

Social and Ethical Issues in Applying Information Technology to Link Global Supply Chains

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Abstract

In this paper some ethical and social issues that arise in applying new information technology to global supply chains are discussed. The Internet, private exchanges, global satellite linkages, and other forms of new technology hold great promise in terms of allowing global supply chains to operate more efficiently and cut cycle times throughout the chains substantially. However, these new technologies also present some social and ethical issues to managers and firms operating in the global environment. For example, to make full use of a global supply chain there must be extensive communication of inventory, production scheduling, and cost information among supply chain partners. This requires a certain level of trust among the partners, and in some cases, collides with cultural differences in how business relationships are conducted. Managers in different countries also may have different views of what constitutes ethical business relationships. These cultural and ethical differences complicate the application of these new technologies and must be dealt with by firms developing global supply chains to use them effectively. The issue of sweatshop labor use in global supply chains is another ethical issue which the principles of lean production and integrated supply chains have the potential to address. This paper will explore such issues and suggest ways managers can deal with them.

Introduction

Supply chain management has become an important topic for most firms in recent years. As globalization proceeds, and information technology develops, the value of and ability to link together supply chain partners is more and more apparent. Firms throughout the world increasingly are sourcing materials and selling their products abroad. Competitive demands require that they respond with quality, low prices, speed, and flexibility to their customers. This puts a premium on a well-functioning supply chain.

Several factors have contributed to the expansion of global supply chains. The continuing liberalization of trade and capital flows has opened many countries to both imports and exports. Multinational firms have been quick to exploit these new opportunities, investing abroad, seeking new sources of low cost supply, and finding new markets for their products. Global expansion poses a host of challenges as well as opportunities, however. Coordinating production and distribution among multiple countries can be a logistical nightmare.

Fortunately, information technology has been developing in parallel with the rapid globalization of business. IT makes it possible to provide the information along the supply chain that is critical to its successful operation. In the 1990's satellite communication was extensively deployed allowing transmittal of phone and fax messages around the world quickly and easily. Companies began joining the computer systems of their subsidiaries in various countries using enabling technology such as EDI (Electronic Data Interchange) for orders and invoices and EFT (Electronics Funds Transfers) for financial transactions. The advent of the Internet in the 1990's is providing a quantum leap in the ability to link together a supply chain because of its interactive nature allowing faster and more extensive communication and the ability to coordinate activities in real time. This, no doubt, is contributing to the rapid development of global supply chains making them both more feasible and more effective.

The application of information technology presents some challenging social, cultural, and ethical issues that are just beginning to be realized and addressed in many global firms. It is the objective of this paper to identify some of these issues and discuss them. Some suggestions will be offered on how firms can anticipate and deal with the inevitable challenges that will arise as they expand their global supply chains and the information technology which supports them.

Using the principles of *lean production* to integrate a global supply chain offers the potential to ameliorate some of the negative consequences of globalization such as sweatshop labor and low prices paid to small commodity producers. The requirements of lean production necessitate establishing supplier relationships based on flexible, high quality production which is unattainable with the transitory, opportunistic pattern of supply contracts used by many multinational firms. The application of IT to global supply chains is an important facilitator to making supply chains lean. The ethical and social consequences of leanness and IT will be discussed in a later section of this paper.

Applications of Information Technology in Supply Chains

The 1990's were a period of rapid development of new information technology. In the early 90's the advances occurred in the greatly increasing speed and lowered cost of personal computers and workstations and the proliferation of application software targeted to supply chain applications. Accompanying these advances were developments in telecommunications technology such as cellular phones and increasing use of satellite transmission to allow worldwide coverage. Bar coding has allowed electronic tracking of products throughout the supply chain facilitating demand tracking and inventory management. All of these advances facilitated the operation of global supply chains that had previously been hindered by the cost and time involved in transmitting information, the lifeblood of a supply chain. But the most important technological advance will likely be the Internet which appeared in the mid-90's and has proliferated at rapidly since then.

The Web provides tremendous advantage in terms of allowing fast and inexpensive transmittal of large amounts of information in real time. Unlike previous inter-company linkages such as EDI that are sequential and hierarchical, the Internet allows simultaneous exchange of information with all supply chain partners. In effect, there is an open communications circuit in the supply chain. Along with the rapid adoption of Internet usage new software applications designed to allow many new uses of the Web have been developed. All of this has facilitated the expansion of global supply chains.

The benefits of improved information transmittal in a supply chain are significant. The difficulties of locating capable suppliers internationally were daunting to many companies causing them to either produce parts and materials internally or outsource domestically. Now with the Internet it is much easier to find suppliers in other countries and carry out the bidding and purchase order process. Once a supplier is selected, coordination of production schedules and delivery requirements is facilitated. Any changes necessary to distribution requirements can be readily transmitted along the supply chain via the Internet. These Internet linkages often take the form of private exchanges where access is limited to supply chain partners.

The development of integrated supply chains is partially motivated by and completely congruent with the movement to *JIT (Just-in-Time)* or *pull* production systems. The JIT approach stresses minimal inventory and fast response to changes in demand along the supply chain. With older *push* approaches to production, orders were submitted well in advance of actual requirements and based on forecast sales rather than actual. The communication process by itself added substantial lead-time to the whole cycle when done by mail, fax or phone. This often led to the so-called *bullwhip effect* in the supply chain where small changes in demand downstream translated into amplified changes as they worked their way upstream in the supply chain. The result was cycles of overproduction with excess inventory at some times and shortages at others. This all leads to fluctuating employment, excess inventory, and unhappy customers. The Internet combined with the JIT approach can minimize the bullwhip effect in a supply chain by letting all supply chain partners know demand and inventory levels both upstream and downstream.

Software application packages are still being developed to take full advantage of the Internet for supply chain coordination. ERP packages can readily link to the Internet but often lack the shop-floor information critical to production planning, capacity planning, inventory control, and logistics. Application software is becoming available to provide this final linkage, but is not widely deployed yet, especially in developing countries.

The Internet also potentially allows members of a supply chain to work more closely together and evolve into a partnership relation. Effective partnerships depend on knowledge and trust of the other firms and the Internet has the capability for providing the information and communication necessary to make this work. For example,

firms may transmit information about their production schedules, capacity availability, inventory levels, quality performance, and so on that can lead to better coordination of their production and distribution, and perhaps facilitate mutual problem solving as well. The paucity of information about members in a supply chain is particularly acute in global relationships and hinders developing true partnership attitudes. The Internet may not replace face-to-face contact, but it certainly can make partners more knowledgeable about each other's activities.

The Internet may also dramatically change the way organizations interact with each other and their organizational structures. The directions in which this may go range from companies that form ephemeral e-commerce relationships to semi-permanent *value chains* of supply chain partners that almost function as a single entity (Hewitt, 2000). Hammer (2001) has developed the concept of a linked supply chain that operates as one integrated process extending the benefits of reengineering outside the walls of the firm. From the JIT point of view the longer-term partnership relationships are preferable to allow the inter-organizational learning that can occur and the mutual assistance that benefits all partners.

Challenges to Applying IT in Global Supply Chains

The potential benefits of information technology to making supply chains more effective and efficient are readily apparent. The pitfalls and challenges to doing so may not be so apparent. There are financial and technical challenges, of course, but perhaps the most difficult will be the cultural and social ones. In this section, I will highlight some of the possible roadblocks to applying IT to global supply chains.

Shore (2001) proposes a model for information sharing in a global supply chain. He calls this model the *Supply Chain IT Linkage Capability Model*. It includes seven variables and the interactions among those variables. The variables are the industry, the market and competitive environment, national culture, corporate IT culture, size of the firm, IT infrastructure, and country IT support. He analyzes four organizations to validate the model. The seven variables all appear to be important influences on the effectiveness of information systems in global supply chains. Barua, et al, (2001) emphasize the importance of a holistic view in implementing Internet technology considering the complementary nature of technology, business processes, and e-business readiness. Then, firms must develop the internal capabilities of using the information shared with their supply chain partners effectively (Lee and Whang, 2000).

The technical challenges involve the absence of adequate computer facilities, transmission infrastructure, and trained personnel. In developing countries, in particular, there may be a shortage of computer equipment and software to allow deployment of Internet-based technologies. The big advantage of the Internet is that it is so readily available, but this assumes one can access it, which requires a PC and appropriate software such as e-mail. It may be assumed that most firms in the industrialized countries have such access, but cannot be assumed in many developing countries.

Use of the Internet requires at least adequate phone lines for transmittal. In some developing countries such infrastructure cannot be assumed. Satellite links or high-speed cable connections may have to be installed which are expensive and may come up against regulatory restrictions in some countries. This constraint may force selection of suppliers or establishment of facilities in more developed countries, or at least major cities of developing countries. That choice may not be optimal either for the firm or the country.

Installation of computer equipment and software requires some technical expertise and this may also not be readily available in some developing countries. Fortunately Web technology is simpler and more easily installed than previous mainframe and mini-computer based systems and their associated software, but never the less can be a constraint in some developing countries. The firm may have to provide its own training or bring in expatriate personnel.

The associated costs of installing the necessary IT hardware and software, and then training people how to use it, also may be a barrier to some supply chain partners. This constraint has even limited application of information technology in smaller firms in developed countries, so can be expected to be even more of a limitation in developing countries. The main supply chain partner (i.e., the dominant or largest firm) may have to provide financial support to other supply chain partners.

The technical and financial problems at least are fairly identifiable compared to the cultural and social issues that arise in applying information technology to global supply chains. Some of the more obvious cultural issues that may arise are listed below:

1. Trust in business relationships
2. Status differences within and between firms
3. Power and hierarchy in organizations
4. Decision models
5. Disclosure of information
6. Goals of the firm

The basis on which business relationships are established and maintained varies among countries. In some regions they are formal, impersonal, and legalistic whereas in others they are informal and personal. The former type of relations is common in industrialized countries, though in varying degrees of formality. This is due to well-established legal covenants and recourse for business relations as well as long-established practice. In many developing countries, on the other hand, legal remedies for business problems are much less easily obtained. Therefore, there is a strong emphasis on trust in conducting business. Often this is viewed as nepotism or favoritism in the developed world but does serve a purpose in avoiding potential problems due to disagreements on business matters. This factor can potentially be either a facilitator or a constraint in a global supply chain. If the relationship is based on trust, there may be more of a willingness to share sensitive information with supply chain partners. However, informal relationships may downplay the value of data interchange stressing instead a phone call or a handshake to make business decisions which could serve as a barrier to using information technology in a supply chain, especially if substantial capital investment is required for the technology. Bell, et al, (2002) emphasize the importance of establishing a basis of trust early in international supply relations and working to maintain that trust.

Status differences between firms based on various dimensions can be much greater in some countries than others. For example, in certain countries the buyer is assumed to be in a superior position to the seller rather than being equals. Another status difference may arise based on size of the firm with large firms assuming superiority over small firms. Nationality of the firm may also induce perceived status differences. Such differences can complicate the partnership relations that are found in the most effective supply chains. They may hinder the willingness to work closely together on issues such as production schedules and new product introductions and to extensively share information.

As Hofstede (1984) has pointed out, societies vary in *power distance* that governs many interactions between individuals, both in business and life in general. Some countries such as the United States and the Scandinavian countries have low perceived power distance ratings allowing individuals from different educational and socioeconomic backgrounds to work together harmoniously. In other countries with greater power distance rankings such as the Latin American countries, there is likely to be less willingness of individuals from differing backgrounds to work together. In such countries, this can hinder the information sharing and cooperation necessary to closely link a supply chain.

How decisions are made (i.e. decision models) can also have an impact on a global supply chain. Western countries tend to stress *data-based decision-making* whereas in other regions, decisions are often more subjectively made. Partially this may be due to lack of accurate data to be used for decision making but is also a cultural characteristic. Management education in the developed world is heavily oriented to the scientific method of knowledge acquisition and the use of analytical (often mathematical) tools for making business decisions. Management education is much less widespread outside the developed Western countries, and therefore many managers are unaware of these decision models. As the number of Western-educated managers increase in the developing countries perhaps this will change, but in the meantime it may be a barrier to implementation of information technology to link global supply chains; i.e. if managers do not perceive the need for extensive data collection and analysis to make a decision why invest in the technology and training to use information systems? Even if the investment is made, will the information provided be used effectively?

The amount and type of information to be disclosed to business partners will be another challenge as global supply chains expand. This is partially related to the first factor discussed (trust) but has other dimensions as well. In some cases the type of information needed for supply chain coordination will just not be readily available because it has not been collected in the past. Examples would be accurate inventory data and production schedules. Without this critical data supply chain coordination cannot be effective. If accurate data is available, then there may be a reluctance to share it with other firms, either because of lack of trust, or even if trust in the business partners exists, due to the fear that the information may leak to competitors or to the regulatory authorities. In most countries, much less information is provided to the public and government agencies than in the United States. Firms in these countries may have an ingrained hesitancy to share information that has always been considered private. Without information exchange information technology will provide little value to a supply chain.

Finally, firms in different countries may have different business goals. In the United States, and increasingly in Europe and Japan, there is an emphasis on putting the interests of shareholders first. This, of course, raises some ethical issues which will be considered later in this paper. Strictly for pragmatic reasons differing goal orientations can cause problems in a supply chain. If, for example, a firm is focused on stability of sales and employment, it may be hesitant to invest in new technology or to open the firm to linkages with other firms that may threaten the status quo. Or if its orientation is to profitability, but more short-term than long, it may also be reluctant to invest in technology and training that has a long-term payback. Information technology is sometimes perceived also as a laborsaving innovation and thus may be opposed by a labor union in a partner firm. Another dimension of goal orientation that may affect the implementation of IT in a supply chain is the value placed on speed and efficiency. Most Western managers value highly process changes that increase speed in any of its dimensions (time to market, cycle time in production, new product development time, transport time) and productivity improvements. In other countries managers do not put as high a premium on these types of improvements and may feel less urgency about pulling products through a supply chain in the minimum amount of time at the lowest possible cost. Therefore, they may be less willing to invest in the technology and training required to implement IT in the supply chain.

Culture has many dimensions, and I have only attempted to list a few that could possibly influence when and how information technology will be implemented in global supply chains. None of these need prevent the application of IT to link global supply chains, but managers should be aware that these types of issues may arise and be prepared to deal with them. Some suggestions on how they might do this will be presented in a later section of the paper. Next some ethical issues that may arise in applying information technology in global supply chains will be discussed.

Ethical Issues in Applying Information Technology in Global Supply Chains

Not only are firms operating global supply chains confronted with many cultural challenges as they deploy information technology to make their supply chains operate more efficiently, they also frequently encounter ethical issues. Of course many of the ethical issues also arise because of cultural differences. In this section, some of the more likely ethical conflicts that may arise as firms implement IT solutions in their global supply chains will be discussed. The ethical issues to be discussed are the following:

1. Exploiting market power
2. Fair pricing
3. Use of confidential information
4. Monitoring of supply chain partners' performance
5. Transfer pricing and tax avoidance
6. Environmental impacts

A potential ethical conflict may arise in a supply chain when the partners have different degrees of market power. This can easily lead to exploitation of other members of a supply chain by the dominant partner. In terms of

information technology issues this could result in conflict as the dominant partner imposes a technology solution on other partners which is not the technology solution that best meets their needs. The mismatch could result from either technology compatibility or cost considerations. For example, a sophisticated information system that requires hardware or software beyond the technical capabilities of a supply chain member to install, operate, and maintain may impose unjustified costs on that partner and not lead to the desired benefits for the dominant partner either. The ethical issue involved is to consider the mutual benefits of a technology solution for the entire supply chain rather than maximization of the dominant partner benefits.

The issue of *fair* pricing has arisen with some agricultural commodities (especially coffee) and labor-intensive products (such as shoes and clothing) where multinational firms have been accused of paying very low prices and wages because of their monopsony power. The growth of global supply chains has the potential to either mitigate or exacerbate this practice. If smaller firms, through their participation in global supply chains, are able to challenge the large multinationals, they may be able to provide an alternative to those firms as buyer of these products and commodities. If these firms act in an ethical fashion paying fair (i.e. prices high enough to allow a living wage to be paid to workers producing the product or commodity), then they could offset the market power of the large MNC's. The application of information technology in a supply chain facilitates this possible social benefit in several ways. First, the use of IT allows smaller firms to participate in global supply chains since information can to some extent substitute for investment. Second, it will allow better knowledge of local conditions as to sources of supply, costs of production, economic conditions, etc., which will allow those firms operating in a socially conscious fashion to implement and enforce living wage policies. However, there is no guarantee that the technology will be used in this way. It could also be used to better identify lowest cost sources of supply and increase monopsony power rather than weaken it. Therefore it becomes very much an ethical issue for managers in global supply chains on how they use information technology.

The primary value of information technology to a supply chain is the vast amounts of information it can collect and disseminate throughout the chain. Ethical issues can arise in how this information is used. To maximize the joint benefits of a supply chain and foster the partnership relations, each member has to know quite a lot about the other members. This often will include production schedules, capacity, inventory levels, product designs, costs of production, and data on quality performance. Effective partnerships use such information to help coordinate supply chain activities and to assist each other to improve their operations. However, there may be a tendency to exploit this competitive information for individual firm advantage. For example, an unethical manager might use cost information from a supplier to try to achieve a lower price from a competitor. Or product or component designs developed by a supplier might be shopped around to find a supplier who will produce it at a lower price. The fear of this type of unethical behavior has made some firms hesitant to apply IT that will allow sharing of this type of confidential information.

The knowledge gained about supply chain members from the information technology employed can also be used in a positive way to monitor adherence to ethical policies adopted by one or more partners in a supply chain. A common excuse used by firms who outsource production of labor-intensive products like shoes and toys to developing countries is that they do not run these factories, do not know what goes on in them, and, in any case, it is none of their business. The negative publicity that firms like Nike have garnered from these practices have forced many of them to join industry coalitions to address working condition and wage issues in developing country factories and to develop ethics policies. If these coalitions and ethics policies are to be effective, extensive monitoring of the overseas plants will be needed. The occasional inspection that occurs by company personnel or some independent oversight body may be insufficient to insure compliance with working condition standards. The information available in a firm's global supply chain could be a useful supplement if the right types of information are collected and the partners in the supply chain diligently monitor performance. If production systems are linked via IT, all supply chain partners should know what and when other members are producing and what their inventory levels and costs are. With this information they can assess whether maximum working hour restrictions are being violated and whether adequate wages are being paid. Of course, supply chain partners will have to be willing to provide the information on their IT systems. This could be a criterion for supplier selection by those companies that want to have a real-time ability to monitor compliance with their ethical policies.

Transfer pricing presents another possible ethical dilemma for managers in a supply chain. The prices charged for movement of products between different entities within a firm or with customers and suppliers can have significant effects on taxes paid. This issue is not new, but information technology makes it much visible what production costs are anywhere in the supply chain. Managers can choose to use this information to shift income around in the supply chain to minimize the total tax bill, which in itself is not unethical unless it violates established tax regulations in a particular country. Since the information necessary to set transfer prices in a way that is in compliance with tax laws can be available with IT in the supply chain, managers will have to decide how to use this information. If the same information is available to all supply chain partners, then a firm may confront an ethical dilemma if it is aware that a partner is violating tax laws, even though it may not be doing so itself.

Environmental issues are also capable of presenting managers in global supply chains with ethical challenges. Much like the excuse used concerning inadequate or dangerous working conditions used by some firms which outsource to developing countries, it has been argued by some multinational firms that they are not responsible for environmental compliance of their suppliers. The greater knowledge of the environmental policies and practices of suppliers that may come through the information flows within a global supply chain again presents managers with the dilemma of what to do if supply chain partners are violating policies which they have established for their own firms. Should they pressure those firms in violation of their policies to change their practices, drop them as suppliers, and report them to authorities or what? In any case, the supply chain can be an effective method of spreading environmental consciousness and implementing *green* policies (Bowen, et al, 2001).

These are some possible ethical challenges that may confront managers of firms participating in global supply chains. There are of course many other potential ethical dilemmas that can arise in business dealings abroad that will also have to be addressed. The relative frequency of occurrence and importance of ethical issues varies between countries Cooper, et al (2000) found in a comparison of Indian, U.S., U.K., and Canadian purchasing and supply management professionals. The impact of global supply chains on these ethical issues occurs because it draws the supply chain members into a partnership relationship that requires extensive information sharing and coordination to be effective. Along with this may come greater awareness of ethical issues at supply chain partners and a need to coordinate as well on these issues. In fact, perhaps the overriding ethical dilemma in global supply chains will be the issue of to what extent greater knowledge of partner behavior carries responsibility to take action when a partner's actions violate one's own ethical policies. The closer relationships mediated by more extensive data interchange via IT is sure to heighten the importance of this issue in the years ahead. In the next section, ways in which firms may respond to the social and ethical issues in their supply chains will be discussed.

Corporate Responses to the Social and Ethical Issues

Firms involved in global supply chains will inevitably have to deal with social and ethical challenges. In this paper the focus is on the ethical and social issues that may arise as firms apply information technology to more effectively link their global supply chains. The previous sections identified some of the issues that may be confronted in these global supply chains. In this section some approaches to understanding and responding to these challenges will be presented. Effective response will depend on both a proper conceptualization of the issues and implementing policies and methods to deal with them as they arise.

A conceptual framework for dealing with cultural and social issues in transferring technology is the sociotechnical systems approach. This approach, formulated in the 1960's by Trist and his colleagues (Trist, 1981), says that any production system is a combination of a technical system and a social system. The technical system consists of the plant, equipment, and methods employed while the social system is attitudes, values and behaviors of the employees working with the technical system. To optimize performance they must be designed to work in harmony. When a technology is being transferred between countries, inevitably the technical system will have to be adapted to function effectively in the different cultural environment. This adaptation takes place through design of the technical system to be congruent with the social system. The key dimensions of the design process are the following: job design, the personnel and reward systems, work organization and supervision, and the information and control system (Miles, 1975). In this paper, the emphasis is on the last of these, but it cannot be considered in

isolation from the other dimensions. A proper sociotechnical systems analysis and design will develop all facets jointly. This S/T approach makes intuitive sense and provides a framework for implementing process improvements in a global supply chain.

For firms in a global supply chain it will be worthwhile when they plan on implementing new information systems to carry out a careful sociotechnical analysis involving all member firms. In the structured S/T approach, each of the design elements will be evaluated as they may affect the installation and usage of the new IT system. For example, if employees of firms in countries that are not experienced in using IT are to be expected to utilize the new system effectively, the way in which their work is structured (work organization), the manner in which decisions are made (supervision), and how they are motivated (reward system) should be carefully analyzed and altered if necessary. The proper S/T design of a job will probably be different in each country so local knowledge is essential to do this properly. If a firm from an industrialized country attempts to impose a uniform IT system on its worldwide supply chain this very likely will fail.

A good method to identify and respond to potential social and ethical conflicts is to use cross-cultural implementation teams. Since knowledge of the local culture is essential to get a good S/T fit, this would include local managers and employees. It should also include representatives from other key partners in the supply chain who can make sure that there exists compatibility between the local system and the global one. Also there need to be individuals on the teams who thoroughly understand the technology, its requirements, limitations, and adaptability. It may have to be adapted but not to the extent that it loses its key functionality. A cross-cultural, cross-functional team from the supply chain partners can analyze and resolve these types of issues to achieve a proper S/T fit and a system that meets the supply chain requirements. Lee and Kim (1999) found that information sharing, participation, and top management support were significantly related to success of IT implementation projects.

A complementary conceptual approach to sociotechnical system theory is to design an information system that is structured to maximize the benefits of a *pull* or *JIT* approach. The major benefits of such an approach are faster response time, greater flexibility, and lower inventories throughout the supply chain. To achieve these benefits the supply chain must be designed in such a way to allow the rapid transmittal of data and fast adjustment to demand changes upstream in the chain. The information system is key to allowing this to happen. A framework of the key factors to consider and the linkages among supply chain partners is presented in a model we developed in another paper (Bruun and Mefford, 2002).

The suggestions made so far address primarily the cultural adaptation of the information system to the host country environments of supply chain participants. The process of doing the sociotechnical system design of the supply chain will likely also identify some of the potential ethical conflicts that may arise. How should firms deal with these and prepare their staffs for additional ones that may occur?

Corporations with strong ethical policies have total support at the top for such policies and disseminate those policies to all employees. This alone would be inadequate without training in how to interpret and employ the policies and clear guidelines on what to do if ambiguities arise. Also they must constantly monitor compliance with those policies and have rewards and sanctions so that employees will follow them. With experience some global firms have been reasonably successful in assuring ethical business practices by their employees. But with the growth of global supply chains, how can they spread these policies throughout their supply chain?

This is no small challenge, and I believe that many firms have not really confronted it yet. To avoid the type of ethical dilemmas suggested in a previous section, they will need to deal with this issue if they want to have effective global supply chains that operate in an ethical manner. Carter (2000) found that firms that communicate their ethical standards and codes of conduct to other supply chain partners experience fewer instances of unethical conduct in buyer-supplier transactions. However, there may be opposition from some supply chain partners who will view attempts by a dominant partner to impose their ethical standards on the supply chain as *cultural imperialism*. More likely there will be a slow diffusion process of common ethical standards throughout the supply chain as the partners become comfortable working together, sharing information, and begin to see themselves as part of a *value chain* rather than completely separate entities. Especially if supply chain partners share information openly and come to have a long-term perspective on the relationship, there may be lower levels of unethical behavior (Ellram and Cooper, 1990; Gardner and Cooper, 1988). Also as markets become more global there may be

movement toward more universal business and management practices; toward best-practice approaches one would hope (for example, Just-in-Time manufacturing). This will not be a rapid process, however, and in the meantime managers will continue to be confronted with ethical dilemmas in their global supply chain relationships. But research has shown that the payoff to pursuing an approach to global supply chain management emphasizing ethics, cooperation, and a joint vision results in “higher competitiveness and greater creation of wealth.” (Valenzuela and Villacorta, 1999).

Lean Global Supply Chains and Sweatshop Labor

As companies expand their global supply chains and apply lean/JIT principles to them, there exists the potential for amelioration of the poor working conditions and low wages found in some industries such as shoe and clothing manufacture. The reason for this is that a lean supply chain cannot operate effectively with sweatshop suppliers. The JIT goal of a flexible, high quality supply chain with minimal inventories and fast delivery is simply not achievable with suppliers that employ the traditional long lead-time, batch production systems that are typically used in the low-tech companies which produce much of the world’s shoes, clothing, toys, and other similar products.

As many firms in the developed countries of Europe, Asia, and North America have realized, the lowest price supplier may not be the lowest cost one. The quality problems and excess inventories that result from selecting suppliers primarily on a price basis are leading astute companies to select suppliers based on the criteria of quality, product design capabilities, delivery reliability, and improvement potential in addition to price. Partnerships with suppliers are increasingly sought to assist each other in production coordination and product development as well as mutual improvement of quality and productivity. Fewer but more capable suppliers with long-term relationships is the inevitable result of such efforts.

The emphasis on supplier partnerships, a key principle in lean production, has not been as widely applied to foreign suppliers. Probably this results from the communication and coordination problems inherent in global supply chains. However, improvements in information technology are making it possible to overcome these constraints and develop closer relationships with foreign suppliers and customers. As these technologies are more widely deployed, firms following JIT principles will logically attempt to extend the same efforts to making their global supply chains leaner, as they are currently doing domestically (Hammer, 2001). In order to accomplish this they will want to develop closer relationships with fewer but better suppliers. In selecting these suppliers they will look for firms capable of producing high quality at low cost and with flexibility to respond quickly to changes in demand.

Firms that compete mainly on price by paying low wages and providing harsh working conditions are not likely to be attractive partners to customers developing lean supply chains. Those types of firms depend on inspection-based quality and do not improve their productivity significantly over time. Customers who follow JIT principles look for suppliers who employ quality-at-the-source (*jidoka*) and continuous improvement (*kaizen*) methods. Sweatshop firms do not do the training nor have the type of motivated employees and low turnover rates that are necessary for *jidoka* and *kaizen* to be applied. Although the price may currently be lower for these sweatshop firms, sophisticated customers know that JIT suppliers ultimately will provide lower costs through higher quality and productivity. They also will allow lower inventories to be carried throughout the supply chain since they can respond more quickly to demand changes.

As the benefits of applying lean principles throughout the supply chain are realized, and those firms in the forefront of doing this gain competitive advantage, it can be expected that firms with global supply chains will increasingly reject the low price, sweatshop supplier in favor of those suppliers who realize the importance of a trained and motivated workforce. Looking beyond short-term cost savings, the JIT customer will seek a capable supplier for a long-term relationship. In some cases this may be a domestic supplier who, in spite of higher labor costs, is competitive because of much higher productivity. For example, New Balance Athletic Shoe, Inc., a U.S. manufacturer, is able to produce many of their athletic shoes in the U.S. and be competitive with firms such as Nike and Reebok that produce overseas. They are able to do this with labor productivity much higher than plants in developing countries (24 minutes per pair versus 3 hours in China) which offsets much of the labor cost differential

(\$4 labor cost per pair in the U.S. versus \$1.30 in China). The reasons for the higher productivity are automation and use of cellular production in New Balance's U.S. factories. New Balance figures the remaining cost differential is made up by its ability to respond quickly to changes in demand at the retail level and to reduce inventories throughout its supply chain. It is currently moving more of its overseas production back to the U.S. to increasingly capture these benefits (Bernstein, 2001). Another U.S. company that has realized similar benefits from keeping production within the U.S. by using JIT manufacturing and cellular production is Milwaukee Electric Tool Co. It is able to be competitive in an industry dominated by production in developing countries.

There is no reason why the same techniques cannot be used as well in developing countries to achieve both high productivity and lower wages. In fact, there are many examples of firms doing this in many different industries in Mexico, China, and other developing countries. In conjunction with a fast and flexible supply chain, this is the best of both worlds for many firms. Cellular production has the potential to greatly reduce the throughput time from weeks to hours in industries like clothing and shoe manufacture and thus make a supplier much more flexible and able to respond quickly to changes in demand. The major constraint on achieving this flexibility and responsiveness will be the lack of such suppliers in developing countries. In many cases they will have to be developed by the multinational firm which is only worthwhile for a long-term supply relationship. Some multinational firms may even find it desirable to invest in their own plants if they believe they can make them so efficient that changes in wages rates and exchange rates will not make them uncompetitive. Or perhaps large contract manufacturers will develop such as has occurred in the electronics assembly industry, each of which services multiple customers with high quality, lean production.

Whatever type of foreign supply relationship is selected, it will be imperative to pay fair wages and invest in training and attractive working conditions to create the skill levels and motivation needed for a *jidoka-kaizen* system to work. Investment in training can only be justified if a loyal and motivated workforce with low turnover is created. But, if properly implemented the higher productivity and quality that results will more than offset the costs of higher wages and better working conditions provided. Combined with the greater flexibility and speed of the lean JIT supplier, the sweatshop company will find itself at a competitive disadvantage.

Over time, as more global manufacturers realize the advantages of a lean supply chain, wages will rise pulling up wage levels in other firms in those countries as well. But as long as productivity increases at least as rapidly as wages, that country will not lose competitiveness, a major fear of developing countries that resist global efforts to improve wages and working conditions. As it has always been, higher productivity is the key to improving standards of living. Lean global supply chains have the potential to contribute to the productivity improvement which fosters economic development, as well as in the short-term to improving the wages and working conditions of workers in companies supplying those global supply chains.

Conclusions

Many potential social and ethical conflicts were identified in this paper as firms attempt to leverage the value of information in their global supply chains by applying information technology. The value of integrating the supply chain into an *Electronic Supply Chain* is readily apparent; the ESC will be able to respond to customers more quickly and flexibly, inventories will be reduced throughout the chain, and productivity and quality will improve for all supply chain partners. However, inter-organizational relationships will be fundamentally altered intensifying the cultural and ethical challenges. How companies respond to these challenges will ultimately determine whether there global supply chains become powerful core competencies or a persistent source of problems and conflict. Several approaches to increase the chances of the former outcome were suggested including a business process analysis approach and the application of sociotechnical system concepts. There also exists the potential for integrated global supply chains to improve the working conditions of employees in developing countries and raise prices to commodity producers by applying the principles of lean production. Sweatshop labor suppliers become uneconomic in the framework of JIT.

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