

The e-business capability of small and medium sized firms in international supply chains

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Abstract. The reality of trade is that it takes two or more parties to do business, and therefore the capabilities of both selling and buying firms are important. Where over 60% of Small and Medium Enterprises (SMEs) in the USA and Canada have adopted some form of business process through a computer mediated network, such as the Internet, other countries have significantly lower adoption rates. In Asia and Latin America, where as many as 99% of all firms are classified as SMEs, low adoption rates may be an impediment to increased international trade. This paper takes a critical look at the existing research on adoption of e-business technology by SMEs internationally. In particular, we identify the gap in our knowledge about what makes SMEs in different countries capable of using the technology in their domestic and international supply chains. We present a typology of the business processes networked over computer-mediated processes from our preliminary empirical field research, interviewing 40 SMEs in Canada, Japan, China and Mexico. This is used to propose a model of international SME capability to guide future empirical research.

Key words: e-commerce, supply chains, international, small and medium enterprises, cross-cultural

1 Introduction

Most countries and multinational organizations are studying the potential of using electronic networks such as the Internet to grow business and improve productivity. In the post dot.com boom period, attention has moved away from speculation and towards finding evidence that electronic commerce delivers tangible benefits. In this regard, studies are now appearing in many countries examining the adoption and implementation of Information and

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Computer Technologies (ICT) and the impact on their domestic economies. To date, the evidence of the impact on the international economy has been mostly anecdotal, often involving case studies of large international firms conducting business through their intra-firm or inter-firm supply chains.

In theory, the potential is great. However, we do not know with precision the total balance of trade between countries for all Internet-based commerce, let alone for just SMEs. A United Nations Conference on Trade and Development (UNCTAD) report on e-commerce and development, in its section on export performance of the service sector, states that “[e]xcept for construction services, all of the dynamic [export] services are ones that can easily be provided electronically.” (UNCTAD, 2002, p.223) It then makes the leap in logic that, because they *can* be provided electronically they are, and then proceeds on that basis. In the USA and Canada, over 60 percent of SMEs have adopted some form of networked business process (McClean 2003) The kinds of technology adopted and the results are similar in both countries. We do know that in both developed and developing countries SMEs compose the vast majority of companies and a significant portion of the national GDP. For example, in Japan, SMEs compose 99% of all firms, and in Canada they are 60% of GDP. Our research indicates that the current e-business capabilities of this important economic sector vary considerably between countries.

Since the Internet is a global medium, there is a tendency to assume that the motivations and opportunities to participate in international supply chains will be similar across borders. There have been studies of large firms that show this is not necessarily the case (Zaheer 1997). An OECD study on Competitive Issues in Electronic Commerce drew some sobering conclusions on the relationship between e-commerce and global trade showing that, contrary to accepted wisdom, the Internet does not, ipso facto, promote more international trade. Such factors as language barriers, taxation issues, regulatory barriers, physical delivery problems, problems with secure payment, computer code, and difficulties identifying actors and enforcing contractual rights means that “although the Internet is a global medium, [this] does not mean that e-commerce takes place in a global market”. (OECD, 2001, p. 8)

In this paper we endeavor to contribute to the research literature by building a preliminary model of factors impacting the capability of SMEs to do business processing in international supply chains using electronic networks. Our model is based on the conclusions we have drawn from our own firm level data on what SME firms are doing in the adoption of electronic networks. The data were derived from on-site interviews with 40 companies across four countries. We also identify the gap in the macro policy oriented literature to date that our research helps to fill.

For brevity, we will not explore in this paper the many definitional issues with the topic. Our working definition of SMEs has been firms of less than 500 people, but the official definition of SMEs varies considerably between countries. We also acknowledge that there are possibly significant differences between a small or micro-enterprise and a growing medium-sized enterprise. Our definition of supply chain refers to echelons of customer and supplier relationships to sell, buy and to exchange facilitating information. We are specifically interested in supply chains that cross national borders. We will



use the term “networked processes” to refer to business processes supported by computer and telecommunications mediated networks. This term reflects our interest in the inter-organizational linkages between organizations in supply chains, and overlaps terms such as e-business processes, e-processing and Internet Business Solutions (IBS).

The paper is organized into four parts:

- A review of some of the recent empirical work on the adoption of networked processes and their limitations for understanding SME capabilities to do business internationally over the Internet.
- A typology of the networked processes that were found in SME operations during our field work in China, Japan, Mexico and Canada.
- A model of the variables impacting the capability of SMEs to adopt and effectively use these networked processes in international supply chains.
- Implications for stakeholders in improved SME capabilities to use network processes, and suggestions for future empirical research.

2 Research on SME adoption versus capability

To the credit of researchers in a number of disciplines, the business use of the Internet is now being treated less as a source of speculation and more as a phenomenon characterized by a body of experience that can be examined empirically. Articles have appeared in academic journals that apply well-known theoretical models of technological innovation to what was previously thought to be a paradigm shift in the nature of technology and economics (e.g. Seyal 2003). Unfortunately for research on SME use of electronically networked processes, much of the literature has been focused on large visible firms doing state of the art applications. Furthermore, large sample empirical studies have tended to focus on describing the overall adoption patterns of information technology (IT). For this body of work we are thankful, but we are doubtful as to its value to SMEs and their efforts to conduct business in international supply chains over electronically networked processes.

In this section we identify three issues that must be acknowledged in order to move forward with research. First, aggregate adoption rates detect differences in the adoption of networked processes, but give little insight into the underlying firm-level drivers that make companies capable of being successful adopters. Second, adoption is a function of SME belief that they are capable of achieving tangible benefits in a short period of time. Finally, the capability of SMEs to use networked processes cannot be separated from their capability to survive as viable entrepreneurial organizations.

2.1 Aggregate adoption numbers and firm capabilities

There has been ample publication of economic statistics about the penetration of ICT to support networked processing (OECD, 2002). These statistics include Internet access, use of broadband, and expenditures on ICT. From these numbers and various schemes for subjectively weighting qualitative judgments about concepts such as “readiness”, league tables have been



composed that rank the progress of various nations against each other (Dutta 2002).

While this body of work has contributed to the policy debate on issues such as international competitiveness, it does not give much insight into how and why SMEs successfully adopt networked processes. A more useful approach is to survey firms by firm characteristic and sector, and to ask detailed questions about how they use electronic networks in their organizational processes. Some progress is beginning to be made in this regard. The Net Impact Studies conducted originally in the USA, France, Germany and England, and then extended to Canada and Italy, attempted to find out what specific Internet technologies were being adopted by various sizes of SME organizations in different sectors, and their impact on financial performance (McClellan 2003). As is the case with large sample surveys, interesting differences between nations, firm size and industry were discovered. The studies gave some clues as to what might impact the capability of SMEs to adopt and implement Internet Based Solutions (IBS). However, definitive answers that could be acted on by policy makers remain elusive. Furthermore, Net Impact and similar studies have not specifically addressed international trade.

The problem with these large national surveys is that aggregation into summative categories hides the details that influence capability. For example, in the Net Impact studies there are eight categories of IBS, in what we call networked processes. In reality, the capability to influence customer service processes and e-marketing processes, two separate classifications of IBS, may be bundled in the same software and hardware in a firm. Smaller firms may not be able to afford these suites of technology, nor need the functionality of combining both.

The other limitation of aggregation is that it does not show the drivers of the necessary integration of capabilities between buyer and seller that are required to support trade in a supply chain. In the Net Impact studies it was found that on average North American SMEs adopted at least three IBSs. However, how compatible they were with each other and those of other firms, whether large firms or SMEs, is unknown. No study has measured flows of products and services through complete supply chains, noting specifically where and how much networked processing facilitates inter-organizational activity. Some crude input/output models for sectors can be prepared, such as in Fig. 1, but once again this is describing aggregate activity, not how a buying firm interacts in a dyad with a selling firm. More importantly, it does not lead to identifying what specific components of the technology are critical in facilitating the interaction leading to a successful relationship. For example, a purchasing firm with an e-procurement system might expect to interface automatically with a supplier that has an e-commerce site to sell product. Not so. The reality is that while the technology has the capability, the incentives and internal organizational capabilities for each party to execute may be lacking.

One valuable conclusion from all the Net Impact studies is that there seems to be significantly more adoption of IBS to support selling, as opposed to buying or the logistics of getting the product made and delivered. This could mean that firms are thinking downstream in the supply chain to customers, versus upstream to suppliers. Is a firm capable if it can only do business in



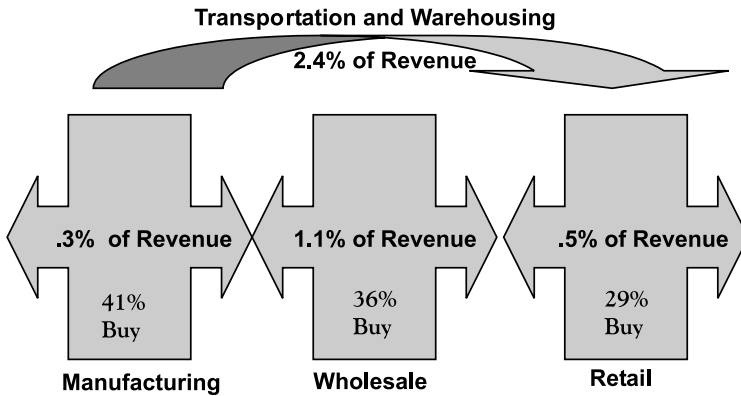


Fig. 1. Aggregate buying and selling between supply chain echelons.

Note: Data adapted from statistics Canada April 2003

one direction? When we dig deeper by comparing nations and their small versus medium-sized companies, the picture gets more interesting. For example, medium sized USA firms are more advanced than medium sized Canadian firms in terms of adoption of supply facing IBS. Does that mean that USA firms are more capable of achieving the advantages of supply chain procurement and logistics? Would this result in a competitive advantage in exporting and importing?

2.2 Capabilities versus opportunities for SMEs

One surprising finding from the Net Impact studies was the high penetration of some form of networked processing among smaller firms relative to larger firms in developed countries (i.e., greater than 60%). Furthermore, the financial results have been clearly positive. While smaller firms trailed larger firms in adoption and financial impact, the gap was not large. The studies, though, also indicate that the growth rate in adoption has slowed dramatically. The penetration rates in the US and Canada are plateauing at around 70% for individual types of IBS. European firms lag in actual adoption, but expect to increase penetration towards North American levels. When national aggregate statistics show that only a small portion of business is being transacted online (see Fig.1), and studies like Net Impact show that the diffusion curve amongst potential adopters is flattening, has the use of networked processing in supply chains peaked at a relatively low level of impact for national economies?

First time adoption of a networked process by an SME may have peaked in developed countries, but the adoption of additional types of networked processing within and between organizations may be producing more significant impacts on economic performance. Our research in developing economies (i.e., China and Mexico) indicates that there is considerable first time adoption of customer facing networked processing. As the number of adopters increase in developing countries, the opportunities for trade with other developing countries and with developed countries can be expected to

expand. This projection assumes that technical opportunity will not be constrained by economic, political or social issues.

Drilling deeper, the greatest opportunities for revenue and cost improvement lie in the sales processes (Net Impact 2003). The capability to deliver low cost channels for acquiring and servicing new customers at a low labour cost per transaction is important. However, once again there are differences between countries on what those opportunities are, and what capabilities make them possible. For example, our research indicates that in China, where labour is cheap, there are not the same incentives to adopt networked processing to achieve operating cost savings. The cost of the required hardware and software, and the requirement to seek scarce capital, may be viewed as being greater than the labour cost that any investment would save.

Table 1 contains a ranking of the major barriers most frequently mentioned in the Net Impact study. It is probably no surprise that the financial risks of investing in an unknown and time consuming innovation is a common barrier. It is not clear whether this is because the SMEs do not have the funds and resources, or because the technology and its implementation are too expensive for the anticipated benefits. The presence of items on the list that suggest a lack of resources does support the former hypothesis. We would also note that the rankings are not consistent across countries, or sectors within each country. What might be a significant barrier in one trading country and sector may not be in another.

What is missing from the discussion is the often claimed opportunity for optimizing coordination of the supply chain. IBS adoption and benefits lag for supply chain networked processing applications. Either the opportunities do not exist as predicted, or are not accessible to SMEs. Alternatively, SMEs require different capabilities to access these opportunities, which they currently do not have. Clearly technical opportunities exist, such as Internet access and networked processing software, to improve organizational performance, and firms have taken advantage of them. Less clear is what other opportunities need to be present to make non-adopting firms capable of adoption and for current adopters to extend their capability. As we explore in the next section, the answer may not lie so much in the technology as in the motivations of entrepreneurs.

Table 1. Ranking of barriers to IBS adoption by region

Ranking of barriers	Canada	USA	Europe
1 Dollar cost of projects/ Cost of new infrastructure	1	1	1
2 Time to implement projects	2	5 (tie)	4
3 Uncertain return on investment	3	6	5
4 Worker training	4	2	2
5 Lack of upper mgmt. Support/ direction/planning/Organization inertia	5	4	3
6 Can't hire people with necessary technical skills	6	3	
7 Bad experiences in the past	7	7	6
8 Regulatory barriers		5 (tie)	7

(Empty cells indicate insufficient data). *Source:* Net Impact Study, 2003

2.3 Motivation and Internet capability

Frequently missing from the exhortations to SMEs to adopt more Internet based technology is the consideration of the nature of the entrepreneurial organization. More specifically, the dominant influence on SME behavior is more likely the attitude of the entrepreneur. SME needs and management styles differ from the large firms that they may deal with, in a supply chain. These differences may become more complex to manage when a cross-cultural dimension is added.

SMEs differ from large organizations in their supply chain management practices and technology in three ways: 1) large companies have a greater scope of operation and thus are more likely to be involved in diverse markets, 2) large companies can spread costly new systems over larger units of production, and 3) large companies have internal technical development and maintenance capabilities (i.e., an IT department) (Smeltzer 2001). Large firms have developed e-commerce based supply chain connections (e.g. EDI) with their major suppliers and customers. This has in large part been due to the investment economies of scale and the fact that large firms have only concentrated on the largest revenue or costs that impact customers and suppliers, which in turn are usually other large firms.

In studies of the nature of entrepreneurial work, two characteristics differentiate entrepreneurs from their managerial peers in large companies. They are more sales oriented and they do not plan well. The most significant concern of a small business manager is maintaining market share (which is a major contributor to keeping the company solvent) (Mahon 2001). Shrader, Mulford, and Blackburn found that approximately two thirds of the firms they studied had no business plan (Schrader 1989). In a study by Dodge and Robbins it was found that, of SMEs that failed, 64% did not have a business plan (Dodge 1992). In supply chain management planning activities, such as vendor selection, SME managers tend to rely on their tacit knowledge rather than systematic techniques (Park 2001).

The picture that emerges is that SME managers and, in particular, small business entrepreneurs, tend to lack, or not value, many of the basic skills needed to adopt and implement networked processes. They are not operationally inclined or concerned with issues of managing their supply base methodically. They are keen to sell more. For larger firms that have invested considerable time and money in implementing their e-commerce strategies, including e-procurement and on-line selling, integrating with these firms can be frustrating. SMEs could shut themselves out of future business by not being network process compliant.

The connection between the motivation of small firm managers and the capability for acquiring technology and for learning to do business over the Internet becomes more complex when the exchange is at a distance and between two different cultures. In the next section we describe what networked processes firms in our fieldwork had adopted. Then we will highlight how differences in SME manager motivations, and the opportunities seen from their national vantage point, play a leading role in their current capability to participate in global supply chains. More specifically, we will present a model that ties SME capabilities to perceptual drivers rooted in cultural dimensions, and we will show how these will vary across borders.



3 Typology of network process types found in field research

We visited 10 companies across a variety of industries in each of three nations: China, Japan and Mexico. China and Mexico were chosen because they were two rapidly developing economies with significant trade with the USA and Canada. Japan represented a developed economy that had significant trade with North America. All three countries were believed to have distinctly different business cultures prior to the time data were collected. In order to provide the basis for comparison with the North American situation, we interviewed 10 SMEs in Canada using the same interview instrument. Our purpose in each on-site interview was to determine which of their business processes were electronic network enabled. We were especially interested in customer and supplier interfacing processes that were critical to supporting the inter-organizational relationships in international supply chains.

We discovered that there were significant differences in networked processing capability among the SMEs we interviewed. The overwhelming use of the Internet in all four countries was email and browsing for business intelligence, but these processes did not directly facilitate supply chain relationships. We modified a typology of business processes over computer-mediated networks compiled by the OECD to describe the functionality of the technology adopted by the SMEs we visited (Roberts 2003). Our modifications were to draw out the details and orientation of the processing between customers and suppliers in a supply chain. Appendix 1 contains our definitions for each network process. Table 2 shows a frequency tally of the number of organizations that we observed, that conformed to each definition in each country, as well as how many had not adopted any form of networked processing. Specific to the ability to communicate with foreign customers and suppliers, we noted whether they had unilingual or multilingual capability on their website. All of the companies we interviewed were involved with international trade in some way, whether importing, exporting, investing, or looking for foreign investment. Some were non-adopters of networked processing.

There were some similarities among China, Japan and Mexico in how they interacted with customers and suppliers, impacting their networked processing. The majority of websites were basic, providing company and product information, but not allowing for on-line ordering, let alone on-line payment. On-line payment was not totally within their control, since it could involve the networked processing of an intermediary such as a bank. In countries like China and Japan, the fact that credit cards are not in common use also made on-line payment difficult.

Most respondents indicated a preference for face-to-face or telephone meetings, while recognizing that electronic networks made sense when long distances were involved. Many also indicated particular activities for which they would use electronic communication, and activities for which they would want face-to-face communication. For example, one respondent said he would use email when it was just facts to be communicated, but would want face-to-face communication if there were sensitive information to be shared. Another indicated that face-to-face communication was required for the initial meeting, but follow-up could be handled by electronic communication.

Table 2. Frequency of networked process adoption by field study participants

	China	Japan	Mexico	Canada
No use	4		1	
Basic website (Unilingual) ^a	4	3	4	3
Basic website (Bilingual) ^b		5	3	1
Sales force/site coordination	2			1
Supplier facing				
On-line ordering/quoting		1	3	3
Order fulfillment & tracking			3	2
Product design & development			1	2
Logistics & inventory control				1
On-line payment			1	
Customer facing				
Customer acquisition	3			7
Customer retention				3
Customer service & support		1	4	6
Order fulfillment & tracking		1	2	2
On-line ordering/quoting		7	1	2
On-line payment				

Notes: See Appendix 1 for networked process definitions.

^aStatic Basic Website (Unilingual): companies having a basic website in the local language that served primarily as a business card – providing identification of company, product line, and contact information.

^bStatic Basic Website (Bilingual): companies having a basic website but in both the local language and the language of their major trading partner (usually English). On rare occasions, the website might be trilingual.

Several companies in both China and Japan said they were just in the process of setting up their web sites. In both countries the feeling still is that business development - attracting new customers - is best done face-to-face. When electronic methods are used extensively, they are used with foreign customers, rather than domestic ones. Most of the suppliers are domestic, and significantly virtually nothing of a supplier facing nature is yet done electronically. Mexico was the most frequent user of supplier facing networked processes. The driver for adoption was requirements set by their large international suppliers - the bulk of whom were in the USA. USA customers also motivated the adoption of customer facing networked processes.

We found that SMEs can be quite sophisticated in one aspect of networked processing, but very rudimentary in other areas. For example, two companies in Mexico have no website, but one purchased from its international suppliers over the Internet using the suppliers' proprietary ordering software, and the other serviced its major American customer electronically.

The networked processing of Chinese and Japanese companies was less sophisticated in dealing with suppliers and customers than in Canada and Mexico. This led us to speculate about a number of probable causes. Connectivity is still an issue in China. Since both China and Japan are non-Roman alphabet countries, it has been only recently that computer code has been able to deal with Chinese characters (*kanji* in Japanese). Thus, widespread computer use happened much later there than in North America.

Also, differences in adoption patterns are deeply rooted in culture. For example, China and Japan, as well as Mexico, are highly relationship oriented. The importance of face-to-face communication is thus high. SMEs to some extent are hostage to the attitudes and capabilities of their large customers and suppliers. If large customers and suppliers do not use, or want to use, the Internet, then there is little incentive for the SME to do so. China and Japan are surrounded by Asian countries that have a similar orientation, leading to a preference for face-to-face communication. In contrast, Mexico, although also relationship-oriented, is next door to the USA, which is a much more individualistic country, appears to have a preference for electronic communication, and has the economic power to enforce its preferences with foreign suppliers and customers.

In the next section we provide a more detailed model that will help to further explain differences in capability to adopt networked processing between trading partners.

4 Model of SME capability to adopt networked processes

Our observations have led us to a preliminary model of the influences on an SME's capability to adopt supply chain oriented networked processes. The premise of the model shown in Fig. 2 is that capability is dependent on four constructs; the external environment, the internal company environment, SME management's perceptions and SME management's attitudes. Most current e-commerce research focuses on the progress of technology adoption in the firm's external environment, and to a lesser extent on the internal environment. Perceptions and attitudes provide important complementary predictors of networked processing capability, particularly for SMEs. Here, the individual owner's perceptions and attitudes have a much greater influence and immediacy than is the case for large companies. In the remainder of this section we will further expand on these four constructs, and the dynamics between them.

Previous researchers have identified three major factors affecting adoption of networked processes – perceived benefits, organizational readiness and external pressure (Stansfield 2003). These also appear in our model as constructs entitled: perceptions, internal environment, and external environment, respectively. However, our constructs include more variables than just these three factors. We have also added a fourth construct - attitudes. These additions are necessary because the literature has not considered the situation of SMEs operating across borders, but rather has dealt with the phenomenon as a purely domestic one. The impact of culture in particular has also been neglected in the Information Technology (IT) and Supply Chain Management (SCM) literature (Ford 2003). For example, Davison and Martinsons in their guest editorial for the special issue on culture and IT management of *IEEE Transactions on Engineering Management* stated “Although there is a growing consensus that context does matter...IT specialists still tend to seek universal formulae for successful practice, while ignoring or downplaying the messiness of human factors in different environments” (Davison 2003, p. 5] This is one area that our model is intended to redress. It takes explicit account of culture - both national and

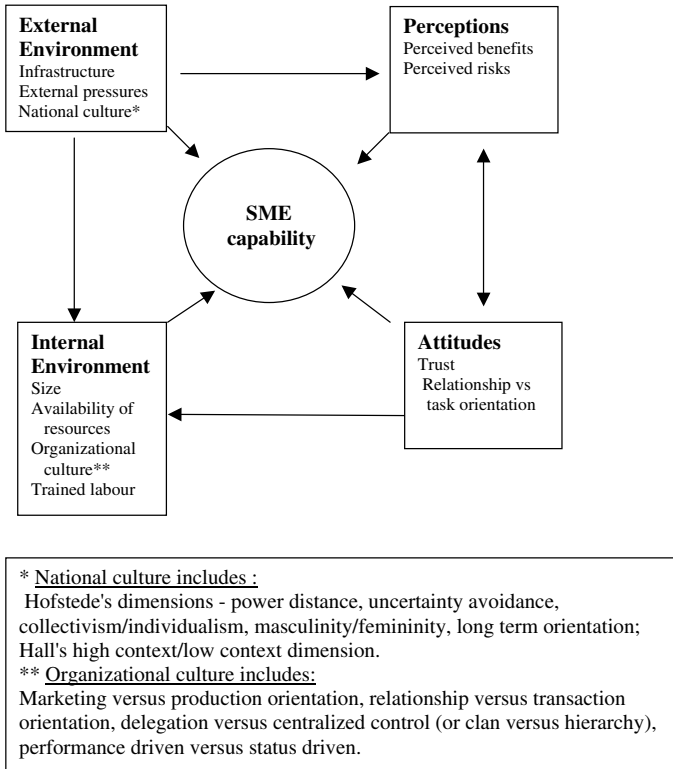


Fig. 2. SME capability to participate in networked processing

organizational - and the perceptions and attitudes of the primary actors. We examine each of the four constructs and their component variables below.

4.1 External environment

It is clear that external environment is important. If there is no Internet connection or stable telecommunications infrastructure, then there is no networked processing and thus no issues with managing internal organization issues. However, as we found with electronic payments in Japan, having the infrastructure in place (i.e., supportive IT infrastructure in the banking system) does not mean that firms use it. In addition to these well-cited variables, we would add external pressure and national culture. The most direct external pressure on an SME comes from customers requiring conformance to their supply management practices, whether e-procurement systems or inventory replenishment. We would hypothesize that this pressure is greatest from large customers. For example, one Mexican SME manufacturer we interviewed had large USA suppliers who had forced the company to adopt electronic order processing as a condition of supply.

The final variable, culture, manifested itself frequently on the capability and ultimately successful adoption of networked processes when we compared the four countries in our study. We operationalize culture according to Hofstede's dimensions (Hofstede 1980). There are other ways to operationalize culture, but we have chosen this one, since not only has his work been one of the most influential in international business studies, but it is the work usually selected by the researchers who are beginning to examine the effect of culture on the use of the Internet, in the IT and SCM literature (La Ferle 2002) (Singh 2003).

Hofstede identified four cultural dimensions, power distance, uncertainty avoidance, individualism/collectivism, masculinity/femininity. Subsequent work by Hofstede and others identified a fifth dimension, long term orientation. (See Appendix 2 for a detailed description of the dimensions.) China, Japan and Mexico are more collectivist in orientation, according to Hofstede's dimensions. The salience of relationships in collectivist cultures is higher than in individualistic cultures. The SMEs we interviewed from these collectivist cultures preferred to use face-to-face communication rather than electronic means. Uncertainty avoidance may also play a role in networked processing capabilities, since countries high on uncertainty avoidance are less comfortable with risk, and risk is inherent in adopting any new technology. The Net Impact studies indicated the cost and time required to get results were significant hurdles experienced by SMEs adopting IBS in North America and Europe. One study reported by Ford, Connelly, Meister found a country's position on the uncertainty avoidance dimension to be a significant predictor of Internet subscription rates (Ford 2003).

We also postulate that, whether a culture is high context or low context, will have an effect on adoption of networked processes. Hall distinguishes between cultures on these two communication preferences (Hall 1960). In low context cultures (e.g., Canada), communications are expected to be direct and explicit. Everyone should be able to understand the message and have equal access to information. Who the person is, or what the situation is, is not expected to have an effect on the message design. In contrast, high context cultures *do* expect communication to be highly dependent on the person and situation. A great deal of communication is contained in what is *not* said, so an ability to read non-verbal signs is essential. Ambiguity and subtlety are valued. Japan is a good example of a high context culture. If one is direct, that person is felt not to have progressed beyond childhood. This cultural dimension has an obvious effect on the propensity of an organization to adopt electronic communication, where non-verbal cues are few. It is a mode of communication that might be hypothesized to fit much more with a low context culture.

4.2 Internal environment

The internal environment construct includes size, availability of resources, skills of the workforce, and organizational culture. Size is important because it limits the amount of risk SMEs can afford to take. The organization also has to be ready to take on the technology. If the SME does not have trained

people or capable workers, adoption is not likely to happen, as resource scarcity theory would predict (Barney 1991).

Be small companies does not mean that SMEs are necessarily predisposed to be laggards in the adoption of networked processing. SMEs in fact may be more nimble than large companies that have out-dated legacy systems, and time consuming and risk averse hierarchical management structures to deal with. This contradicts the prevailing thought that large companies always leading the way and drag their SME brethren on-line. In China, for example, the largest companies in an industry may be former state-owned enterprises (SOE) which must deal with legacy systems and political policies (i.e., guaranteed job security for unskilled workers). The new class of entrepreneurs in China have no such sunk cost thinking and are more likely to adopt networked processing when the opportunities present themselves. However, this will also depend on whether supply chain partners in the external environment will cooperate.

The final variable in the internal environment construct is organization culture. This is made up of the values and beliefs of the organization and includes such factors as marketing versus production orientation, relationship versus transaction orientation, delegation versus centralized control (or clan versus hierarchy), and performance driven versus status driven. Organizational culture is influenced both by the external environment and the attitudes of the owner. These two influences may work in opposite directions. This came out in our interviews when we would encounter an owner who would be enthusiastic about interacting with customers and suppliers electronically (attitudes), but was brought down to earth by the need to service the manual systems and inter-personal needs of suppliers and customers (external environment) who were both large and small, domestic and international.

4.3 Perceptions

The external environment is chaotic and far too complex for any individual to comprehend every factor. Information overload is a common complaint among managers. In the past 5 years the tsunami of information and misinformation about e-commerce has confused many a manager. Perception is the “short-cut” mental process used to make sense of this complexity. Each person screens the stimuli in a way that helps make sense of the world. Perception is learned, consistent, and based on one’s cultural background. It is also often inaccurate (Adler 2002). We act, based on our perceptions of the environment, not on environmental reality. For this reason, it is an important factor in our model.

For example, some of our respondents in each country perceived that getting help to implement networked processing was expensive. The providers of solutions in the external environment were over-priced large company consultants. This fostered the perception among owner/managers that any networked processing initiative would need to be done in-house or by using a member of their social network (e.g., a younger family member). Often these resources were not available or incompetent, thus limiting any benefits from future networked processing.



One important variable in this construct is perceived benefit. The entrepreneur will act to enable electronic networks if s/he *perceives* the benefit to be greater than the *perceived* risks, another factor. These risks and benefits may or may not correspond to the actual environment. For example, one of our Canadian respondents commented on why he did not like to use e-auctions “The Internet is a killer of the North American type of business. Customers can get Chinese quotes. There is no secrecy. It is difficult to compete in that environment.” He did not perceive the technology as opening up the possibility of successfully increasing the firm’s international sales, so it was not adopted. Perceptions also indirectly influence attitudes. This is a two-way effect as indicated in Fig. 2, because the attitudes one holds will also influence how one perceives the environment.

4.4 Attitudes

Management attitudes, both rational and irrational, influence the allocation of people and money in SMEs. The significant role that the attitudes of owners can play in the adoption of new technology and strategy development, has been well documented (Stansfield 2003). Attitudes do not form in a vacuum. The decision maker, often an entrepreneur or a small network of associates, formulates attitudes based on perceptions of their environment. Attitudes are expressions of values – cultural and personal. The entrepreneur’s attitudes influence his/her own behaviour, such as decisions, and thereby have a direct impact on the SME’s capability. They also influence employee attitudes and behaviour and thus affect the internal environment through the organizational culture factor, with a further indirect effect on the SME’s capability through that mechanism.

From our observations, trust and relationship orientation are two important factors in this construct. Trust was a delicate topic to discuss with the SMEs we interviewed in all countries. Trust was often a function of reliability versus a higher order concept such as risk sharing in joint activity. It was fragile and maintained by interpersonal contact. Even after personal contact had been established, there was a sense in some cases that SMEs felt that networked processes bolstered trust because there was an audit trail through e-mails and electronic documents.

Relationship orientation is an aspect of Hofstede’s dimensions in the external environment (masculinity/femininity), but appears in attitudes as well. Although it may appear redundant to include it again on the individual side of the model, it is essential if we are not to confuse levels of analysis. Hofstede has repeatedly reiterated that his dimensions are applicable only at the country or regional level. The fact that some subsequent researchers have applied the dimensions to the individual level has led to some criticism of Hofstede’s theory that would better have been directed at the methodological errors of the other researchers (Ford 2003). The SME owner’s attitude on the higher importance of relationship or task will have an impact on the internal environment. This in turn impacts the SME’s capability to use networked processes, since we can postulate that a task-oriented owner will be more inclined to aggressively pursue these processes than would a relationship-oriented one, to whom human contact is important.

5 Conclusions, implications and further research

We have formulated a model describing the drivers of SME capability for networked processes, but we need to look more deeply into the process of capability building. Our field research suggests that there are differences in the extent to which various networked processes have been adopted in the countries we studied. These differences reflect gaps in SME capability between countries. The reasons vary for different types of networked processing and by organizational variables such as size. In our model of SME capability we propose that researchers start with how entrepreneurs perceive their situation. More relevant to international supply chains, we need to understand the differences between trading partners in how they perceive their external and internal environments.

The implications for SME stakeholders participating in international supply chains is two fold. First, to adopt appropriate networked processing to support greater participation, SMEs must develop the business planning skills to identify, select, and implement the supporting technology. They must be educated as to why this is important. The smaller the firm the less likely this entrepreneur-centered organization will have the time and talent to perform this critical management activity. Governments and trade associations may have an important role in changing the entrepreneurial culture and business environment, to encourage more forward thinking in this regard. We also see a role for larger firms to do more supplier development in this area. Second, the forward facing drive of SMEs in the supply chain to acquire and keep customers is the strongest incentive to motivate entrepreneurs interested in adopting networked processing. To do this, supply facing technology such as e-procurement systems, must be capable of being adopted by SME customer organizations. Supply facing technology tends to lag customer facing and thus there is not the “pull through” from downstream customers. The needed changes in the external business environment must include changing the attitudes and incentives for institutions, governments and large multinationals, as well as SMEs.

We see a number of productive avenues for further research into international supply chains, focusing on the constructs in our SME capability model. On the conceptual front, there needs to be more work on defining the technology and organizational types so that valid international comparisons can be made. It would make contingent modeling (i.e., accommodating sectoral and scale differences) much easier, which in turn would make any advice to SMEs or SME policy makers more specific and thus more useful.

Specific to the international issues we touched on in this paper, we see four areas for development. First, “trust” is a culture-bound concept, which impacts buying and selling between known supply chain partners. How do different expressions and perceptions of trust interact when the inter-organizational process is carried out over an electronic network? Second, how do specific cultural dimensions such as uncertainty avoidance, individualism and power distance (i.e., Hofstede’s framework) and high context/low context (i.e., Hall’s framework) enable or block SME use of electronic networks? Even more importantly, what effect does this have when SMEs from countries at different ends of the cultural dimensions interact? Third,



how do different cultures balance traditionally preferred modes of communication, such as face-to-face meetings, with options to execute inter-organizational processes over an electronic network? Finally, we observed the diversity of structures in the organization of SMEs (e.g. family-run, clan) and social networks (e.g. professional associations, family friends) exerting different influences on SME adoption and implementation of network processes. We feel that examination of these structures will disclose the underlying drivers that make international supply chains capable with extensive SME participation.

Appendix 1: Definitions of networked processes

Supplier facing

On-line ordering: processes to order goods and services from suppliers. The OECD label that includes this process is e-commerce, but this term has accumulated a host of different nuances. Our definition differentiates between the ability of a company to order on-line with its suppliers, and the ability of a company's customers to order on-line with them. Our on-site interviews indicated that it is not a symmetrical relationship.

Order fulfillment and tracking: processes for preparing and distributing purchase orders to suppliers. Tracking usually refers to the ability of customers to self-serve their needs for order tracking by accessing the supplier's databases.

Product design and development: processes dedicated to designing and developing products via computer mediated networks (e.g., Computer Aided Design (CAD)). This may include on-line collaboration.

Logistics and inventory control: processes for planning, monitoring and executing decisions associated with materials management and shipping conducted over electronic networks.

Customer facing

Customer acquisition: processes for acquiring new customers. They include electronic catalogues, Web advertising and Web activity analysis.

Customer retention: processes for monitoring and maintenance of existing customers. They include customer relationship management systems (CRM), list management and database marketing. The OECD categories put customer acquisition and retention together. We have separated them because it was clear from our interviews that the majority of companies were paying more attention to acquiring new customers electronically. From our research, retention appears to be carried out by more traditional processes, such as face-to-face selling and telephone marketing, especially to domestic customers.

Customer service and support: processes to deliver work-in-process and after-sales services. This is labeled Product Service and Support in the OECD categories. We have changed the name to reflect the fact that our



interviewees referred more to supporting customer information needs than to product processing, such as merchandise returns. Examples are websites that contain support pages, such as frequently asked questions (FAQ), downloadable manuals or the possibility to post questions on-line.

Order fulfillment and tracking: processes directly linked to the orders that a company receives from its customers. They include order control, product control, and order tracking.

On-line ordering: processes to allow customers to order on-line from the company. This could also include sub processes such as automatic due date issuance and confirmation.

On-line Payment: processes to calculate, accept, and confirm payment. The OECD categories don't differentiate between on-line or off-line payments. Both come under their category of Finance, Budget and Account Management. These processes may include linkages to intermediaries such as banks and their credit card companies.

Internal processes

Sales force/human resource coordination: processes to coordinate the activities of employees. In particular, coordinating salespeople on the road following up on leads and orders. Some SMEs had multiple sites (e.g., several sales offices; a factory and a sales office). We found one example of human resource coordination in a consultancy in China where an on-line scheduling system was used to coordinate the availability of personnel for various projects. This application was shared over multiple sites.

Appendix 2: Definitions of Hofstede's cultural dimensions

Power distance. This is the extent to which people accept the unequal distribution of power in institutions and organizations. In high power distance countries, people feel that an unequal distribution of power is legitimate and to be expected and respected. Hierarchies are important. In low power distance countries people want a more equal distribution of power and hierarchies are to be flattened as much as possible.

Uncertainty avoidance. This reflects the extent to which people in a society feel threatened by ambiguity and uncertainty. People in high uncertainty avoidance countries will try to put in place mechanisms that provide the most predictability and stability.

Individualism/Collectivism. In individualistic societies, people see themselves as separate individuals, with their focus being primarily on taking care of themselves and their immediate families. Social networks tend to be loosely knit. In contrast, in collectivist societies, social networks tend to be tightly knit, and people strongly distinguish between in-groups (e.g., people in their extended family, clan, organization) and out-groups (everyone else). Common goals and objectives are important, rather than individual goals that focus primarily on self-interest. In return for loyalty, members expect the support and protection of the group.



Masculinity/Femininity. This dimension has been re-named Career Success/Quality of Life by Adler (2002). The masculine end of the dimension (Career Success) refers to the stereotypical “masculine” values of assertiveness, competitiveness and material rewards. The feminine end of the dimension (Quality of Life) refers to the stereotypical “feminine” values of nurturing, quality of life and relationships.

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