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An inter-organizational information system for supply chain management

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Abstract

The deployment of the emerging concepts of information technology, strategic alliances, and business process re-engineering within the intra/inter-organizational context have become a popular prescription in enhancing supply chain management. This paper reviews the theoretical foundations for the study of inter-organizational relationships within a supply chain management context, and analyzes the contingencies of deploying inter-organizational information systems (IOIS). A framework is proposed which deploys IOIS from an IOIS provider's perspective. The framework is discussed from the viewpoint of using a strategic information system within the context of the China to Hong Kong to importing country supply chain. © 2001 Elsevier Science B.V. All rights reserved.

Keywords: Supply chain management; Inter-organizational relationships; Inter-organizational information system

1. Introduction

Inability to respond to the constant demand for quicker filling of orders and faster deliveries places many firms in a trend of declining market share. Many prescriptions for survival are in vogue world-wide, coming from both the consultancy and academic fraternities. Both business process re-engineering (BPR) and the application of information technology (IT) are ingredients found in most of the popular prescriptions.

The literature on BPR and IT is extensive, and we can only hope to briefly review that which is

related to our central theme. Hammer [1] in a paradigm shift introduced a broader theme to the role and view of BPR, and also discussed the awareness or lack of it in the business community. While on the IT front, Davenport [2] emphasizes the need to incorporate IT into the actual business process redesign. In another contribution, Hammer [3] presents a number of high-profile case studies in which dramatic productivity improvements were achieved via the use of BPR and IT. It is possible to cite many other references that trumpet the benefits of deploying BPR with appropriate aid from IT, see [4,5].

Part of the BPR literature is concerned with the improvement of internal operations, i.e. the intra-organizational business processes, with successful applications reported by Caron et al. [4] and King [6]. This literature has given impetus to the

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deployment of BPR within the inter-organizational business processes, i.e., between various co-operative firms or chain firms. Buzzell and Ortmeier [7] show how the inventory replenishment, customer service, and delivery costs can all be improved significantly by re-engineering the distribution channel partnerships. In summary, it appears that the re-engineering of the inter-organizational business process not only improves a firm's internal initiatives, but also improves the initiatives of participating external firms, to the benefit of all firms in the entire supply chain.

The value chain is, essentially, a network of echelons that performs different value added activities, while collaborating within the value chain and confronting threats due to the uncertainties that exist at various levels, see [8]. This type of inter-organizational collaboration is sometimes referred to as channel partnerships or strategic alliances, see [9]. An examination of the issues relating to the theoretical foundations of inter-organizational cooperation is essential in the process of restructuring global supply chain management.

Advances in information technology facilitate the deployment of electronic commerce within the supply chain system. Electronic data interchange (EDI) has been used to process business transactions between suppliers and customers since the early 1960s, covering various business activities such as sales/purchase, order processing, and the transfer of funds. In recent times, advanced inter-organizational computer networks have enabled the application of new concepts in supply chain management, e.g., systems such as reversed inventory replenishment schemes. The Internet is starting to make world-wide web-based electronic commerce feasible, and the utilization of electronic commerce in supply chain management will increase in both sophistication and volume.

The general implication of all this for individual firms is that the survival in the global competitive market will no longer just depend on market strategy, but also on the firm's ability to cope with contingencies and uncertainties in both directions, i.e. downstream and upstream. This obviously requires a rethinking of inter-organizational management in the context of the available information technology.

This paper analyzes the global supply chain management from the emerging supply chain management issues and the inter-organizational relationships paradigm (IOR), with the inter-organizational information systems (IOIS) service providing a general path of evolution – IOIS being an information system that is shared by two or more collaborative companies, assisting the information flow and storage for, typically, engineering design and sales/purchase orders. A framework is also presented that helps to better analyze the contingencies of deploying IOIS services to cooperative upstream (supplier) and downstream (buyer) firms. Standard terms within the context of electronic commerce and supply chain management are used throughout this paper.

2. Value chain issues

A supply chain is often defined as “a system whose constituent parts include material suppliers, production facilities, distribution services and customers, all linked via the feed-forward flow of material and feed-backward flow of information”, see [10]. Porter's [11] value chain is a concept that considers a firm as a player within the network of value added activities. Porter's model [11] depicts five primary activities and five support activities within the entire value chain. The five primary activities – inbound logistics, operations, outbound logistics, sales and marketing, services – are basically sequential in nature. The five support activities – administration, human resource and management, product/technology development, procurement – are operated in parallel, supporting each of the primary activities.

Value chain analysis is used to maintain a competitive advantage, and requires an integrated analysis of the firm's business activities from ‘inbound logistics’ to ‘service’. Pant [12] used Porter's value chain analysis to identify the business activities to which the Internet can add value. The impact of the ‘information superhighway’ on the electronic marketplace based on the value chain analysis was further analyzed by Benjamin and Wigand [13]. It is clear that advanced internet-based software technology can facilitate and simplify the development

of electronic data interchange (EDI), i.e. the inter/intra-organizational software. It is also certain that the rapid growth and low cost of deploying the world-wide-web will, in time, make the Internet system the backbone of the management of the supply value chain.

Traditionally, different companies manage their supply chain in different ways because no standard model was available. The first general framework for supply chain management – supply chain reference model (SCOR) – was developed by the Supply Chain Council, see [14]; a second update was released in August 1997. The model is rather general, defining the supply chain standard processes and establishing standard terminology in quite broad terms. SCOR spans customer and market interactions plus the physical material transactions. The support functions such as administration, R & D, and customer services are not included. This model can also help manufacturers to carry-out benchmarking against other well-established companies.

The SCOR model has four levels of supply chain management:

- *Level 1* defines the plan, source, make and deliver process. At this level, the supply chain competitive plans are established.
- *Level 2* defines some 19 core processes within the supply chain, such as inventory planning, assessing distribution requirements, analyzing make/buy decisions, etc. Companies can configure their supply chain by deploying proper core processes based on their operations strategy.
- *Level 3* provides information for level 2 core processes that aids companies in planning supply chain improvement. It includes the definition of the processes and the input/output of each element, the benchmarks, what may be regarded as good practices, and the systems/software tools to support these practices.
- *Level 4* defines the practices that companies can adopt to obtain a competitive edge and accomplish business redesign. This is not within the main scope of the model and its use is up to the individual company.

In the SCOR model, the supply chain consists of a plan, source, make and deliver process elements (defined in level 1) which revolve around the entire supply chain. The main assumption of the model is that by integrating the process elements along the supply chain companies should become more competitive, see [14].

Traditional corporate strategies that mainly focus on internal operations have less suitability in addressing the issues arising in a highly dynamic market environment. To effectively handle this type of environment, various inter-organizational relationships (e.g. strategic alliances) need to be established. In this new form of intense collaboration, firms form alliances with the co-operative echelons within their value chain, and so gain a better competitive advantage. Competitive benefits come, for example, through the sharing of resources (e.g., information), and the elimination of duplicate effort. Aggressive firms may also undertake re-engineering within the inter-organizational business process in order to achieve greater productivity improvements.

Narus and Anderson [15] discussed the importance of establishing a flexible distribution channel, resulting in a competitive advantage through sharing the resources and capabilities among the distribution channels. Donald [16] discussed Caterpillar's experience in rethinking the IOR with its dealers, revealing how better product design and customer service were achieved. They suggest that the formation of inter-organizational collaborations is essential for multinational businesses to be able to enhance their ability to cope with global turbulence, see also [17].

Caterpillar reassessed the role of local dealers in helping to build and maintain close relationships with the customers. Caterpillar's distribution management system incorporated local dealers into the critical business system, with dealers acting as sources of market information, intelligence and proxies for customers. Moreover, the dealers provide a wide range of before and after sale service to the customers such as financing, insurance, training and maintenance, all of which need to be well supported by Caterpillar. Donald [16] concludes that there are mutual benefits for both Caterpillar and the dealers in this new and more intensive collaboration.

Table 1
IOR theoretical foundations

IOR theoretical foundations	Summary
Exchange theory [22]	Emphasizing goal attainment of organizations, economic value not involved in the exchange At best in studying non-profit making interorganizational transactions
Political economy [4,5]	Organizations seek ample supply of resources (money and authority) to fulfil their domain requirements Inter-organizational exchange carried out to maximize the supply of resources (money and authority) The exchange is legally mandated
Transaction cost economics [10,37]	Explain the choice between market and hierarchies by analysing the economic activities Three dimensions of transaction cost: asset specificity, uncertainty and frequency of transaction Participants could behave opportunistic within the economic activities (opportunism) Participant's capabilities in making business transaction decisions are limited by their capacity (bounded rationality)

3. Frameworks to study supply chain management issues from the IOR perspective

IOR issues have been widely explored over the past three decades; Table 1 summarizes the major research contributions to the theoretical foundations. Exchange theory forms a fundamental contribution, conceptualizing the inter-organizational relationships by emphasizing goal attainment through inter-organizational exchange. According to Levine and White [22], the elements of exchange can be clients, labor, and other related resources. From this perspective, exchange need not directly involve any measurable economic advantages, thus extending application of this theory to non-profit-making inter-organizational transactions, see also [18].

Clark [19] and Paulson [20] conceptualized IOR in terms of their organizational, structural and behavioral characteristics. Benson [21] further extended the IOR conceptual approach by incorporating political economy, and by further suggesting that organizations should seek an ample supply of resources (money and authority) to fulfil their domain requirements. From this line of research, information exchange with other organ-

izations is carried out in order to obtain resources and to maximize the supply of money and authority. Benson stated that when the IOR is in balance, there will be four dimensions of inter-organizational equilibrium:

- Domain consensus: agreement among participants regarding the appropriate role and scope of agency.
- Ideological consensus: agreement regarding the nature of the tasks confronted and the appropriate approaches to these tasks.
- Positive consensus: the judgement by workers in one organization of the value of the work of another organization.
- Work coordination: patterns of collaboration and cooperation between organizations.

From an exchange perspective, the inter-organizational interaction is on a voluntary basis; whilst the political economy perspective emphasizes inter-organizational interaction as having its basis in a legal mandate, i.e., governed by laws or regulations. This is useful when the domain is subdivided into a network of sequentially dependent organizations, leading to the formation of a value chain. The participants within the value chain perform their

own tasks and pass the jobs to downstream participants. These operations run on the basis of a domain mandate and are governed by the legal and/or political systems. The concepts of Levine et al. [22] and Benson [21] were further tested by Hall et al. [18] through a field survey, and the empirical findings were consistent with Levine and Benson's propositions. Hall et al. [18] studied the pattern of inter-organizational relationships under different conditions by conducting a survey in 76 organizations. Their study revealed that the exchange theory is best supported when the inter-organizational interaction is on a voluntary basis. When the inter-organizational interaction is a legal mandate, the exchange theory becomes less useful. He suggests that a political economy prevails when the inter-organizational interaction is deployed under the condition of legal mandate or formal agreement.

Another dominant theoretical foundation concerns transaction costs and economics, primarily developed by Coase [23] and further refined by Williamson [24]. The transaction cost approach is intended to explain the choice of governance structure for different markets and hierarchies, and is done by analyzing the economic activities from a transaction cost perspective. The three dimensions of transaction cost are: uncertainty, frequency of transaction and asset specificity. For example, if market uncertainty is high, perhaps due to unpredictable changes in the environment, the transaction cost becomes high and the market transaction is said to be less efficient. The fundamental assumption in this theory is that firms seek to economize transaction costs via opportunism within bounded rationality.

Williamson [25,24] suggested the possibility of minimizing individual error by utilizing contracts to safeguard economic transactions. Such transaction cost approaches are widely used as the basis of the analysis of inter-organizational issues. For example, Klien et al. [26] adopted the transaction cost theory and developed a transaction cost analysis model which analyzes channel integration within the international market. Pearce [27] used the transaction cost theory to develop a framework to better understand the performance and survival of joint ventures. Over the past decade, researchers have attempted to assess the impact of IT on the

inter-organizational economic efficiency by analyzing the transaction cost in different operating circumstances. It is also suggested by several authors, see [28,29], that the use of IOIS can reduce the inter-organizational coordination cost and that the market will, therefore, become more efficient.

The information processing perspective has become an important consideration in management theories over the past three decades. This perspective views IT as a facilitator of new inter-organizational relationships, and an influential element in organizational economics and strategy, see [30,26]. Bensaou et al. [8] conceived information processing as a system, agreeing with Galbraith [31] that organizational design can be considered as structural, procedural, and with an IT-based configuration that facilitates the handling of information from input, to processing, to exchange, and to distribution.

The aptness of the information processing system in servicing the information processing needs can determine the organizational effectiveness and performance. Bensaou et al. [8] examined the inter-organizational relationships via an extensive literature survey, and developed a framework to view the organization from an information processing perspective. They also explored the theoretical foundations from transaction cost economics (see also [32,24,33]), organization theory (see [32,20]), and also political economy (see [34,35]). From an information processing perspective, information processing needs are determined by uncertainties that exist at various levels; while the information processing capability is determined by the inter/intra-organizational coordination mechanisms. Bensaou's [8] framework covers uncertainties at three levels: environmental, partnership and task uncertainty. To cope with these uncertainties, the information processing capabilities – structural, process, and IT mandated mechanism are proposed.

In the supply chain management context, the authors of this paper take the dominant theoretical foundations as the basis to develop a framework. The framework helps further analysis of the impact of providing IOIS services from the IOIS service provider's perspective within a supply chain.

4. Proposed framework and contingencies in deploying IOR and SCM

Trading is obviously a prime example in the application of both local and global supply chains. Traders add value by searching for new suppliers/buyers, and by managing the relationships. They also handle the economic transactions as well as control the physical distribution. In the light of modern electronic commerce, the emerging 'electronic trader' attempts to conduct business in an innovative way by 'matching' the suppliers and buyers electronically through an electronic brokerage system – the world-wide-web.

Malone [29] suggests two types of effects resulting from electronic commerce. The first type he termed the 'electronic brokerage' effect. In essence, the electronic broker connects many suppliers and customers electronically through a database network. This network adds value to the supply chain by providing services such as filtering, transaction management, and active on-line advertising/marketing. This is done by filtering inappropriate suppliers and customers, managing business transactions (such as sales and purchase order processing and order status monitoring), and by active on-line advertising/marketing. The 'electronic brokerage' effect is produced by suppliers and buyers from different geographical locations, who subscribe to the brokerage network with the objective of identifying appropriate world-wide suppliers/buyers at low cost. This phenomenon has been reinforced in recent years with the development of the World-Wide-Web. Netbuy (<http://www.netbuy.com>, an electronic broker) and TRADE'ex (<http://www.tradeex.com>, a solution provider) being good examples of the 'electronic brokerage' effect.

The second type of effect identified by Malone [29] is the 'electronic integration' effect. This effect is produced when suppliers and buyers extend their information processing capabilities to penetrate the interface between the value-added stages. Such information includes inventory replenishment schemes (such as WalMart), where the inventory status can be accessed by vendors and replenishment procedures initiated when inventory levels reach the agreed reordering levels. This involves EDI in cross boundary communications between

the information systems of both parties. We can refer to this as the inter-organizational information system (IOIS). According to Malone [29], the prime benefit is the time compression and improved data accuracy (since data needs only to be entered once). Another important benefit is the close integration of the inter-organizational business processes, allowing modern management philosophies such as Just-in-time systems, concurrent engineering concepts, and various inventory replenishment schemes to take root.

The contingencies proposed by Oliver [30] can be adapted to further realize the intention of establishing relationships with other collaborative organizations (for instance, buyers and suppliers). There are six types of contingencies in Oliver's framework, namely: (1) Necessity – organizations need to meet legal or regulatory requirements; (2) Asymmetry – organizations attempt to have control over other organizations or their resources; (3) Reciprocity – organizations collaborate to pursue common goals (rather than controlling other organizations); (4) Efficiency – organizations economize the inter-organizational transaction cost; (5) Stability – organizations maintain their stability by building an adaptive response to environmental uncertainty; (6) Legitimacy – organizations attempt to maintain or improve their image and reputation within the institutional environments. These contingencies are interrelated and may overlap.

The literature on the establishment of IOR does not appear to explore all the contingencies mentioned. For example, some of the literature (see [36]) conceives the establishment of a distribution channel integration and alliance formation, see also [9], as a means to economize business transactions, i.e., the efficiency contingency only. Others, see [7,15], emphasize the achievement of common goals in establishing partnerships in distribution management, i.e., the reciprocity contingency only. According to Oliver [30], 'necessity' occurs when superior authorities such as legislation and regulatory bodies mandate the formation of IOR. The other five contingencies are voluntary-based, critical contingencies within the Oliver's framework.

Malone [29] suggests that the relationship between suppliers and buyers is highly dependent on the product complexity. For a product with

Table 2
IOR contingencies within SCM: An IOIS service provider’s perspective

Contingencies	Relationships within SCM	
	Focal – upstream (Trader as a buyer)	Focal – downstream (Trader as a supplier)
Asymmetry	Increase the power over the upstream firms (influence the upstream firm’s business processes)	Increase the bargaining power over the downstream firm or decrease the power of downstream firms over the focal firm through diffusing the IOIS to downstream firms
Reciprocity	Information sharing (facilitating virtual business network)	Information sharing, better customer service (e.g., easier purchase and product information request)
Efficiency	Reduce coordination cost ^a	Reduce coordination cost ^a
Stability	Increase focal organization’s stability (e.g., by locking the suppliers)	Increase focal organization’s stability (e.g., by locking the customers and building competitor’s entry barrier)
Legitimacy	Increase the reputation of focal firm as well as its upstream firms	Increase the reputation of focal firms as well as its downstream firms

^aCoordination cost includes: (1) the cost of searching for suppliers and buyers; (2) the cost of maintaining the relationship; (3) the transaction cost.

simple specification (for instance, giftware) and a low asset specificity (for instance, less dedicated human resource or machinery required to conduct and monitor the inter-organizational business processes), it may be efficient to acquire the product from the market. However, for a product with a complex specification and high asset specificity, a hierarchical is the suggested approach. It can thus be argued, in a supply chain management context, that the relationship between suppliers and buyers can be considered as network specific, and the relationships may be hierarchical and/or market, suggesting no rigid, fixed form of relationship between suppliers and buyers.

The contingencies of establishing IOR with specific focus on the role of the trader (the focal organization) within the SCM context are summarized in Table 2. Table 2 shows the contingencies of establishing IOR with the upstream organizations (suppliers) and the downstream organizations (buyers) from an IOIS service provider’s perspective. The proposed model, see Fig. 1, attempts principally to help participants in

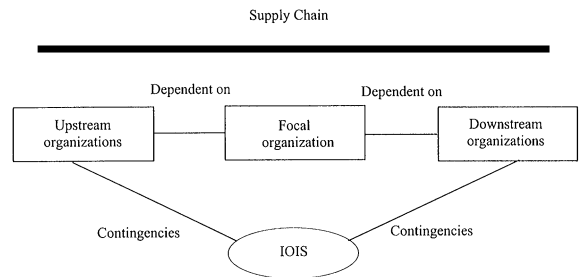


Fig. 1. Model of IOIS in SCM: an IOIS service provider’s perspective.

a SCM (traders, distributors, and electronic brokers, etc.) to better understand the IOIS service provider’s perspective. The proposed model is depicted in Fig. 1 and represents an inter-organizational system (IOS), consisting of a focal organization (can be manufacturer, distributor or wholesaler), its upstream organizational set (suppliers) and its downstream organizational set (customers). The area outside the IOS boundary includes the possible environmental influence on the IOS.

From the resource dependence perspective, see Pfeffer and Salancik [37], organizations are dependent on environmental resources for survival, which may become a source of vulnerability and that must be minimized. The principal assumption in the model presented is that the upstream organizational set is not monopolist, i.e., not involved in complex products. It is also assumed that the upstream organization is not vertically integrated to a significant degree, thus excluding joint ventures and/or other strategic alliances. The model is, in essence, designed for small to medium-sized firms producing a variety of products in the light industries. The flow of power in the model is from the downstream organizational set, through the focal organization, to the upstream organizational set; while the flow of dependence is in the reverse direction. By providing IOIS services, the focal organization seeks to minimize its environmental impact, its transaction costs, and its dependence within the IOS. The model also depicts the focal organization as dependent on the downstream organizational set, and with power over the upstream organizational set. IOIS is, in effect, deployed to minimize vulnerability arising from the dependence and the transaction costs. This is achieved by providing a better on-line service, by simplifying the order process, and by providing a quicker response to customer inquiries. The focal organization is concealing strategic resources from the customer and hence its dependence on the customer is minimized. The transaction costs, in terms of asset specificity (e.g., specific human resources) can be reduced, because less specific human effort is required to handle customer orders and inquiries. However, the use of the IOIS will balance the focal organization's power over the downstream organizational set – customers cannot be forced to use IOIS unless they are encouraged by specific strategic advantages.

With respect to the relationships between the focal organization and the upstream organizational set (suppliers), the focal organization's dependence is low, though it has some degree of power over the suppliers. The focal organization is able to force its suppliers to use the IOIS to improve strategic advantages. For example, forcing the deployment of a system to re-engineer inter-organizational pro-

cesses involving economic transactions, as refusal can be met with possible switching of supplier at possibly with little cost. The transaction costs can thus be reduced by deploying IOIS imposed by the focal organization, and thus reduces the opportunistic behaviour of suppliers.

5. Application of model as an integrator in the supply chain

A situation that can be used to illustrate the model is the SCM situation that exists between China, Hong Kong, and the final destination countries such as the USA/Europe. The 'open policy' adopted by mainland China and the subsequent economic reforms have encouraged a large number of Hong Kong manufacturers to move their production facilities to Pearl River Delta area of Southern China. Hong Kong is the largest foreign investor in mainland China; it may no longer be politically appropriate to describe it as foreign after the July 1, 1997 unification! Hong Kong's robust financial support systems, strong transportation infrastructure, and its technical and managerial know-how, has allowed it to become the focal point and management centre for most firms conducting business activities in mainland China.

The combination of Hong Kong-based management with manufacturing operations in mainland China has given Hong Kong companies a unique competitive advantage in the global market. A recent study of Hong Kong's distribution systems, see [38], showed that Hong Kong has become an increasingly important centre for mainland China exports, providing good trading facilities through finance, insurance, transportation and telecommunication support. In another study of Hong Kong's competitive position, Enright et al. [39] suggested that Hong Kong has a unique combination and balance between government and business, between local and overseas firms, between entrepreneurship and management, between commitment and hustle. They suggest that Hong Kong is playing the role of regional hub for various business activities such as sales and marketing, procurement and logistics, and that the major line of business of many foreign firms in Hong Kong is

selling to and buying from mainland China. All these studies seem to emphasize the role of Hong Kong as a regional integrator.

A significant number of trading firms in Hong Kong act as middlemen: searching for products from mainland China and then reselling to foreign importers and wholesalers at higher prices. Many such firms are original equipment manufacturing (OEM) based. They reallocate the majority of the OEM orders received from foreign customers to manufacturers in mainland China, i.e., they conduct marketing, project management and finance related service functions in Hong Kong, while the production takes place in mainland China.

In terms of the relationships between the Hong Kong focal firms and their upstream firms in mainland China, the observed common characteristics are:

- Hong Kong firms act as integrators within the global supply chain, with a significant amount of bilateral information flowing through the chain at high operational cost. Such information includes long-distance phone calls, faxes, and EDI using value-added networks. Specific information flowing between Hong Kong, China and foreign customers may include sales and purchase requests, stock status data, engineering data and ad hoc enquiries.
- Remote management of procurement: production and quality management functions in mainland China and their integration to the Hong-Kong-based management function is sophisticated, requiring support from modern management philosophies and information technology.

The majority of focal firms in Hong Kong are involved in light and simple products, e.g., toys and giftware, with the main competitors being the emerging Asian countries of Thailand, Vietnam, India, etc. With respect to the relationships with downstream firms in the foreign destination countries, focal firms in Hong Kong have limited bargaining power as they are almost totally dependent on the foreign markets. The ability of Hong Kong firms to provide both technology and management expertise in their upstream operations in China, gives Hong Kong a significant competitive advantage over other Asian countries.

5.1. *Providing IOIS service to upstream firms*

By providing IOIS services, focal firms in Hong Kong seek to maintain control over their suppliers – the asymmetry contingency. Suppliers in mainland China may be requested to adopt IOIS to communicate with the focal firms, and the most up-to-date information can be shared across the organizational boundaries – the reciprocity contingency. Business transactions can be controlled in a manner that complies with the focal firm's standards throughout the network. For example, the standard procedures for electronic quotations and shipment schedules. The specific tasks of dedicated order processing, monitoring staff, as well as the possible failures arising from opportunistic behaviour can be better controlled – the efficiency contingency. The cost of searching, switching and monitoring the suppliers in mainland China can also be reduced with the aid of an IOIS – the efficiency contingency.

Internet-based solutions are now affordable and efficient in deploying IOIS within the Hong Kong-mainland China network. In addition, proper support from IOIS will facilitate implementation of emerging manufacturing philosophies like total quality management, just-in-time inventory, and various other inventory replenishment schemes. In summary, the use of IOIS serves to stabilize the performance of suppliers from mainland China. This will lead to a stable input to focal firms in Hong Kong and also to a good degree of consistency in product/service standards – the stability contingency. IOIS can also help to build a reputation with the network upstream firms in mainland China – the legitimacy contingency.

5.2. *Providing IOIS service to downstream firms*

From a resource dependence perspective, Hong Kong's dependence on upstream mainland China suppliers and downstream foreign buyers induces a certain level of undesirable instability. The introduction of an IOIS service to downstream foreign customers will seek to minimize such instability by increasing the bargaining power over the foreign customers, or conversely decreasing the power of foreign customers over Hong Kong firms – the

asymmetry contingency. For example, some Hong Kong trading firms attempt to attract foreign customers by providing free Internet access. Initially the downstream customers may not be willing to place orders through Internet, but, by providing free hardware and free internet access, Hong Kong trading firms can encourage downstream customers to explore what is on offer: updated product information, placing on-line orders at special discounts based on a purchasing profile maintained by the IOIS, and even interactively monitoring the status of shipments. This type of strategic IOIS can help to lock the customer in and at the same time build an entry barrier to competitors – the stability contingency.

The cost of coordinating the specific resources required in processing the orders can also be reduced when running an Internet-based IOIS, because a web browser is also capable of handling a large proportion of the daily order processing tasks. IOIS with proper functionality can also aid non-specific human resources in handling general requests and approval of matters – the efficiency contingency.

As mentioned earlier, the model proposed assumes that the upstream organizations of the focal organization, i.e, its suppliers are not monopolistic. Otherwise collaboration is deemed to be inappropriate and outside the model proposed. For example, consider the focal organization as being a small personal computer manufacturer that buys the central processing units from a major upstream supplier, say a major manufacturer such as Intel, it would be unrealistic to expect the focal company to force such a large corporation to use the IOIS provided by the focal manufacturer.

6. Concluding remarks

While this model was developed in Hong Kong for the specific chain of China – Hong Kong markets in mature industrialized countries, it has applications in similar settings. An example of using IOIS in a similar fashion could involve a car manufacturer. The supply chain can be managed from the focal perspective of the company, called

the pivotal office. The pivotal office could be a strategic system provided by the car manufacturer to upstream organizations that supply parts and subassemblies, and to the downstream such as dealers and consumers. Examples of IOIS services in this context could include the linking of a large number of motor sales suppliers, providing information from parts quality, to logistics, to warranty claims and cost recovery. While examples of IOIS services to dealers and customers can include a system that will permit customers to select, configure and price vehicles, apply for credit and communicate on line with the particular dealer. It is also possible to envisage quite a number of similar situations involving other products and services where the focal organization could be in the USA with suppliers situated in South America and/or Asia and with distributors in the USA and Canada.

In summary, this study attempted to analyze the supply chain management from the inter-organizational relationships (IOR) research paradigm, and from the inter-organizational information system (IOIS) service provider's perspective. The framework presented better defines the role of an IOIS service provider (possibly a trader) in managing the upstream and downstream functions. The contingencies in providing IOIS service to both upstream and downstream firms were also analyzed and a framework was developed. The framework was applied to light industries in the context of SCM, with the focal organization in Hong Kong, upstream operations in mainland China, and downstream world-wide customers. However, it is emphasized that a competitive advantage can extend beyond the focal firm, and that the upstream and downstream firms can also benefit from such an IOIS. The benefits include supply stability, reciprocity, efficiency, and legitimacy.

In light of the current economic recession which now appears to be well entrenched in South East Asia, the survival of focal firms no longer just depends on their internal organizational performance. They need to restructure their relationships with their upstream and downstream firms along the entire supply chain in order to be able to achieve significant global performance improvements.

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