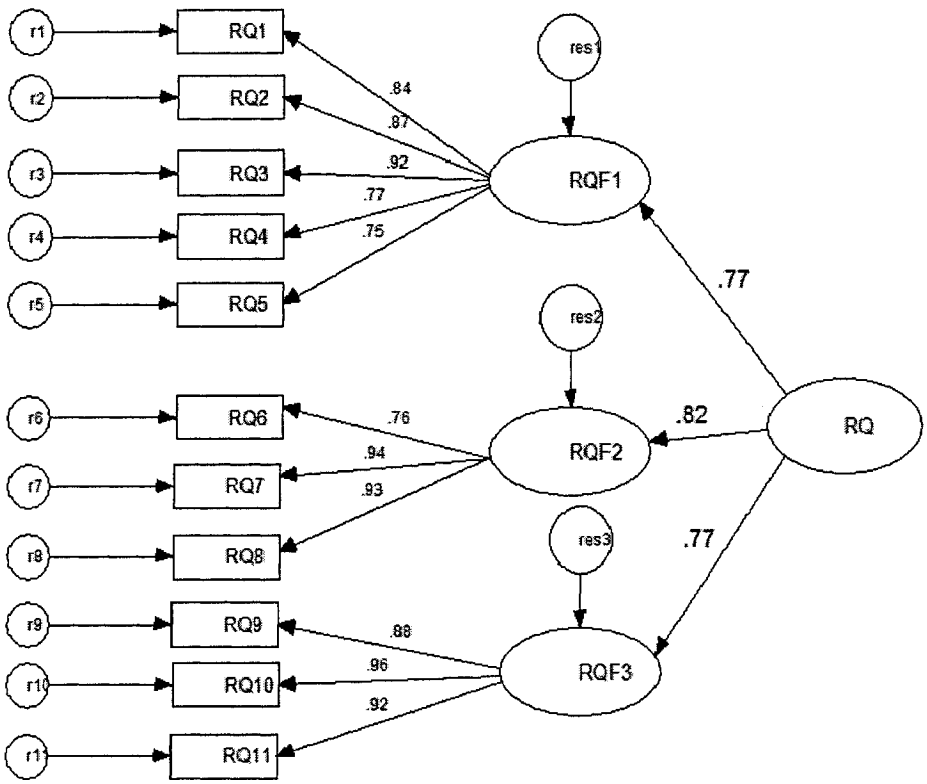
Figure 5.3.6.4 the Results of First-Order CFA Model for RQ



χ^2/df = 2.329; RMR = 0.027; GFI = 0.935; AGFI = 0.895; NFI = 0.958; CFI = 0.975

Second-Order CFA model Assessment The results of second-order CFA model for POWER are shown in Figure 5.3.4.5. The results indicate acceptable coefficients λ being greater than 0.5, the value of GFI= 0.938 and CFI=0.977 are indicative of an adequate fit of the model. The overall model fit indexes and the standardized coefficients also indicate the existence of second-order construct for Relationship Quality

Figure 5.3.6.5 the Results of Second-Order CFA Model for RQ



χ^2/df = 3.057; RMR = 0.047; GFI = 0.919; AGFI = 0.875; NFI = 0.942; CFI = 0.960

5.3.7 Predicative Validity of Measurement (Hypotheses Testing at the Bi-Correlation Level)

In order for measurement to be generalized, criterion-related validity or predictive validity must be performed by comparing the second-order factor models with one or more external variables (criterion) known or believed to measure the attribute. In this study, the criterion used to test the predictive validity is endogenous latent variable (i.e. dependent variable).

To check for the predictive validity of the 9 hypotheses presented in Chapter 3, the Pearson correlation coefficients of the hypothesized relationships were calculated using a composite score for each construct. The composite score was computed by taking the average score of all items in a specific construct. The results are presented in Table 5.7.1. As can be seen from the table, all correlations are significant at the 0.01 level. The results demonstrate that all hypothesized relationships of interest are statistically supported by the Pearson correlation. However, since the interaction between/among the constructs, further hypotheses testing using structural equation causal modeling were discussed in the next chapter.

Table 5.3.7.1 Hypotheses Testing at the Bi-Correlation Level

Hypothesis	Independent Variable	Dependent Variable	Pearson Correlation
H1: SL→LC	Supportive Leadership (SL)	Learning Capability (LC)	**0.778****
H2: SL→ITSC	Supportive Leadership (SL)	IT Support Capability (ITSC)	**0.676****
H3: SL→POWER	Supportive Leadership (SL)	Power in IOS Context (POWER)	**0.596****
H4: ITSC→LC	IT Support Capability (ITSC)	Learning Capability (LC)	**0.791****
H5: ITSC→POWER	IT Support Capability (ITSC)	Power in IOS Context (POWER)	**0.720****
H6: LC→POWER	Learning Capability (LC)	Power in IOS Context (POWER)	**0.691****
H7: POWER→RQ	Power in IOS Context (POWER)	Relationship Quality (RQ)	**0.624****
H8: POWER→VA	Power in IOS Context (POWER)	Value Appropriation (VA)	**0.721****
H9: RQ→VA	Relationship Quality (RQ)	Value Appropriation (VA)	**0.726****

** Correlation is significant at the 0.01 level

5.4 Summary of This Chapter

This chapter validates the constructs' reliability and unidimensionality through statistical analyses of CITCs and Alphas using SPSS 10 and validates the constructs' convergent validity and discriminant validity through statistical analysis of first-order CFA and second-order CFA model analysis using AMOS 4.0. Some adjustments has been made to the measurement items to improve the overall model fit indexes based on MIs and theoretical justification. Predictive validity of constructs was vilified through Bi-correlation analysis using SPSS 10. A bi-correlation based hypotheses testing shows that all hypotheses are preliminarily supported. The next chapter will test the hypotheses by applying structural equation modeling technique.

Table 5.4.1 Summary of Measurement Analysis for CITC and Alpha

Constructs	Sub-constructs	Range of CITC	# of items	Alpha
Learning Capability	Knowledge base	**.6245~.7753**	**8**	**.9141**
	Knowledge identification capability	**.7413~.8260**	**5**	**.9195**
	Knowledge sharing capability	**.6628~.8586**	**5**	**.8980**
	Knowledge transferring capability	**.6377~.8135**	**5**	**.8903**
Supportive Leadership	Commitment to organizational learning	**.7810~.9028**	**4**	**.9425**
	Commitment to IOS supply chain network	**.5661~.7340**	**7**	**.8657**
IT Support Capability for Supply Management	IT infrastructural capability	**.4975~.7468**	**5**	**.8473**
	IT use capability	**.6274~.7467**	**5**	**.8653**
Power in Supply Chain Network	Information control	**.6300~.7811**	**7**	**.9101**
	Electronic trading network control	**.7708~.9101**	**6**	**.9557**
	Network structural bonding control	***.3452*~.6427**	**5 (initial)**	**.7628 (initial)**
		.5631~.6863	**4(final)**	**.7753 (final)**
Value Appropriation	Long-term value appropriation	**.6355~.7231**	**7**	**.8884**
	Short-term value appropriation	**.7191~.8108**	**4**	**.9041**
Relationship Quality	Satisfaction with Cooperation	**.6490~.8588**	**5**	**. 9053**
	Perceived Outcome fairness	**.7316~.8593**	**3**	**.9056**
	Willingness to cooperate in the future	**.8598~.9160**	**3**	**.9471**

Table 5.4.2 Summary of Model Fit Indexes for Each sub-construct

Constructs	Sub-constructs	Model Fit Indexes
Learning Capability	Knowledge base	**GFI =.903**
		AGFI =.817
		RMR =.049
		(KB7&KB8 correlated)
	Knowledge identification capability	**GFI =.973**
		AGFI =.898
		RMR =.022
		(KIC4&KIC5 correlated)
	Knowledge sharing capability	**GFI =.979**
		AGFI =.922
		RMR =.018
		(KSC4&KSC5 Correlated and KSC6 deleted)
	Knowledge transferring capability	**GFI =.984**
		AGFI =.939
		RMR =.014
		(KTC3&KTC4 correlated)
Supportive Leadership	Commitment to organizational learning	**GFI =.961**
		AGFI = .803
		RMR =.021
	Commitment to IOS supply chain network	**GFI =.977**
		AGFI =.930
		RMR = .032
		(SL1&SL4 deleted)
IT Support Capability for Supply Management	IT infrastructural capability	**GFI =.990**
		AGFI =.963
		RMR =.018
		(ITIC4&5 correlated)
	IT use capability	**GFI =.996**
		AGFI =.981
		RMR =.014
		(ITUC1 deleted)
Power in Supply Chain Network	Information control	**GFI =.967**
		AGFI =.923
		RMR =.023
		(IC1 deleted)
	Electronic trading network control	**GFI = .974**
		AGFI =.923
		RMR =.015
		(ETNC2&3 And ETNC5&6 are correlated)
	Network structural bonding control	**GFI = .989**
		AGFI =.944
		RMR =.029
Value Appropriation	Long-term value appropriation	**GFI =.956**
		AGFI =.897

			RMR =.027
		(LTVA1 & LTVA2 correlated , LTVA4 &LTVA5 correlated)	
	Short-term value appropriation		**GFI =.979**
			AGFI =.894
			RMR =.020
		(STVA2 deleted)	
Relationship Quality	Satisfaction with Cooperation		**GFI =.992**
			AGFI =.976
			RMR =.009
	Perceived Outcome fairness		
			GFI =.934
			AGFI =.876
			RMR =.030
	Willingness to cooperate in the future		**GFI = .967**
			AGFI =.938
			RMR =.024

CHAPTER 6 STRUCTURAL MODEL AND HYPOTHESES TESTING

6.1 Structural Equation Modeling

Although the bi-correlations are statistically significant for all hypotheses proposed in Chapter 3, these hypotheses may not be true when all the relationships are put together in a multivariate complex model due to the interactions among constructs. A major methodological breakthrough in the study of complex interrelations among constructs has been the development and application of Structural Equation Modeling (SEM) (Joreskog, 1977). SEM "is a statistical methodology that takes a confirmatory (i.e., hypothesis-testing) approach to the analysis of a structural theory bearing on some phenomenon (Byrne, 2001, p3)". It is widely recognized as a powerful method for capturing and explicating complex multivariate relations in social science area. The general SEM is composed of two sub-models: the *measurement model* and the *structural model.* Measurement model defines relations between observed indicator variables and unobserved latent variables. It represents the CFA Model described in chapter 5, which specifies the indicators of each construct, assesses the reliability of each construct and the structure of each construct. Structural model defines the set of dependence relationships linking the conceptual model constructs (i.e., conceptual model hypotheses testing), which is the main objective of this chapter. Measurement models will be used to test whether mean scores can be used to verify the proposed research

model. The structural model will be used to test the significance of the proposed paths. Of primary interest in SEM is the extent to which a hypothesized model "fits" or, in other words, adequately describes the sample data.

6.2 Model Fit Indexes

The widely used program AMOS will be used to estimate structural model. The primary focus of the SEM estimation process is to yield parameter values such that the discrepancy (i.e., residual) between the sample covariance matrix and the population covariance matrix is minimal. There are no single statistics that can best describe the strength of a model. Researchers have developed a number of goodness-of-fit measures to assess the results. There are three important types of indices: 1) overall fit indexes, 2) comparative fit indexes, and 3) the modification index. Modification index is used to revise model to enhance the model fit indexes based on appropriate theoretical justifications. The AMOS algorithm provides several such statistics that can be used to evaluate the hypothesized model and modify the research model.

6.2.1 Overall Fit Indexes

Chi-square (χ^2)

The first measure of overall fit is the chi-square statistic *(χ^2)*. The most fundamental measure of overall fit is the chi-square statistic (χ^2). Low values, which result in significance levels greater than 0.05, indicate that the actual and predicted input matrices are not statistically different, hence a good fit. However, the χ^2 measure is often criticized for its over-sensitivity to sample size, especially in cases where the sample size

exceeds 200 respondents (Hair et al., 1992, pp. 490). As sample size increases, this measure has a greater tendency to indicate significant differences for equivalent models. Thus the current study does not use the χ^2 measure.

Goodness-of-fit index (GFI) and Adjusted Goodness of Fit (AGFI)

GFI provided by AMOS can be considered to be a measure of the proportion of variance/covariance that the proposed model is able to explain. In other word, it represents the overall degree of fit (the squared residuals from prediction compared to the actual data), but is not adjusted for the degrees of freedom. The AGFI differs from GFI only in the fact that it adjusts for the number of degrees of freedom in the specified model. As such, it also addresses the issue of parsimony by incorporating a penalty for the inclusion of additional parameters. GFI and AGFI values range in from 0 (hypothesized mode fits the sample data very poor) to 1 (hypothesized mode fits the sample data perfectly). Generally, a GFI and AGFI value of greater than 0.90 is considered as acceptable. A recommended acceptance value of AGFI is 0.80 or greater (Segars and Grover, 1993).

Root Mean Square Residual (RMR).

RMR indicates the average residual value derived from the fitting of the variance-covariance matrix for the hypothesized model to the variance-covariance matrix of the sample data (Byrne, 2001). RMR values range from 0 to 1, with smaller values indicating better model fit; values less than .05 indicate good fit (Byrne, 2001). The recommended maximum value of RMR is 0.1 (Chau, 1997).

6.2.2 Comparative Fit Indexes

This kind of measures compare the proposed model to baseline model (null model), which is a realistic model that all other models should be expected to exceed. In most cases, the null model is a single construct model with all indicators perfectly measuring the construct. The most popular measures of this kind are the **Normed Fit Index (NFI)** and **Comparative Fit Index (CFI)**. Values for both NFI and CFI ranges from 0 (very poor fit) to 1 (perfect fit) and are derived from the comparison of an hypothesized model with the baseline model. A commonly recommended value is 0.90 or greater (Hair et al., 1992).

6.2.3 Modification Indexes

The AMOS program also provides modification indices that suggest possible ways of improving the model fit, such as uncovering new relationships among constructs. However, the modifications must have sufficient theoretical justification.

6.3 The Hypothesized Structural Model

Once the measurement and structure models are specified, AMOS was used to explore the relationship between Learning Capability, Supportive Leadership, IT Support Capability for Supply Chain Management, Power in IOS context, Value Appropriation and Relationship Quality. In this study, composite measures were used as indicators for Learning Capability, Supportive Leadership, IT Support Capability for Supply Chain Management, Power in IOS context, Value Appropriation and Relationship Quality.

Figure 6.3.1 illustrates theoretical framework for Power in IOS context. The hypotheses proposed in Chapter 3 are represented by the following causal relationships in the model: Figure 6.3.2 displays the structural model for the initial AMOS structural modeling analysis.

H1: An organization's supportive leadership positively influences its learning capability (H1: SL→LC).

H2: An organization's supportive leadership positively influences its IT support capability for supply management (H2: SL→ITSC).

H3: An organization's supportive leadership positively influences its power in IOS supply chain network context (H3: SL→POWER).

H4: An organization's IT support capability for supply management positively influences its learning capability (H4: ITSC→LC).

H5: An organization's IT support capability for supply management positively influences its power in IOS supply chain network context (H5: ITSC→POWER).

H6: An organization's learning capability positively influences its power in IOS supply chain network context (H6: LC→POWER).

H7: An organization's power in IOS supply network context positively influences its relationship quality with its trading partner (H7: POWER→RQ).

H8: An organization's power in IOS supply chain network context positively influences its value appropriation. (H8: POWER→VA).

H9: An organization's relationship quality with its trading partner positively influences its value appropriation (H9: RQ→VA)

Figure 6.3.1 Theoretical Framework for Power in IOS context

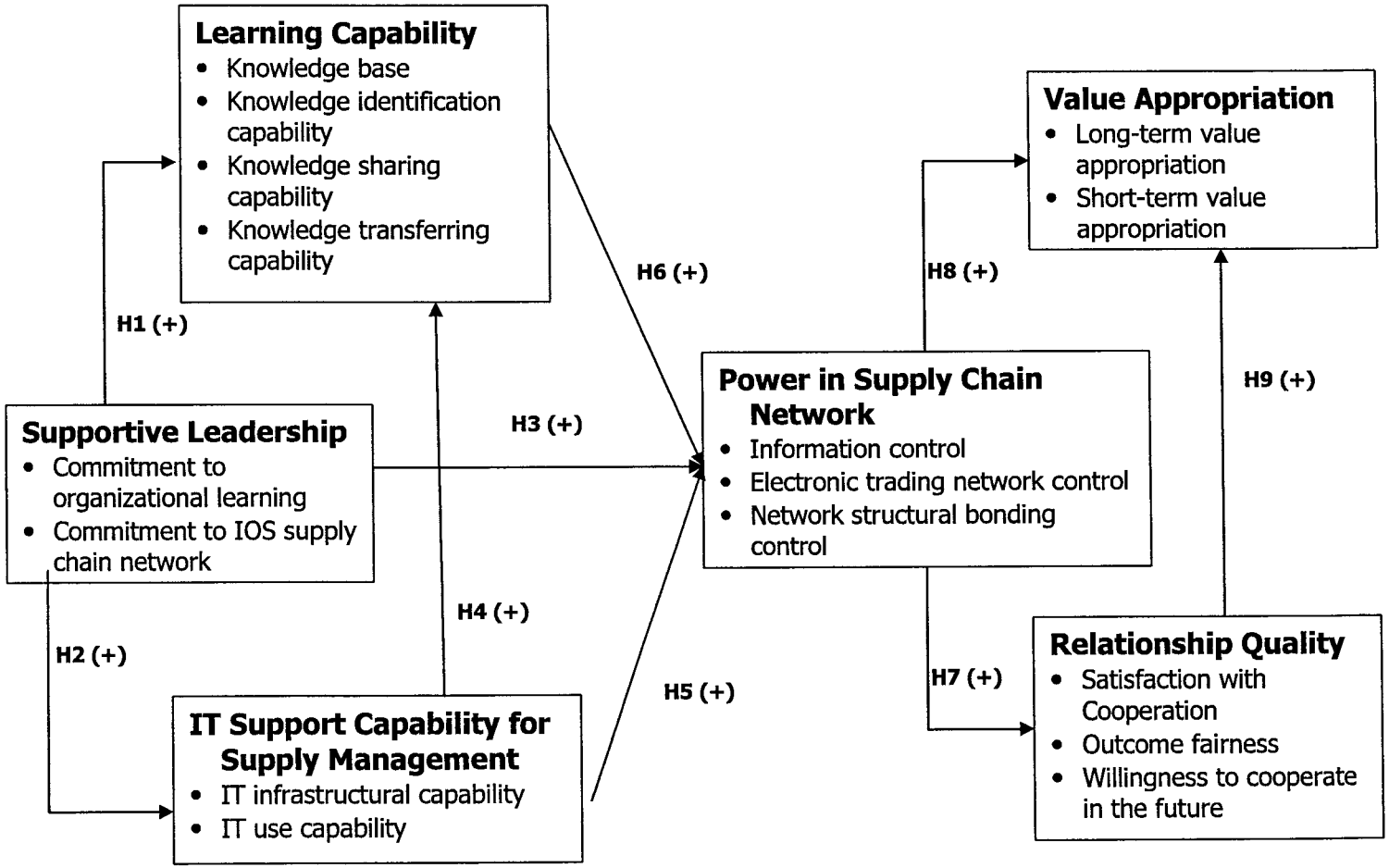
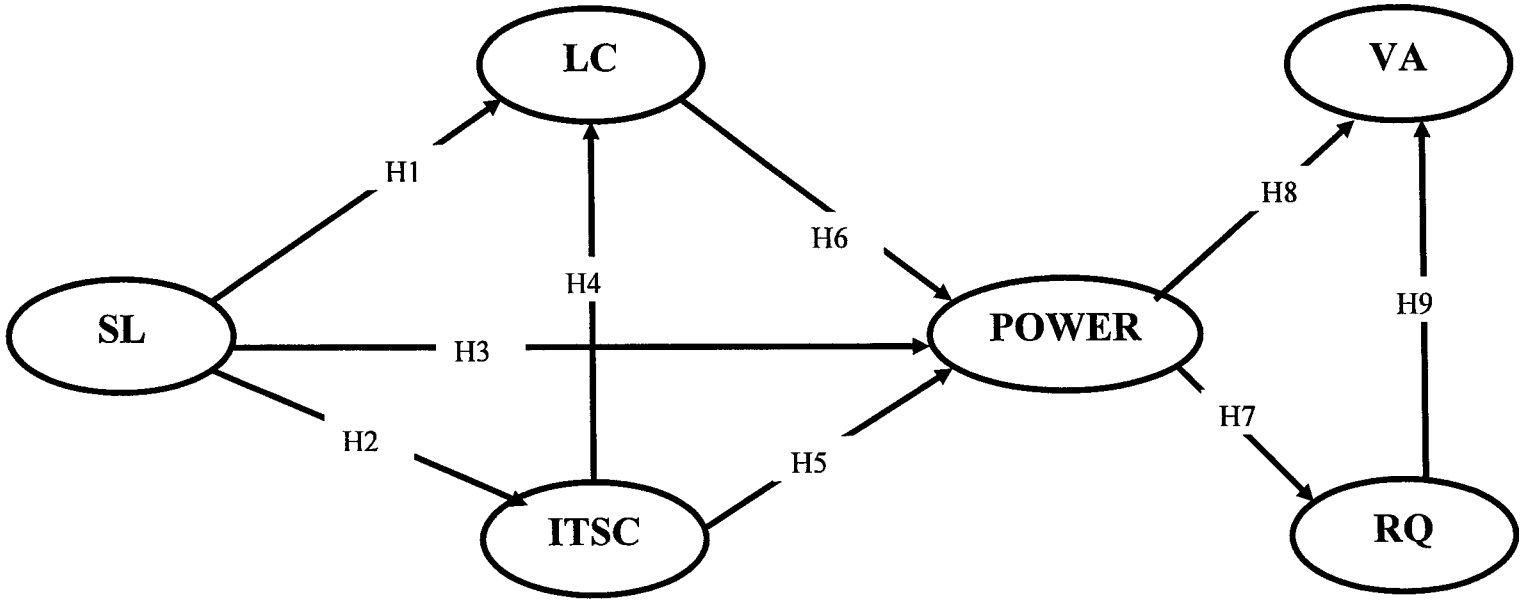


Figure 6.3.2 Proposed Structural Model



6.4 Structural Model Testing Results

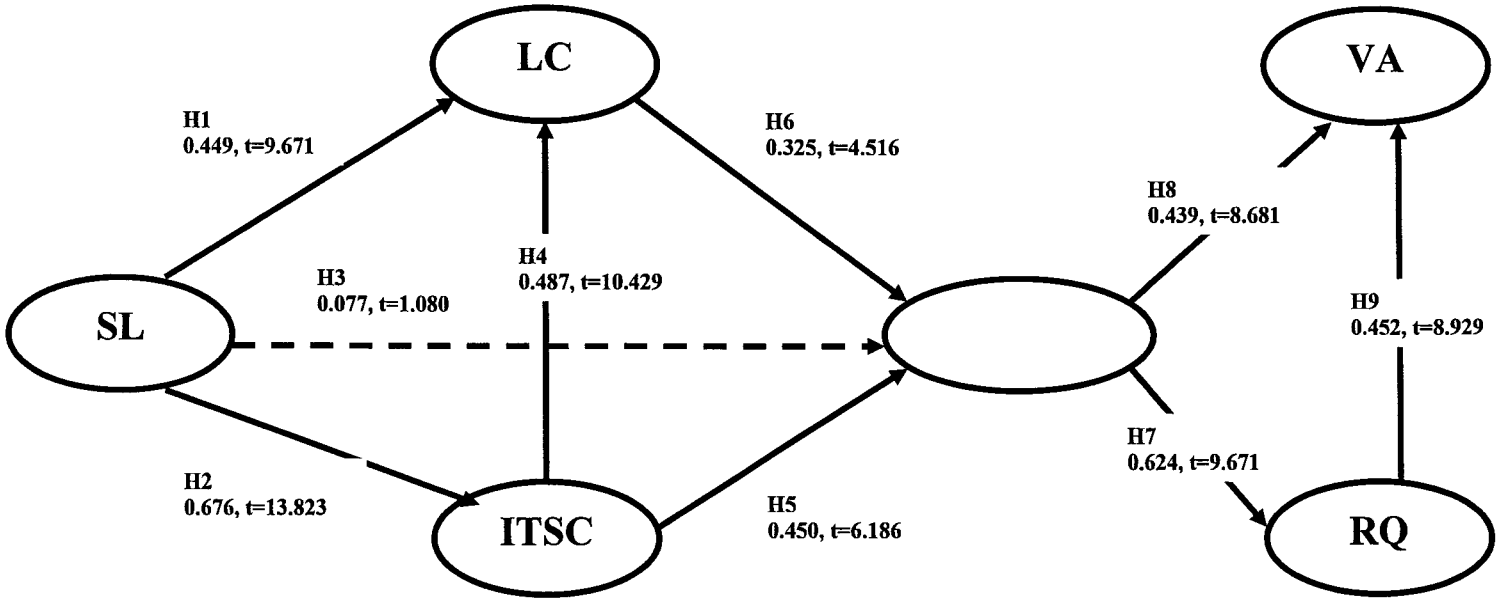
The hypothesized relationships are now ready to be tested based on the structural model specified in Figure 6.3.2 and the model fit properties are evaluated using the model fit indexes discussed above. The composite score computed for each construct was used as input to the structural modeling process. The initial results of the proposed structural model are shown in Figure 6.4.1 and detailed results also presented in Table 6.4.1. Out of the 9 hypothesized relationships, 8 hypotheses were supported by data; all the t-values of the 8 hypotheses are over 3.00. The t-value of greater than 3.00, indicating the relationships are significant at the 0.001 level. The model fit indexes such as RMR=0.032 GFI=0.955 AGFI=0.843 NFI=0.966 and CFI=0.972 demonstrate that the hypothesized model fit the data reasonably well. The results confirm the proposed theoretical model proposed in Chapter 3 and support most of the hypotheses.

After removing non-significant relationship between Supportive Leadership (SL) and power in IOS context (POWER), the revised model re-test, the results of the revised structural model are shown in Figure 6.4.2 and detailed results also presented in Table 6.4.2. The remaining 8 hypotheses were strongly supported by data; all the t-values of the 8 hypotheses are over 4.00, indicating the significant level at 0.001. The main difference between revised structural model results and initial structural model results lies that the standardized coefficient between Learning Capability (LC) and Power in IOS context increases from 0.276(t=3.227) to 0.325 (t=4.516). This means after removing the non-

significant relationship between SL and POWER, the relationship between LC and POWER strengthened. The model fit indexes change a little bit as follows:

RMR=0.034 GFI=0.954 AGFI=0.863 NFI=0.965 CFI=0.972 demonstrating the good model fit.

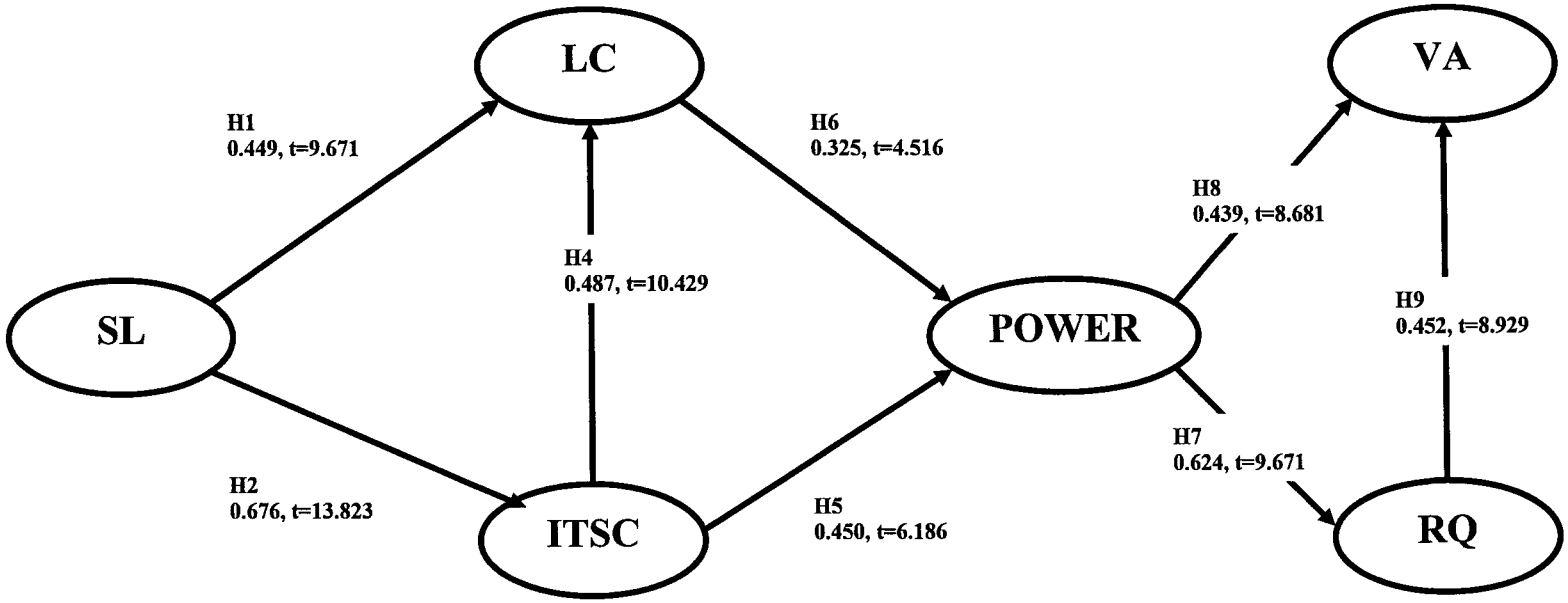
Figure 6.4.1 AMOS Structural Model Test Initial Results



RMR=0.032 **GFI**=0.955
AGFI=0.843 **NFI**=0.966
CFI=0.972

LC—Learning Capability
SL—Supportive Leadership
ITSC—IT Support Capability
POWER—Power in IOS Context
VA—Value Appropriation
RQ—Relationship Quality

Figure 6.4.2 AMOS Revised Structural Model Test Results (Remove H3)



RMR=0.034 **GFI**=0.954
AGFI=0.863 **NFI**=0.9665
CFI=0.972

LC—Learning Capability
SL—Supportive Leadership
ITSC—IT Support Capability
POWER—Power in IOS Context
VA—Value Appropriation
RQ—Relationship Quality

Table 6.4.1 AMOS Structural Model Initial Results

Hypotheses	Relationship	AMOS Coefficients	t-value	Support
H1	SL→ LC	0.449	9.671*	Yes
H2	SL→ ITSC	0.676	13.823*	Yes
H3	SL→ POWER	0.077	1.080	No
H4	ITSC → LC	0.487	10.429*	Yes
H5	ITSC → POWER	0.450	6.186*	Yes
H6	LC→ POWER	0.276	3.227*	Yes
H7	POWER → RQ	0.624	9.671*	Yes
H8	POWER → VA	0.439	8.681*	Yes
H9	RQ → VA	0.452	8.929*	Yes
RMR=0.032 GFI=0.955 AGFI=0.843 NFI=0.966 CFI=0.972 * P<0.001				

Table 6.4.2 AMOS Revised Structural Model Results (Removing H3)

Hypotheses	Relationship	AMOS Coefficients	t-value	Support
H1	SL→ LC	0.449	9.671*	Yes
H2	SL→ ITSC	0.676	13.823*	Yes
H3 (Remove)				
H4	ITSC → LC	0.487	10.429*	Yes
H5	ITSC → POWER	0.450	6.186*	Yes
H6	LC→ POWER	0.325	4.516*	Yes
H7	POWER → RQ	0.624	9.671*	Yes
H8	POWER → VA	0.439	8.681*	Yes
H9	RQ → VA	0.452	8.929*	Yes
RMR=0.034 GFI=0.954 AGFI=0.863 NFI=0.965 CFI=0.972 * P<0.001				

6.5 Discussions

6.5.1 Hypothesis 1:

An organization's supportive leadership positively influences its learning capability (H1: SL→LC)

The hypothesis H1 was found to be significant. This indicates that an organization which commits more resources in organizational learning and IOS network (i.e., strong supportive leadership) will contribute to its learning capability, which includes four dimensions: knowledge base, knowledge identification capability, knowledge sharing capability and knowledge transfer capability. This hypothesis can be justified in the organizational learning literature theoretically. An organization's learning capability is path dependent, strong learning capability need long-term investment and accumulated from previous experience.

6.5.2 Hypothesis 2:

An organization's supportive leadership positively influences its IT support capability for supply chain management (H2: SL→ITSC)

The hypothesis 2 was found to be significant statistically. The data confirms our original theoretical justification. An organization with strong supportive leadership will realize that the new development in IT area will influence an organization's future development strategically. Considering the importance of supply chain management in

current dynamic environment, top management with long-term vision will consistently emphasize IT infrastructure capability and IT use capability to support its organization's supply management.

6.5.3 Hypothesis 3:

An organization's supportive leadership positively its power in IOS supply chain network context (H3: SL→POWER)

The hypothesis 3 was found to be non-significant statistically. The data do not support our original theoretical hypothesis. Originally, we thought an organization's Top management realizing the IOS potential impact on its business will commit more recourses and investment to IOS network and will obtain the dominant position in IOS trading partner relationship. However, from the output of AMOS, the standardized direct effect of supportive leadership is 0.077; the results suggest that an organization's supportive leadership does not affect power in IOS context directly. Considering the hypotheses 1& 2, it does make sense that the direct relationship between supportive leadership (SL) and Power in IOS context does not significant. Since strong supportive leadership can influences power indirectly through an organization's increased learning capability and IT supportive capability. The indirect relationship can be justified by the following significant relationship proposed in hypotheses 5&6. The output of AMOS also indicate that the indirect relationship between supportive leadership and power in IOS context exists; the standardized indirect effects of supportive leadership and power in IOS context is 0.519.

6.5.4 Hypothesis 4:

An organization's IT support capability for supply chain management positively influences its learning capability (H4: ITSC→LC)

The hypothesis 4 was found to be significant statistically. The results suggests that strong IT supportive capability which includes two dimensions (IT infrastructure capability and IT use capability) can contribute to organization's knowledge base accumulation, knowledge identification, knowledge sharing and knowledge transfer through more flexible IT infrastructure in the organization and more intensive IT use throughout the organization.

6.5.5 Hypothesis 5:

An organization's IT support capability for supply chain management positively influences its power in IOS supply chain network context (H5: ITSC→POWER)

The hypothesis 5 was found to be significant statistically. Power in IOS supply chain network context includes three dimensions: information control, electronic trading network control, network structural bonding control, which is not only behavioral concept involving inter-organizational relationship, but also involving technical aspects. Therefore, data supporting this hypothesis indicates that the determinant of power in IOS context should include some technical perspective aspect. This is one of important

contribution of this research: exploring the determinant of the power in IOS context from technical perspective.

6.5.6 Hypothesis 6:

An organization's learning capability positively influences its power in IOS supply chain network context (H6: LC→POWER)

The hypothesis 6 was found to be significant statistically. The results indicates that strong learning capability in an organization can change its weakness relative to its trading partner or its competitors and can minimize the threats from external environment and can capture the new opportunities, which positively influence its power in IOS context. Strong learning capability will guarantee an organization to obtain/maintain its dominant position in trading partner relationship. This is another of important contribution of this research: exploring the determinant of the power in IOS context from behavioral perspective.

6.5.7 Hypothesis 7:

An organization's power in IOS supply chain network context positively influences its relationship quality with its trading partner (H7: POWER→RQ)

The hypothesis 7 was found to be significant statistically. Relationship quality with its trading partner represents the relational outcome of the power in inter-

organizational context. The results indicate that powerful organization will feel more comfortable with its trading partner because powerless organization will try its best to meet powerful organization's expectation and requirement. Powerful organization has more choice to choose its main trading partners and powerful organization exercise power in more non-coercive way in current environment. After the trading partners were selected, powerful organization will satisfy the cooperation with its trading partner, feel fair about the outcome and will to cooperate in the future.

6.5.8 Hypothesis 8:

An organization's power in IOS supply chain network context positively influences its value appropriation. (H8: POWER→VA)

The hypothesis 8 was found to be significant statistically. Value appropriation represents the economic outcome of the power in inter-organizational context. The results indicate that powerful organization will get more benefit through IOS network. This is not unexpected. Since value appropriation is ultimate goal for any organization considering from economic perspective. Cooperation is necessary for value creation during any alliance. Value creation is prerequisite for value appropriation. The development of supply chain management, the opportunities for value creation are adequate. However, value created through cooperation is not equally allocated among trading partners. Value appropriation reflects the competitive aspect in inter-organizational context. Powerful organization will get more benefits that its trading partners.

6.5.9 Hypothesis 9:

An organization's relationship quality with its trading partner positively influences its value appropriation (H9: RQ→VA)

The hypothesis 8 was found to be significant statistically. This indicates that the relational outcome of the power will positively influence its economical outcome. That's one important reason that in current environment, even powerful organization has to handle inter-organizational relationship very carefully. Good relationship with its trading partners will influence an organization's economical benefits from short-term and long-term perspective.

6.5.10 Hypothesis 10 (new hypothesis added based on respecified model):

An organization's supportive leadership positively influences its relationship quality with its trading partners (H10: SL→LC)

After examining the AMOS results of revised structural model (removing H3), we find that there is still one MI that can be taken into account in the determination of a well-fitting model of Power in IOS context. The largest of these (MI=13.283) is associated with a path flowing from Supportive Leadership (SL) to Relationship Quality (RQ) and the expected value is estimated to be 0.154. Substantively, this path makes good sense. In fact, this new relationship between SL and RQ seem reasonable. In inter-organizational context, if the top management of an organization commits more resources to IOS network, the relationship between the organization and its trading partners. In order to

examine this new relationship, related literature was re-examined. Some researcher such as Narus and Anderson (1986) proposed that top management signal commitment to trading partners represents a long-term orientation toward the network partnership, which means supportive leadership does influence relationship directly. Thus the structural model was again respecified: with the path from SL to RQ freely estimated.

The re-specified model and the AMOS results were shown in Figure 6.5.1. The detailed results also presented in Table 6.5.1. The revised model yielded an overall $\chi^2(6)=$ 13.517 , with RMR=0.013 GFI=0.980 AGFI=0.931 NFI=0.987 CFI=0.992. After adding this new relationship, No large MIs remains in the model. More important fact is that all parameter estimates are statistically significant and substantively meaningful.

Discovering new relationships will be of great value both to practitioners and researchers. For practitioners, this new relationship can help them in terms of assisting them handling inter-organizational relationship. For researchers, this new relationship will provide them some new insights for further academic exploration. This new relationship from SL to RQ revised one of our initial proposed hypotheses. Initially, we proposed supportive leadership positively influence the Power in IOS context directly and through the power positively influence the relationship quality between trading partners indirectly. But the data not support our initial specification. Data substantively support the direct relationship between supportive leadership and relationship quality. In other word, supportive leadership positively influences relationship quality directly. Related literature was examined later. This new relationship is supported by literature (

Narus and Anderson, 1986). This new relationship provides practical implications for managers who need to handle inter-organizational relationship. New hypothesis is presented as follows:

H10: An organization's supportive leadership positively influences its relationship quality with its trading partner (H10: SL→RQ).

Figure 6.5.1 AMOS Revised Structural Model Test Results (remove H3 /add new H10)

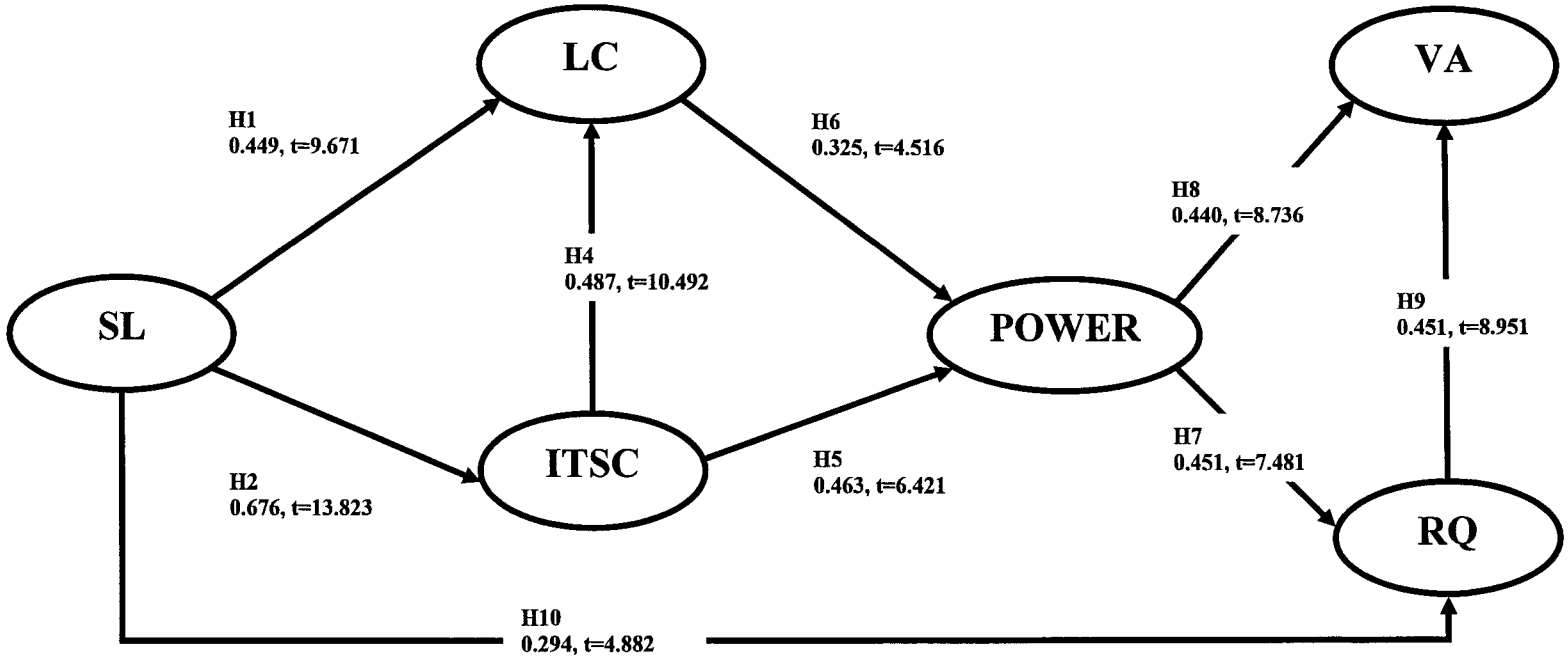


Table 6.5.1 AMOS Revised Structural Model Results (remove H3/add H10)

Hypotheses	Relationship	AMOS Coefficients	t-value	Support
H1	SL→ LC	0.449	9.671*	Yes
H2	SL→ ITSC	0.676	13.823*	Yes
H3 (Remove)				
H4	ITSC → LC	0.487	10.429*	Yes
H5	ITSC → POWER	0.463	6.421*	Yes
H6	LC→ POWER	0.325	4.516*	Yes
H7	POWER → RQ	0.451	7.481*	Yes
H8	POWER → VA	0.440	8.736*	Yes
H9	RQ → VA	0.451	8.961*	Yes
H10	SL→ RQ	0.294	4.882	Yes

RMR=0.013 GFI=0.980 AGFI=0.931 NFI=0.987 CFI=0.992
* P<0.001

CHAPTER 7 SUMMARY, CONTRIBUTIONS, IMPLICATIONS, LIMITATIONS AND FUTURE RESEARCH

This chapter provides (1) Summary of research findings and major contribution, (2) Implications, (3) limitations of the research, and (4) Future Research.

7.1 Summary of Research Findings and Major Contributions

7.1.1 Conceptual Model Development and Confirmation Relationships

The developed conceptual model in this study addresses a missing link in the existing literature. In supply chain management literature, cooperation is emphasized by many researchers. Competition aspect is ignored to some degree. Power in an inter-organizational context reflects the co-opetition nature of the inter-organizational relationship. This conceptual model systematically explores the determinants and outcomes of power in IOS context. The framework of inter-organizational power in IOS context developed here will provide some meaningful implications for researchers and SCM practitioners. This research adopts the nature of inter-organizational relationship as 'co-opetition', There is no doubt that effective supply chain management has become a potentially valuable way to improve organizational performance and get expanded value through squeezing waste within the supply chain. Cooperation and organizational integration are key dimensions of effective supply chain network management (Lee and

Ng, 1997). Cooperation is necessary for expanded value creation in inter-organizational context. Powerful company is necessary for effective operation of IOS network. However, expanded value creation is pre-requisite for value appropriation; value appropriation is the ultimate goal, which represents competition aspect in the inter-organizational context.

Power has been explored in several disciplines such as the marketing and behavioral literature (EI-Anary and Stern, 1972). Power is an unavoidable phenomenon in almost any IOS supply chain network. Literature in IOS area has not yet defined the power concept in IOS context. In this research, power means control information, control electronic trading network, and control network structural bonding. Most of the researches analyze the power from the behavioral perspective. How the technical factors influence the power in IOS context is the gap in the literatures. This dissertation research tries to address this deficiency. This research synthesizes both *behavioral and technical perspectives* to explore the determinants of the power in the IOS supply network.

Power is a dynamic concept. This model incorporates learning capability in supply network area; we can explore the power in a dynamic way which link organizational learning literature and power literature. An organization's learning capability will change its weaknesses and strengths and its relative position compared with its trading partners. Learning is an important aspect and learning is a fundamental requirement for an organization's sustainable existence (Garvin, 1993; Kim, 1993; Senge, 1990). Learning capability is a very strong concept, but the research in IOS context is

limited, this study try to address this deficiency. Learning capability is consisted of four sub-constructs: knowledge base, knowledge identification capability, knowledge sharing capability and knowledge transfer capability in IOS context. Knowledge base is the foundation for knowledge identification, knowledge sharing and knowledge transfer; Knowledge identification capability contribute to valuable knowledge scanning and knowledge accumulation. Knowledge sharing is way to leverage the existing knowledge within an organization. Knowledge transfer applies existing knowledge and internalizes trading partners' knowledge to serve business objectives. And based on the literature review, we conclude that learning capability is the guarantee to achieve/keep an organization's dominant position in IOS context or change the disadvantageous position. Therefore, learning capability is one factor, which influences the power in IOS context. Large-scale data confirm this relationship.

This study examines supportive leadership, not only emphasizing the top management's commitments to continuous organizational learning and internal electronic network building within its own organization but also emphasizing management's commitments to the IOS supply chain network. This implies that organizations which want to be in the dominant position in the supply chain network must commit more resources to IOS supply network and relationship building with its trading partners.

IT support capability in IOS context represents technical determinant to influence power in IOS context in this research. Large-scale data confirms this important

relationship. IT support capability represents technical determinant influencing power in IOS context.

This research explores the outcomes of power in IOS context from economical and relational perspective. The relationship between power and its economical outcome (value appropriation) & relational outcome (relationship quality) were confirmed by large-scale data. Much of power literature in marketing channel area has examined the sources of power and how they affect attitudes and behavior within channel (e.g. Stern & EI-Ansary, 1972; Brown, 1995). The research relating to economic outcome of power was ignored to some degree.

Finally, this research using an empirical research measure to explore power in IOS supply chain network area will bring new insights to supply chain management process. This research adopted a sound methodology, which resulted in more precise measurement of the related underlying constructs and examined the inter-relationships among the related constructs. The hypothesized model adequately describes the sample data. This research will expected to motivate further theory development and empirical investigation in power literature.

7.1.2 Scale Development

This study develops valid and reliable instruments of some important concepts. Instrument development is a necessary foundation to test and validate a conceptual model. The concepts such as IT support capability, learning capability has been explored

in IT literature, network literature, and learning literature. However, the valid and reliable instruments of these concepts in IOS context are limited.

The measurement scales for *Learning Capability*, *Supportive leadership*, *IT support capability*, *Power in IOS supply chain network context*, *Relationship Quality* and *Value appropriation* were examined by following rigorous procedures: an extensive literature review, pretest, Q-sort and a large-scale study. The confirmation process is according to the typical standards of scale development (Ragu-Nathan et al., 2001; Sethi and King, 1994; Anderson and Gerbing, 1988). Researchers could reuse the final scales in similar research settings. These scales can help practitioners to understand these concepts and apply them in their routine management work.

7.2 Research Implications

IOS initiators are mostly at the higher level of IOS network, such as American Airlines initiated Sabre network, Main Automotive manufacturer's EDI network. Top management need to consider the long-term impacts of IOS on its business and conduct well-planned IT investment in order to keep track with IT development for future survival and growth.

Supportive leadership in this research not only emphasize management's commitment to organizational learning such as: learning IOS technology, learning from how to cooperate with your IOS partners, learning how to handle conflicts with your IOS partners, but also emphasize the management's commitment to IOS network and IOS

trading partners. Although the large-scale data do not confirm the directly relationship between supportive leadership and power, new relationship between supportive leadership directly influence the relationship quality was founded. This implies that an organization that commits more resource to IOS network and IOS network relationship building will build long-term relationship with its trading partners, which influence its value appropriation from short-term and long-term perspective.

Value appropriation reflects the competitive aspect of the network relationship. In order to guarantee its value appropriation and effectively operate supply network, powerful organization is supposed to commit more resources and investments in IOS network in order to maintain high quality relationship with its trading partners. This reflects the cooperative aspects of the network relationship and stable, fair relationship between trading partners is important for all participant in IOS supply chain network.

Stannack (1995) viewed the function of supply chain management power as managing, guiding and controlling the behavior of suppliers and view the function of marketing channel power as managing behavior of buyer or consumers. This research not only explores the relational outcome of power (e.g. willingness to cooperate in the future) through controlling valuable resources in IOS supply chain network, but also explore the economic outcome i.e. value appropriation. Powerful organization needs to adjust its own behavior in order to maintain its power and to achieve its long-term objectives. IOS supply chain network involvement is a company-wide problem which must be involved by top management and the teamwork of functional managers within an organization.

7.3 Research Limitations

While the current research made significant contributions from both a theoretical and practical point of view, there are still some limitations in this research.

First, Single respondent bias exists. In this research individual respondents (purchasing professionals) in an organization were asked to respond to complex power issues in IOS supply chain network context who need to understand inter-organizational relationship, and related IT capability from IT support supply chain management perspective and other behavioral issues in the organization. However, no person in an organization is in charge of the entire supply chain network participation. Therefore, the use of single respondent responses may generate some measurement inaccuracy.

Second, respondent rate is low. The response rate in this study is 7%, is considered as low. A main important of the low response rate is that respondents are tired of responding survey. For example, one respondent declines the survey because he receives one or two questionnaire almost every month. Because of the constraints of time or company policy respondents are unlikely to participate in the lengthy survey. Another reason for the low respondent rate is that some former researcher didn't handle the after-survey problems such as summary results are not sent back to respondents timely.

7.4 Future Research

Future research should re-validate measurement scales developed through this research by using the similar reference populations in order to improve the scales generalizability.

Many researchers such as Pettigrew (1972, p189) argued that "power resources must not only be possessed by an actor, they must also be controlled by him". This study focuses on exploring power through the control of valuable resources. Control is very important in power literature. However, the issue of the skillful *use of power* is also important and promising. In general, the way to exercise power in reality includes two types: coercive and non-coercive. This study does not focus on the method of using power. Power literature has demonstrated that the way of using power is an evolutionary process from coercive-focus to non-coercive-focus (Stannack, 1996).

Gaski (1986) found that a low, but positive, correlation between the power of the manufacturer and the distributor's satisfaction with the relationship. The explanation lies in the fact that the distributor's satisfaction is not determined by the amount of power exercised by the manufacturer, but by the way in which it is exercised. Specifically, the use of coercive strategies of influence seems to cause conflict and dissatisfaction to a greater extent than non-coercive strategies of influence. Geyskens et al. (1996) showed that when a relatively powerful organization refrains from exerting its power in a coercive way, the relatively independent channel member may interpret this as a signal that its dominant partner is seeking cooperation with a view to accomplishing common,

long-term goals (Anderson and Weitz, 1989). By renouncing the use of coercive power, the more powerful firm can transmit its confidence to the weaker partner and try to gain its trust. In fact, the weaker member is more likely to trust the relatively powerful member when it perceives that the latter is using its power to promote joint interests, reach collective goals (Dwyer et al., 1987) and bring about an improvement in results and satisfaction for both members of the channel. According to Mohr et al. (1999), if power is not used in an exploitative fashion, manufacturers may see a positive relationship between their use of power and dealer satisfaction." Future research will explore the way powerful organizations exercising its power in reality and how the exercising way will influence the economic outcomes and relational outcomes.

In this research, value appropriation includes short-term and long-term value appropriation. In the future research, we will explore the detail relationship between power and short-term and long-term value appropriation.

In reality, top management increasingly recognizes the potential contributions of supply chain management to long-term competitive advantages. Considering IOS potential impacts on its business, top management need to pay more attention to IOS management. Therefore, how to manage IOS effectively in order to improve supply chain management is an interesting and promising area for future research.

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APPENDIX A: Measurement Items Entering Q-Sort
(93 items)

Supportive Leadership(12 items)

1. In our organization, top management encourages an experimental mind-set
2. In our organization, top management encourages an experimental risk-taking
3. In our organization, top management encourages open communication environment
4. In our organization, top management provides regular employee training programs
5. In our organization, top management encourages knowledge storage (e.g. central knowledge database building)
6. In our organization, top management encourages employees to share ideas freely with each other
7. In our organization, top management facilitates the communication among different functional areas
8. In our organization, top management encourages business communications through IOS network (e.g. EDI)
9. In our organization, top management provides IOS related training in order to meet IOS requirements
10. In our organization, top management commits the resources for the IOS development and maintenance
11. In our organization, top management commits the resources for the reliability of IOS network
12. In our organization, top management commits the resources for security of IOS network

IT Use Capability(5 items)

13. Our IT infrastructure is used to connect different functional areas/branches together
14. Our IT infrastructure is used to offer a wide variety of information to end users
15. Our IT infrastructure is used to offer organization-wide communication
16. Our IT infrastructure is used to connect to our trading partners
17. Our IT infrastructure is used to manage and maintain large scale data/information

IT Infrastructural Capability(6 items)

18. We have the ability to use IT to analyze our marketing position
19. We have the ability to use IT to analyze our competitive position
20. We have the ability to use IT to analyze our supplier capability
21. We have the ability to use IT to facilitate decision-making (e.g. make-or-buy decision)
22. We have the ability to use IT to make transactions with our trading partners

23. We have the ability to use IT to capture new business opportunities with trading partners

Knowledge Base (9 items)

24. We have the knowledge about our weaknesses and strengths comparing with out trading partner
25. We have the knowledge about the products of our trading partners
26. We have the knowledge about the weaknesses and strength of our trading partners
27. We have the knowledge about how to handle the conflicts with our trading partners
28. We have the knowledge about how to use computer systems to connect with our trading partners
29. We have the knowledge about the market position of our trading partners
30. We have the knowledge about how to use shared information through IOS network
31. We have the knowledge about how to analyze potential threats from our trading partners through IOS network
32. We have the knowledge about how to analyze potential opportunities from our trading partners through IOS network

Knowledge Identification Capability (5 items)

33. We have the ability to monitor new purchasing tools/techniques
34. We have the ability to monitor new information technology used in purchasing area
35. We have the ability to identify what kind of knowledge we need to retain in purchasing area
36. We have the ability to identify valuable knowledge for our business from our trading partners
37. We have the ability to identify valuable knowledge for our business from our competitors

Knowledge Sharing Capability (6 items)

38. Among different functional areas, we have the ability to exchange our functional area knowledge with each other
39. Among different functional areas, we have the ability to communicate with each other through our internal network
40. Among different functional areas, we have the ability to exchange ideas relating to work improvement
41. Among different functional areas, we have the ability to exchange failure as well as success stories relating to our work

42. Among different functional areas, we have the ability to disseminate useful work processes (e.g., formal seminar)
43. Among different functional areas, we have the ability to exchange computer network related knowledge routinely

Knowledge Transferring Capability (5 items)

44. Based on our existing knowledge we have ability to assimilate new general knowledge (e.g. new technique/tools/ new basic skills)
45. Based on our existing knowledge we have ability to assimilate new network knowledge to promote our purchasing process
46. Based on our existing knowledge we have ability to assimilate our partner's knowledge to serve our objectives
47. Based on our existing knowledge we have ability to assimilate our competitor's knowledge to serve our objectives
48. Based on our existing knowledge we have ability to apply our general knowledge to different tasks

Information Control (7 items)

49. Through IOS network, our organization can control the ways in which our trading partner can access our sensitive operational information
50. Through IOS network, our organization can control the ways in which our trading partners use shared information
51. Through IOS network, our organization can protect our proprietary information from leaking to our trading partner
52. Through IOS network, our organization can monitor the accuracy of shared information
53. Through IOS network, our organization can monitor related IOS trading partner to update information
54. Through IOS network, our organization can control the vulnerability caused by information exchange with our partners Through IOS network, our organization can provide more information to our partners through IOS than they can get without IOS
55. Through IOS network, our organization can get more information from our trading partners than they get from us

Electronic Trading Network Control (7 items)

56. Our organization can lay down the rules and procedures for order processing through IOS network
57. Our organization can decide on the rules and regulations for IOS network
58. Our organization can decide on the format and standard for IOS use

59. Our organization can decide the mechanism for establishing and changing the standards/protocols
60. Our organization can determine IOS functioning (e.g., network architecture, product coding)
61. Our organization can determine the specification of transaction price through IOS
62. Our organization can determine who can access the IOS network and under what conditions

Networks Structural Bonding Control (6 items)

63. Compared to our trading partners, our organization can determine who is our primary trading partner
64. Compared to our trading partners, our organization can dissolve the relationship with our partners inexpensively
65. Compared to our trading partners, our organization is less dependent on our partners relating to our business (e.g. sales, profits)
66. Compared to our trading partners, our organization can switch to our partners' competitor easily in general
67. Compared to our trading partners, our organization can provide IOS related technical support to our partners
68. Compared to our trading partners, our organization can provide IOS-related consultant service to our partners

Short-term Value Appropriation (6 items)

69. Through IOS network, our organization achieves short-term purchasing cost reduction
70. Through IOS network, our organization gets desired outcomes on costs, prices when negotiating with our IOS partners
71. Through IOS network, our organization reduces the time to process data
72. Through IOS network, our organization improves the data accuracy
73. Through IOS network, our organization improves response time to process document
74. Through IOS network, our organization enables invoices to be paid earlier than before

Long-term Value Appropriation (8 items)

75. From long-term perspective, with IOS network our organization achieves our partners' compliance to our requirements

76. From long-term perspective, with IOS network our organization achieves our partner's adaptation to our requirements
77. From long-term perspective, with IOS network our organization locks-in our partner by providing IOS related training or required software
78. From long-term perspective, with IOS network our organization builds entry barriers to our industry for non-IOS participants
79. From long-term perspective, with IOS network our organization sets up exit barriers for our IOS trading partners
80. From long-term perspective, with IOS network our organization shares our resources across multiple products/services
81. From long-term perspective, with IOS network our organization improves long-term data integrity
82. From long-term perspective, with IOS network our organization increases the opportunity for exploring new IT-related benefits in the future

Satisfaction with Cooperation (5 items)

83. Our collaboration with partner through IOS is successful
84. Our collaboration with partner through IOS has more than fulfilled our expectations
85. We are satisfied with the outcomes from this collaboration through IOS
86. Our trust on our trading partner has increased through IOS network
87. Our conflicts relating to IOS network are well managed

Outcome Fairness (3 items)

88. Our outcomes received from the collaboration through IOS are just
89. The benefits of collaboration with partner through IOS have been fair
90. Our gains from the collaboration through IOS is fair

Willingness to Cooperate in the Future (3 items)

91. We would welcome the possibility of additional collaboration in the future through IOS network
92. We would be willing to work with our trading partners again in the future through IOS network
93. We would be willing to collaborate with our trading partners again through IOS network

APPENDIX B: Cohen's Kappa And Morre And Benbasat Coefficient

The Q-sort method is an iterative process in which the degree of agreement between judges forms the basis of assessing construct validity and improving the reliability of the constructs. The method consists of two stages. In the first stage, two judges are requested to sort the questionnaire items according to different constructs, based on which the inter-judge agreement is measured. In the second stage, questionnaire items that were identified as being too ambiguous, as a result of the first stage, are reworded or deleted, in an effort to improve the agreement between the judges. The process is carried out repeatedly until a satisfactory level of agreement is reached.

The following example describes the theoretical basis for the Q-sort method and the two evaluation indices to measure inter-judge agreement level: Cohen's Kappa (Cohen, 1960) and Moore and Benbasat's 'Hit Ratio" (Moore and Benbasat, 1991).

Let us assume that two judges independently classified a set of N components as either acceptable or rejectable. After the work was finished the following table was constructed:

		Judge 1		
		Acceptable	Rejectable	Totals
Judge 2	Acceptable	X_{11}	X_{12}	X_{1+}
	Rejectable	X_{21}	X_{22}	X_{2+}
	Totals	X_{+1}	X_{+2}	N

Xij = the number of components in the i^{th} row and j^{th} column, for i,j = 1,2.

The above table can also be constructed using percentages by dividing each numerical entry by N. For the population of components, the table will look like:

		Judge 1		
		Acceptable	Rejectable	Totals
Judge 2	Acceptable	P_{11}	P_{12}	P_{1+}
	Rejectable	P_{21}	P_{22}	P_{2+}
	Totals	P_{+1}	P_{+2}	100

Pij = the percentage of components in the i^{th} row and j^{th} column.

We will use this table of percentages to describe the Cohen's Kappa coefficient of agreement. The simplest measure of agreement is the proportion of components that were classified the same by both judges, i.e., $\Sigma_i P_{ii} = P_{11} + P_{22}$. However, Cohen suggested comparing the actual agreement, $\Sigma_i P_{ii}$, with the chance of agreement that would occur if the row and columns are independent, i.e., $\Sigma_i P_{i+}P_{+i}$. The difference between the actual and chance agreements, $\Sigma_i P_{ii} - \Sigma_i P_{i+}P_{+i}$, is the percent agreement above that which is due to chance. This difference can be standardized by dividing it by its maximum possible value, i.e., $100\% - \Sigma_i P_i + P_{+I} = 1 - \Sigma_i P_i + P_{+i}$. The ratio of these is denoted by the Greek letter kappa and is referred to as Cohen's kappa.

$$k = \frac{\Sigma_i P_{ii} - \Sigma_i (P_{i+} P_{+i})}{1 - \Sigma_i (P_{i+} P_{+i})}$$

Thus, Cohen's Kappa is a measure of agreement that can be interpreted as the proportion of joint judgment in which there is agreement after chance agreement is excluded. The three basic assumptions for this agreement coefficient are: 1) the units are

independent, 2) the categories of the nominal scale are independents, mutually exclusive, and 3) the judges operate independently. For any problem in nominal scale agreement between two judges, there are only two relevant quantities:

p_o= the proportion of units in which the judges agreed

p_c= the proportion of units for which agreement is expected by chance

Like a correlation coefficient, k=1 for complete agreement between the two judges. If the observed agreement is greater than or equal to chance K <= 0. The minimum value of k occurs when ΣP_{ii} =0, i.e.,

$$\min(k) = \frac{-\Sigma_i (P_{i+} P_{+i})}{1 - \Sigma_i (P_{i+} P_{+i})}$$

When sampling from a population where only the total N is fixed, the maximum likelihood estimate of k is achieved by substituting the sample proportions for those of the population. The formula for calculating the sample kappa (k) is:

$$k = \frac{N_i Xii - \Sigma_i (X_{i+} X_{+i})}{N^2 - \Sigma_i (X_{i+} X_{+i})}$$

For kappa, no general agreement exists with respect to required scores. However, recent studies have considered scores greater than 0.65 to be acceptable (e.g. Vessey, 1984; Jarvenpaa 1989; Solis-Galvan, 1998). Landis and Koch (1977) have provided a more detailed guideline to interpret kappa by associating different values of this index to the degree of agreement beyond chance. The following guideline is suggested:

Value of Kappa	Degree of Agreement Beyond Chance
.76 - 1.00	Excellent
.40 - .75	Fair to Good (Moderate)
.39 or less	Poor

A second overall measure of both the reliability of the classification scheme and the validity of the items was developed by Moore and Benbasat (1991). The method required analysis of how many items were placed by the panel of judges for each round within the target construct. In other words, because each item was included in the pool explicitly to measure a particular underlying construct, a measurement was taken of the overall frequency with which the judges placed items within the intended theoretical construct. The higher the percentage of items placed in the target construct, the higher the degree of inter-judge agreement across the panel that must have occurred.

Moreover, scales based on categories that have a high degree of correct placement of items within them can be considered to have a high degree of construct validity, with a high potential for good reliability scores. It must be emphasized that this procedure is more a qualitative analysis than a rigorous quantitative procedure. There are no established guidelines for determining good levels of placement, but the matrix can be used to highlight any potential problem areas. The following exemplifies how this measure works.

Item Placement Scores

CONSTRUCTS		ACTUAL						
		A	B	C	D	N/A	Total	% Hits
THEORETICAL	A	26	2	1	0	1	30	87
	B	8	18	4	0	0	30	60
	C	0	0	30	0	0	30	100
	D	0	1	0	28	1	30	93

Item Placements: 120 Hits: 102 Overall "Hit Ratio": 85%

The item placement ratio (the "Hit Ration") is an indicator of how many items were placed in the intended, or target, category by the judges. As an example of how this measure could be used, consider the simple case of four theoretical constructs with ten items developed for each construct. With a panel of three judges, a theoretical total of 30 placements could be made within each construct. Thereby, a theoretical versus actual matrix of item placements could be created as shown in the table above (including an ACTUAL "N/A: Not Applicable" column where judges could place items which they felt fit none of the categories).

Examination of the diagonal of the matrix shows that with a theoretical maximum of 120 target placements (four constructs at 30 placements per construct), a total of 102 "hits" were achieved, for an overall "hit ratio" of 85%. More important, an examination of each row shows how the items created to tap the particular constructs are actually being classified. For example, row C shows that all 30-item placements were within the target construct, but that in row B, only 60% (18/30) were within the target. In the latter case, 8 of the placements were made in construct A, which might indicate the items

underlying these placements are not differentiated enough from the items created for construct A. This finding would lead one to have confidence in scale based on row C, but be hesitant about accepting any scale based on row B. In an examination of off-diagonal entries indicate how complex any construct might be. Actual constructs based on columns with a high number of entries in the off diagonal might be considered too ambiguous, so any consistent pattern of item misclassification should be examined.

Cohen's Kappa coefficient can also be calculated using the following website:

http://www.kokemus.kokugo.juen.ac.jp/service/kappa-e.html

APPENDIX C: Large-scale Survey Questionnaire

The Questionnaire Used For the Large-scale Study

Supportive Leadership, Learning Capability, IT Support Capability, Power and Value Appropriation in IOS Supply Network Context

General Instructions

This study uses IOS supply chain network as its context, which is the supply chain network linked by inter-organizational information system (IOS). IOS is defined as IT-based systems that link your organization with your suppliers or your buyers, such as Electronic Data Interchange (EDI), Electronic Funds transfer (EFT).

The purpose of this survey has to two objectives. One is to explore how the power in IOS context (i.e. Information control; electronic trading network control; network structural bonding control) influences an organization's economic outcome (i.e. value appropriation) and relationship outcome (i.e. relationship quality with its trading partners). The other is to identify which factors influence the power in IOS context.

This study is being conducted by Ms. Xiao Li of the University of Toledo as part of her dissertation under the supervision of Dr. Kunnathur and Dr. Ragu-Nathan. It is estimated to take you 20-25 minutes to complete this questionnaire. There are no right or wrong answers. We are interested in your perceptions. Your response will be entered in a coded format and will be strictly confidential; only group data will be analyzed and reported. In no instance will a company and/or individual ever be identified as having given a particular response.

We kindly ask you to fill out this questionnaire and thank you in advance for your responses. The data collected in this survey will be treated as confidential, it will be stored in a secure place and it will be used only for this study and in related reports. Information in reports will only be discussed at the aggregate level so that information about any particular firm cannot be ascertained or deduced by readers.

Thank you for your assistance in this research!

Section 1: The following statements describe in the Interorganizational Information Systems (IOS) context. Please circle the appropriate number to indicate the extent to which you agree or disagree with each statement as applicable to your organization

1	2	3	4	5	NA
Strongly disagree	disagree	Neutral	Agree	Strongly Agree	Not Applicable

In our organization, top management...

encourages an experimental mind-set ---------- 1 2 3 4 5 NA

encourages an experimental risk-taking ---------- 1 2 3 4 5 NA

encourages open communication environment ---------- 1 2 3 4 5 NA

provides regular employee training programs ---------- 1 2 3 4 5 NA

encourages knowledge storage (e.g. central knowledge database building) -------- 1 2 3 4 5 NA

encourages employees to share ideas freely with each other ---------- 1 2 3 4 5 NA

facilitates the communication among different functional areas ---------- 1 2 3 4 5 NA

encourages business communications through IOS network (e.g. EDI) ---------- 1 2 3 4 5 NA

commits the resources for the IOS development and maintenance ---------- 1 2 3 4 5 NA

commits the resources for the reliability of IOS network ---------- 1 2 3 4 5 NA

commits the resources for security of IOS network ---------- 1 2 3 4 5 NA

Section 2: The following statements describe an organization's **IT Infrastructural capability supporting IOS and IT use capability**. Please circle the appropriate number to indicate the extent to which you agree or disagree with each statement as applicable to your organization

1	2	3	4	5	NA
Strongly disagree	disagree	Neutral	Agree	Strongly Agree	Not Applicable

Our IT infrastructure (IT facility) is used to ...

connect different functional areas/branches together ---------- 1 2 3 4 5 NA

offer a wide variety of information to end users ---------- 1 2 3 4 5 NA

offer organization-wide communication ---------- 1 2 3 4 5 NA

connect to our trading partners ---------- 1 2 3 4 5 NA

manage and maintain large scale data/information ---------- 1 2 3 4 5 NA

We have the ability to use IT to...

analyze our marketing position ---------- 1 2 3 4 5 NA

analyze our competitive position ---------- 1 2 3 4 5 NA

analyze our supplier capability ---------- 1 2 3 4 5 NA

facilitate decision-making (e.g. make-or-buy decision) ---------- 1 2 3 4 5 NA

make transactions with our trading partners ---------- 1 2 3 4 5 NA

Section 3: The following statements describe an organization's ability to **accumulate its knowledge bases, identify** valuable external knowledge, **share** knowledge within the organization and **transfer** the related knowledge to achieve business objectives. Please circle the appropriate number to indicate the extent to which you agree or disagree with each statement as applicable to your organization

1	2	3	4	5	NA
Strongly disagree	disagree	Neutral	Agree	Strongly Agree	Not Applicable

We have knowledge about ...

our strengths comparing with our trading partner ---------- 1 2 3 4 5 NA

the products of our trading partners ---------- 1 2 3 4 5 NA

the strengths of our trading partners ---------- 1 2 3 4 5 NA

how to handle the conflicts with our trading partners ---------- 1 2 3 4 5 NA

how to use computer systems to connect with our trading partners ---------- 1 2 3 4 5 NA

the market position (leader or follower) of our trading partners ---------- 1 2 3 4 5 NA

how to use the information through IOS network ---------- 1 2 3 4 5 NA

how to analyze potential threats/opportunities from our partners through IOS network ---------- 1 2 3 4 5 NA

We have the ability to ...

monitor new purchasing tools/techniques ---------- 1 2 3 4 5 NA

monitor new information technology used in purchasing area ---------- 1 2 3 4 5 NA

identify what kind of knowledge we need to retain in purchasing area ---------- 1 2 3 4 5 NA

identify valuable knowledge for our business from our trading partners ---------- 1 2 3 4 5 NA

identify valuable knowledge for our business from our competitors ---------- 1 2 3 4 5 NA

Among different functional areas, we have the ability to

share our functional area knowledge with each other (e.g. cross-functional team work) ---------- 1 2 3 4 5 NA

communicate with each other through our internal network ---------- 1 2 3 4 5 NA

share ideas relating to work improvement ---------- 1 2 3 4 5 NA

share failure as well as success stories relating to our work ---------- 1 2 3 4 5 NA

share useful work processes (e.g., formal seminar) ---------- 1 2 3 4 5 NA

share computer network related knowledge routinely ---------- 1 2 3 4 5 NA

In our organization, we have ability to

assimilate new general knowledge (e.g. new technique/tools/ new basic skills) ---------- 1 2 3 4 5 NA

assimilate new network knowledge to promote our purchasing process ---------- 1 2 3 4 5 NA

assimilate our partner's knowledge to serve our objectives---------- 1 2 3 4 5 NA

assimilate our competitor's knowledge to serve our objectives ---------- 1 2 3 4 5 NA

apply our general knowledge to different tasks---------- 1 2 3 4 5 NA

Section 4: The following statements describe an organization's ability to **control or influence** its trading partner **in IOS context**. Please circle the appropriate number to indicate the extent to which you agree or disagree with each statement as applicable to your organization

1	2	3	4	5	NA
Strongly disagree	disagree	Neutral	Agree	Strongly Agree	Not Applicable

Our organization can...

control the ways in which our trading partner can access our sensitive information ---------- 1 2 3 4 5 NA

control the ways in which our trading partners use shared information ---------- 1 2 3 4 5 NA

protect our proprietary information from leaking to our trading partner---------- 1 2 3 4 5 NA

monitor the accuracy of shared information ---------- 1 2 3 4 5 NA

require related IOS trading partner to update information ---------- 1 2 3 4 5 NA

control the vulnerability caused by information exchange with our partners ----- 1 2 3 4 5 NA

provide more information relating to our industry to our partners through IOS than they can get without IOS---------- 1 2 3 4 5 NA

determine who can access the IOS trading network and under what conditions - 1 2 3 4 5 NA

determine the specification of transaction price through IOS trading network --- 1 2 3 4 5 NA

lay down the rules and procedures for order processing through IOS trading network ---------- 1 2 3 4 5 NA

decide on the rules and regulations for IOS trading network ---------- 1 2 3 4 5 NA

decide on the format and standard for IOS trading network ---------- 1 2 3 4 5 NA

decide the mechanism for establishing the standards/protocols for IOS network ---------- 1 2 3 4 5 NA

(Section 4 Continued)

Section 4: The following statements describe an organization's ability to **control or influence** its trading partner **in IOS context**. Please circle the appropriate number to

indicate the extent to which you agree or disagree with each statement as applicable to your organization (Continued)

1	2	3	4	5	NA
Strongly disagree	disagree	Neutral	Agree	Strongly Agree	Not Applicable

Our organization ...

can determine who is our primary trading partner	1	2	3	4	5	NA
can dissolve the relationship with our partners inexpensively	1	2	3	4	5	NA
is less dependent on our partners relating to our business (e.g. sales, profits) than our partner is dependent on us	1	2	3	4	5	NA
can switch to our partners' competitors easily, in general	1	2	3	4	5	NA
can provide IOS related technical support to our partners	1	2	3	4	5	NA

Section 5: The following statements describe an organization's **short-term/Long-term benefits from IOS network.** Please circle the appropriate number to indicate the extent to which you agree or disagree with each statement as applicable to your organization.

1	2	3	4	5	NA
Strongly disagree	disagree	Neutral	Agree	Strongly Agree	Not Applicable

Through IOS network, our organization ...

achieves short-term purchasing cost reduction	1	2	3	4	5	NA
gets short-term desired outcomes on costs, prices from our trading partners	1	2	3	4	5	NA
improves our current on-time delivery	1	2	3	4	5	NA
improves daily operational efficiency	1	2	3	4	5	NA
improves response time to process document directly	1	2	3	4	5	NA

From long-term perspective, with IOS network our organization...

achieves our partners' compliance to our requirements	1	2	3	4	5	NA
achieves our partner's cooperation with us	1	2	3	4	5	NA
retains our partner by providing IOS related training or required software	1	2	3	4	5	NA
builds entry barriers to our industry for non-IOS participants	1	2	3	4	5	NA
sets up exit barriers for our IOS trading partners	1	2	3	4	5	NA
shares our resources across multiple products/services	1	2	3	4	5	NA
increases the opportunity for exploring new IT-related benefits	1	2	3	4	5	NA

Section 6: The following statements describe the **relationship quality between your organization and your trading partners.** Please circle the appropriate number to indicate the extent to which you agree or disagree with each statement as applicable to your organization

1	2	3	4	5	NA
Strongly disagree	disagree	Neutral	Agree	Strongly Agree	Not Applicable/Do not Know

Our collaboration with partner through IOS is successful ---------- 1 2 3 4 5 NA

Our collaboration with partner through IOS has more than fulfilled our expectations ---------- 1 2 3 4 5 NA

We are satisfied with the outcomes from this collaboration through IOS ---------- 1 2 3 4 5 NA

Our trust in our trading partner has increased through IOS network ---------- 1 2 3 4 5 NA

We are satisfied that our conflicts with our partner are well managed -------- 1 2 3 4 5 NA

Our outcomes received from the collaboration through IOS are fairly divided ----- 1 2 3 4 5 NA

The benefits of collaboration with partner through IOS have been fair ---------- 1 2 3 4 5 NA

Our gains from the collaboration through IOS is fair ---------- 1 2 3 4 5 NA

We would welcome the possibility of additional collaboration in the future through IOS network ---------- 1 2 3 4 5 NA

We would be willing to work with our trading partners again in the future through IOS network ---------- 1 2 3 4 5 NA

We would be willing to collaborate with our trading partners again through IOS network, should the opportunity arise ---------- 1 2 3 4 5 NA

Section 7: General Information

1. What is your present job title? _____

2. The IOS network which your organization has participated (e.g. EDI, EFT) is set up by (**Mark all that apply**):

   [] your trading partner [] your organization [] a third party

   [] your organization and your trading partner [] others

   [] your organization and a third party

3. The IOS network which your organization has participated: **(Mark all that apply)**

   [] is a part of an electronic market with many suppliers and many buyers

   [] is one to one connection between one buyer and one supplier

   [] has one buyer and many suppliers [] has one supplier and many buyers

   [] others

4. The number of employees in your organization

   [] 100 - 249 [] 250 - 499 [] 500 - 999

   [] 1000 - 2499 [] 2500 and over [] others

5. The number of employees in purchasing function in your organization

[] less than 10 10 - 25 [] 26 - 50

[] 51 - 100 [] 101- 200 [] over 200

6. The average annual sales $ (in millions) for your organization

[] less than 10 [] 10 – 49.9 [] 50 – 99.9

[] 100 – 499.9 [] 500 – 1000 [] over 1 billion

7. Please indicate your organization's industry

[] manufacturing [] service [] others

Thank you for your assistance in this research! Your name and effort to answer this survey is greatly appreciated. If you wish to receive a summary of the research findings, please enter your name and address below or attach a business card.

Name_____Phone_____

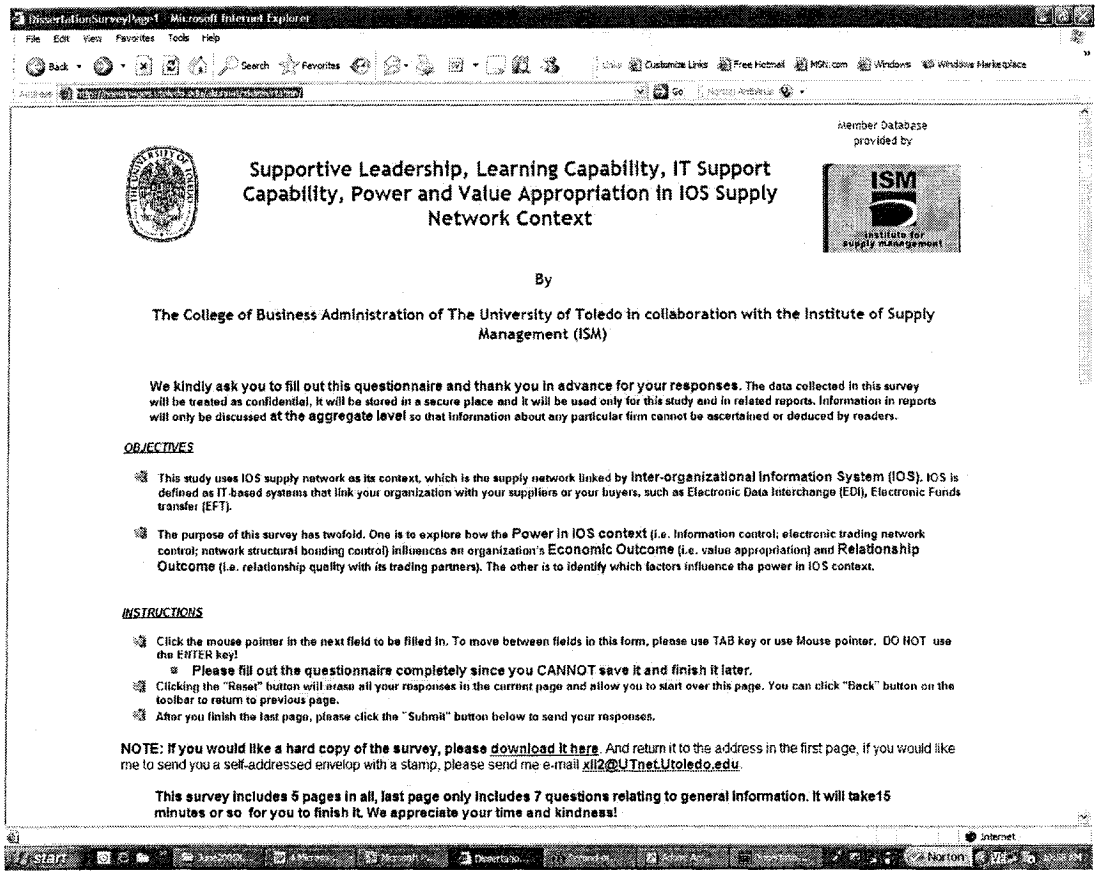
Organization Name_____

Address_____

APPENDIX D: On-line Survey

Website address:

http://homepages.utoledo.edu/akunnat/xlidissertation/



Member Database provided by

ISM Institute for Supply Management

Supportive Leadership, Learning Capability, IT Support Capability, Power and Value Appropriation in IOS Supply Network Context

By

The College of Business Administration of The University of Toledo in collaboration with the Institute of Supply Management (ISM)

We kindly ask you to fill out this questionnaire and thank you in advance for your responses. The data collected in this survey will be treated as confidential, it will be stored in a secure place and it will be used only for this study and in related reports. Information in reports will only be discussed **at the aggregate level** so that information about any particular firm cannot be ascertained or deduced by readers.

OBJECTIVES

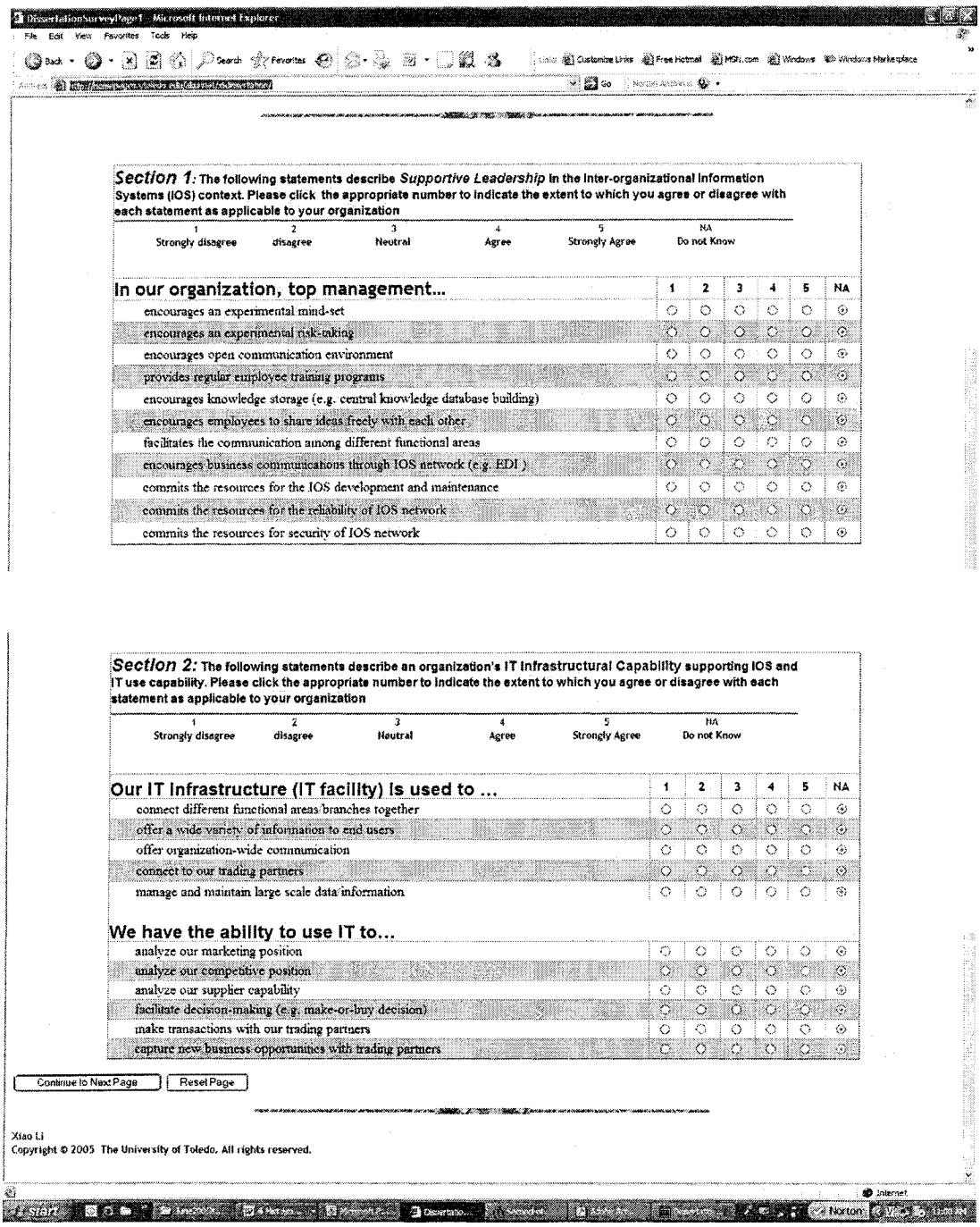
- This study uses IOS supply network as its context, which is the supply network linked by **inter-organizational information system (IOS)**. IOS is defined as IT-based systems that link your organization with your suppliers or your buyers, such as Electronic Data Interchange (EDI), Electronic Funds transfer (EFT).
- The purpose of this survey has twofold. One is to explore how the **Power in IOS context** (i.e. information control; electronic trading network control; network structural bonding control) influences an organization's **Economic Outcome** (i.e. value appropriation) and **Relationship Outcome** (i.e. relationship quality with its trading partners). The other is to identify which factors influence the power in IOS context.

INSTRUCTIONS

- Click the mouse pointer in the next field to be filled in. To move between fields in this form, please use TAB key or use Mouse pointer. DO NOT use the ENTER key!
  - **Please fill out the questionnaire completely since you CANNOT save it and finish it later.**
- Clicking the "Reset" button will erase all your responses in the current page and allow you to start over this page. You can click "Back" button on the toolbar to return to previous page.
- After you finish the last page, please click the "Submit" button below to send your responses.

NOTE: If you would like a hard copy of the survey, please download it here. And return it to the address in the first page, if you would like me to send you a self-addressed envelop with a stamp, please send me e-mail xli2@UTnet.Utoledo.edu.

This survey includes 5 pages in all, last page only includes 7 questions relating to general information. It will take15 minutes or so for you to finish it. We appreciate your time and kindness!



Section 1: The following statements describe *Supportive Leadership* in the inter-organizational information systems (IOS) context. Please click the appropriate number to indicate the extent to which you agree or disagree with each statement as applicable to your organization

1 Strongly disagree · 2 disagree · 3 Neutral · 4 Agree · 5 Strongly Agree · NA Do not Know

In our organization, top management...	1	2	3	4	5	NA
encourages an experimental mind-set	○	○	○	○	○	⊙
encourages an experimental risk-taking	○	○	○	○	○	⊙
encourages open communication environment	○	○	○	○	○	⊙
provides regular employee training programs	○	○	○	○	○	⊙
encourages knowledge storage (e.g. central knowledge database building)	○	○	○	○	○	⊙
encourages employees to share ideas freely with each other	○	○	○	○	○	⊙
facilitates the communication among different functional areas	○	○	○	○	○	⊙
encourages business communications through IOS network (e.g. EDI)	○	○	○	○	○	⊙
commits the resources for the IOS development and maintenance	○	○	○	○	○	⊙
commits the resources for the reliability of IOS network	○	○	○	○	○	⊙
commits the resources for security of IOS network	○	○	○	○	○	⊙

Section 2: The following statements describe an organization's IT infrastructural capability supporting IOS and IT use capability. Please click the appropriate number to indicate the extent to which you agree or disagree with each statement as applicable to your organization

1 Strongly disagree · 2 disagree · 3 Neutral · 4 Agree · 5 Strongly Agree · NA Do not Know

Our IT infrastructure (IT facility) is used to ...	1	2	3	4	5	NA
connect different functional areas/branches together	○	○	○	○	○	⊙
offer a wide variety of information to end users	○	○	○	○	○	⊙
offer organization-wide communication	○	○	○	○	○	⊙
connect to our trading partners	○	○	○	○	○	⊙
manage and maintain large scale data/information	○	○	○	○	○	⊙
We have the ability to use IT to...						
analyze our marketing position	○	○	○	○	○	⊙
analyze our competitive position	○	○	○	○	○	⊙
analyze our supplier capability	○	○	○	○	○	⊙
facilitate decision-making (e.g. make-or-buy decision)	○	○	○	○	○	⊙
make transactions with our trading partners	○	○	○	○	○	⊙
capture new business opportunities with trading partners	○	○	○	○	○	⊙

Continue to Next Page · Reset Page

Xiao Li

APPENDIX E: SIC Codes

SIC_2	SIC_2D
0	NOT AVAILABLE
1	Agricultural Production Crops
2	Agricultural Production Livestock
7	Agricultural Services
8	Forestry
9	Fishing, Hunting, and Trapping
10	Metal Mining
12	Coal Mining
13	Oil and Gas Extraction
14	Nonmetallic Minerals, Except Fuels
15	General Building Contractors
16	Heavy Construction, Ex. Building
17	Special Trade Contractors
20	Food and Kindred Products
21	Tobacco Products
22	Textile Mill Products
23	Apparel and Other Textile Products
24	Lumber and Wood Products
25	Furniture and Fixtures
26	Paper and Allied Products
27	Printing and Publishing
28	Chemicals and Allied Products
29	Petroleum and Coal Products
30	Rubber and Misc. Plastic Products
31	Leather and Leather Products
32	Stone, Clay, and Glass Products
33	Primary Metal Industries
34	Fabricated Metal Products
35	Industrial Machinery and Equipment
36	Electronic and Other Electronic Equipment
37	Transportation Equipment
38	Instruments and Related Products
39	Misc. Manufacturing Industries
40	Railroad Transportation
41	Local and Interurban Passenger Transit
42	Trucking and Warehousing
43	U.S. Postal Service
44	Water Transportation
45	Transportation by Air
46	Pipelines, Except Natural Gas
47	Transportation Services
48	Communications
49	Electric, Gas, and Sanitary Services
50	Wholesale Trade - Durable Goods
51	Wholesale Trade - Nondurable Goods
52	Building Materials & Garden Supplies
53	General Merchandise Stores
54	Food Stores
55	Automotive Dealers & Service Stations
56	Apparel and Accessory Stores
57	Furniture and Homefurnishings Stores
58	Eating and Drinking Places
59	Misc. Retail
60	Depository Institutions
61	Nondepository Institutions
62	Security and Commodity Brokers
63	Insurance Carriers
64	Insurance Agents, Brokers, and Services
65	Real Estate
67	Holdings and Other Investment Offices
70	Hotels and Other Lodging Places
72	Personal Services
73	Business Services
75	Auto Repair, Services, and Parking
76	Misc. Repair Services
78	Motion Pictures
79	Amusement & Recreation Services
80	Health Services
81	Legal Services
82	Educational Services
83	Social Services
84	Museums, Botanical, Zoological Gardens
86	Membership Organizations
87	Engineering & Management Services
88	Private Households
89	Services, NEC
91	Executive, Legislative, and General
92	Justice, public order, safety
93	Public finance, tax, monetary policy
94	Admin of human resource programs
95	Admin of environmental quality & housing
96	Admin of economic programs
97	National Security and International Affairs
99	Nonclassifiable establishments