

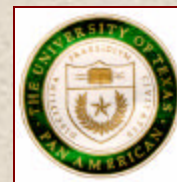
Examining Key Factors of Supply Chain Optimization: The Maquiladora Example



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Abstract: Supply chain optimization is a key goal of manufacturers in the new millennium, as markets become increasingly competitive in global markets. Companies have already cut operating expenses and reduced prices in efforts to remain viable as competitive pressures increase. Rather than making further cuts, firms be better served to concentrate on increasing internal efficiencies and outsourcing less efficient operations to more efficient external sources (Lambert and Cooper, 2000). Bowersox and Calantone (1998), Dyer (1996), and Kogut (1985) suggest that several factors appear to be critically important in optimizing the supply chain, including: distance, comparative advantage and integration. This study reports on how the declining Maquiladora industry in Mexico has faced these issues and present suggestions for improving the situation in the future.

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Introduction

The faltering Mexican manufacturing sector, specifically the Maquiladora industry, is critically important for U.S. interests for a variety of reasons. From an economic standpoint, Maquiladoras are important because they transform primarily U.S. made components and raw materials into finished goods – 82 percent of manufacturing materials come from the U.S. (Whalen, 2001). Perhaps more importantly, Maquiladoras manufacture products for domestic consumption to a burgeoning middle class in Mexico and act as a bridge to markets in Latin America, which represent “major market opportunities” (Bowersox and Calantone, 1998; pg. 90). From a governmental standpoint, the Maquiladoras promote stabilization of our southern border and economic growth along both sides of that border. For example, Maquiladoras accounted for 25 percent of Mexico’s Gross Domestic Product (GDP) and 17 percent of Mexican employment in the late 1990’s (INEGI, 1997). Meanwhile, the emerging middle class fuels economic vitality in border towns by workers eager to purchase the American lifestyle and U.S. Maquila managers moving to the area (Lindquist, 2001; Salas, 2002; Thomas, 2001).

The last several years have been hard on the Maquiladora industry, which posted negative growth of nearly 10 percent in 2001 -- a loss of 253 plants with corresponding declines in employment and profitability (CNIME, 2002). Several factors account for this loss including a worldwide economic slump and the attractiveness of Asia’s lower wage rates. While these factors are uncontrollable, the industry can reverse the downward trend by recognizing internal problems and implementing effective solutions.

Given that transportation and logistics costs historically represent some of the highest costs associated with international operations (Bowersox and Calantone, 1998), this area appears to offer one of the most salient opportunities for survival of the Maquilas. This is especially true in the case of Mexico, which sports the highest ratio of logistics costs to GDP of any country, based on a 1997 study of both developed and developing nations (Bowersox and Calantone, 1998). Therefore, this study is designed to investigate why this situation exists and suggest ways to improve logistic efficiency. An interpretive approach was used to uncover current impediments to efficient logistical process through the perspectives of individuals living the Maquila experience daily – specifically managers of Maquilas, government officials responsible for facilitating Maquiladora operations, and third party providers interfacing between the U.S. and Mexican logistics systems.

Literature Review

Part of the logistical problem faced by Maquilas is probably a function of the historical development of the Maquiladora industry. The industry owes its existence to a happenstance of government policies and entrepreneurial drive that formed the first Maquilas in the 1960's. The first significant event leading to formation of a new industry was the closing of the U.S. to Mexican agricultural workers, resulting in numerous unemployed, unskilled laborers along the border. This prompted the Mexican government to enact a program encouraging U.S. businesses to perform labor-intensive, value-added activities in manufacturing facilities in this border region by eliminating tariffs on re-exported materials and limiting taxation to the added value performed in Mexico. Seeing this, individuals and businesses quickly moved into the

region, a move that was facilitated through the rapid formation of contract manufacturing facilities. With the eventual passage of the North American Free Trade Agreement (NAFTA) in 1994, which phased out export restrictions between the U.S. and Mexico, Maquiladoras grew rapidly. NAFTA led to a 170 percent increase in exports to Mexico, much of it representing inputs to the Maquiladoras (Whalen, 2001). Between 1994 and 2000, Maquila employment grew 110 percent to the point where the industry accounted for \$63.5 Billion for Mexico and employment for 1.1 million Mexican workers (Gruben, 2001; Lindquest, 2001).

The Maquiladora industry began its decent in 2001 with the implementation of Article 303 of NAFTA, which required documentation of country of origin for all materials crossing into Mexico even when all materials originated within the NAFTA trading block. This not only increased the costs of supplying Maquiladoras by hundreds of thousands of U.S. dollars, but increased both cycle time and uncertainty associated with international sources of supply (Lindquest, 2001). As a result, Maquiladoras had to increase inventory levels to ensure sufficient working materials and customer service became more problematic. Certainly, these issues increased the difficulty of achieving profitability and feasible alternatives must be developed if the industry is to survive.

Finding Solutions

Given the timing of the decline in profitability, supply chain issues appear a feasible culprit. Supporting this, Zeng (2000) posits that purchasing is one of the key drivers influencing the survival and growth of manufacturing firms. Other sources support this rationale, finding that

between 50 percent and 70 percent of the company's value comes through purchased items (Mihaly, 1999).

Several factors appear to be critically important in optimizing the supply chain, including : 1) distance; 2) comparative advantage; and 3) integration (Bowersox and Calantone, 1998; Dyer, 1996; Kogut, 1985). In terms of distance, not only must organizations manage international exchange in a timely manner, but absolute distance carries an increasing cost as average distance between links increases (Bowersox and Calantone, 1998). Associated channel costs come through increased transportation costs, increased inventory carrying costs, and decreased nimbleness as the time necessary to meet market expectations increases. Comparative advantage is obtained when firms take advantage of differentials in factor costs across countries (Alguire, Fear, and Metcalf, 1994; Kogut, 1985). Unfortunately, firms locating in countries to take advantage of labor or tax differentials may face diminished returns when compared with relative disadvantages in the flow of goods and information across borders (Bowersox and Calantone, 1998). Integration between members of the supply chain harnesses cooperation, effective communication, and mutually-beneficial goals to improve firm performance. Cross-national chains face problems managing diverse cultures, customs, and bureaucracies in attempting to achieve the benefits derived from integration. These issues complicate international sourcing, where supplier selection decisions can not be optimized due to conflict among the factors influencing these decisions (Min, 1994).

Methodology

To develop an understanding of how Maquiladoras currently handle supply issues, factors influencing their supply selection decisions, and uncover possible problems affecting supplier optimization, we developed a question guide centered around supply chain issues, especially dealing with existing supply partner relationships (Appendix 1). Using the question guide, phenomenological interviews were conducted with managers overseeing various aspects of the cross-border supply chain, including customs brokers, regional economic development offices, Maquiladoras, and contract manufacturing facilities (Thompson, 1997). Thus, informants were selected using purposive sampling to tap the broad range of perspectives, rather than as representatives of the population in a statistical sense (Lincoln and Guba, 1985). As recommended by Thompson (1997), interviews were guided by the perspectives of the informants and additional perspectives gave voice to alternative perspectives until saturation was achieved. In several cases, multiple informants were employed to ensure adequate representation of the experiences typical within the firm. Resulting data were analyzed using a grounded theory methodology to uncover theoretical linkages, rather than to test existing theory (Glaser and Strauss, 1967; Strauss and Corbin, 1994).

This data gathering technique resulted in eight interviews, which were audio-taped and resulted in approximately 175 single-spaced pages of transcribed text. All informants signed informed consent release forms and were assured anonymity. Interviews took place in the offices of the informant and interviewers were given tours of the facility as part of the interview

in most cases. Careful field notes, including photographs, made during these interviews allowed access to perspectives in action, which were later compared to the perspectives of action contained in the transcribed interviews (Arnould and Wallendorf, 1994). Along with member checks, this triangulation of methods both increased the richness and improved the trustworthiness of the data (Lincoln and Guba, 1985).

Results

In this section, we focus on three key factors discussed by Bowersox and Calantone (1998) as extremely important in implementing cross-border supply chain relationships: distance, comparative advantage and integration. Each of the factors is detailed with respect to how it manifested itself in our interview data. While these problems surfaced for nearly everyone, solutions do exist. These solutions will be presented in the discussion section.

Distance Issues

Many of our respondents discussed serious problems relating to problems with the transport of goods effectively and efficiently between countries. The majority of these problems related to procedures in place between countries that caused significant delays in the time it took to transport goods across national borders. For example,

[Slowdowns] are usually on the Mexican side. See, on the Mexican side, at least southbound traffic, usually encounters several different things. One is that the documentation process is pretty good. It's just when it gets to Mexico, the inspections. Over in Mexico, if we have one piece over what's documented on the invoice, it's considered contraband. They automatically fine you, they pull you into a secondary storage area or parking area and want you to unload everything. That can take hours or days. It can be days if they don't want to let it go. If you don't want to work with them, and give them a little bonus on the side, then, you're out of luck. You can be there maybe a week, depending on what it is [the violation] and what company you are. The bigger manufacturing companies have more pull, they've been more established, and they are already well known. (FTZ)

As this example shows, governmental legislations can impose significant slowdowns on products being shipped across the border. These slowdowns can negate any sourcing or timing advantage that a firm had when locating to Mexico.

A second distance issue had to do with the duplication of resources rather than the efficient utilization of resources across borders. The decision to operate a Maquiladora plant in Mexico is driven by a number of factors, not just the availability of inexpensive labor. Initially, the idea was to have “twin plants,” a component production facility in the U.S. and an assembly plant in Mexico. However, this reality rarely occurred. Instead, many companies chose to relocate both facilities to Mexico and limit their U.S. operations to headquarters and warehousing facilities. However, some companies tried to manage facilities on both sides, with limited success, as the following example illustrates:

Having a warehouse over here for someone who had a kind of medium amount of business, it becomes like a tar-baby. You can't have just one guy, because what if he's sick? What if he's on vacation? What if you only had one forklift, because what if it breaks down? It would make it tough. So, you end up with all this stuff over here and it becomes a big cost thing with them. (Cain)

This example shows the challenges multi-nationals face when implementing a cross-border strategy. In a sense, the decisions are the classic “make” or “buy” decisions faced by all organizations. However, the requirements of maintaining facilities on both sides of the border lead to inefficient use of resources and ultimately negate the cost savings achieved by locating in a less expensive labor market.

A final distance issue had to do with the rigidity of local logistics, both in terms of providers and participants in the process. This manifested itself through an engrained cultural belief, as the following example shows:

You still can't get Mexicans from Monterrey to go anywhere but to Laredo. They won't change, even though it costs more money and takes more time. It's the camino real – the royal road, from Mexico City to San Antonio. They've been doing it for five hundred years and they're not about to change just because it makes more sense, is faster, and costs less. (Cain)

This participant explains the “royal road,” which is the one large highway system traversed by many of the Mexican truck drivers. There is a lot more to this quote than the fact that the participant believes that the Mexicans he works with are resistant to change. Much of the problem lies in the social structure of Hispanic cultures. These drivers are familiar with the route and who works on the route. They know exactly what they face when dealing with Mexican customs and any other officials they may meet along the way. As such, they don’t wish to deviate from the familiar, leading to less efficient transport of goods for the client company.

This same form of ethnocentrism exists when dealing with local transportation providers. Some may call this corruption, others will view it as normal operating requirements, as can be seen in the following example:

I had my own fleet of trucks when I was up in Michigan. Down here, I didn’t have a fleet of trucks. I had to get a local carrier. Come to find out, one guy was running the whole place, he had this whole city. Like, you couldn’t talk to anybody without going through them. Every time you went out to quote, as soon as you got the quote back, you could just tell those guys were in collusion. They’re all deadbeats. (Delco)

Understanding the cultural issues, such as business customs and ethics, and also the great emphasis on family and friendships, would help the manufacturer accept this experience as a cost of doing business in Mexico. While the manufacturer would prefer to bid out transportation, he must face the fact that there is only one option and learn to adapt to this situation.

Comparative Advantage Issues

As Porter (1990) claimed, global sourcing enables a company to capture local advantages. Kogut (1985) asserts that, since factor costs vary from one country to the next, firms could take advantage of these differences by locating the activities comprising its value chain in countries that possess a

comparative advantage in the factors that a given activity used intensively.

Porter was adamant that there is no excuse for accepting basic factor disadvantages and that a firm must view its production system in global terms and disperse particular activities in the value chain to whatever country enjoys advantages. While these ideas make intuitive sense, implementing them is sometimes quite difficult, as is seen in the following example: Its an economies of scale, moving an operation over there. Big volume and your wage rates are so huge. Like here, were General Motors pays \$18-\$27 an hour for factory workers. They move down there, and everything is considerably less, with the same technology. That's what it takes, because of all the costs of moving down there, administrative costs, all that stuff going up over there. The only thing that is cheaper is the actual in-line labor. (Fox)

What this example illustrates is that trading comparative advantage in labor factor with equivalent costs for other resources – only works when labor is the major factor cost. Thus, the costs to the entire value chain have increased and the labor cost advantage has been lost.

Another example shows a similar problem with trading one cost function for another without regard to the entire systems' costs:

I think a typical US wage, on the hourly basis, is probably in the vicinity of nineteen and twenty bucks and hour. And you can almost double that for benefits. In the Mexican arena, right now, we are probably in the range of about two dollars and hour. And you can almost double that, too, from a benefits standpoint, to four dollars. Of course, what you gain in terms of labor [costs], you usually end up paying logistics, and the infrastructure, and you run into power [electricity] problems. (Delco)

In this example, the company traded off the comparative advantage in the labor factor with higher logistics and infrastructure costs. Without viewing the entire value chain, a company misses the uneven balance in the entire cost structure by focusing solely on the labor factor.

A third example illustrates something all multi-national firms face; communication barriers. Many of our participants complained about the number of different governmental and non-governmental agencies that have power over their ability to do business. It seems many of the agencies are unaware of other agencies requirements and thus, manufacturers

attempting to comply with all rules and regulations encounter numerous problems in meeting these requirements:

Its very hard to get information. You go to customs, “How do you do this?” And they tell you to do whatever. Then you find out they didn’t tell you everything. You’re supposed to register with Treasury, you’re supposed to register with customs, you’re supposed to register with their equivalent to OSHA. And then you take their equivalent to OSHA, and then there’s another outfit completely different that’s responsible for administering OSHA. They both have power over you and then the state can come in and inspect you for the same thing. So, you have three or four different inspectors coming in, all looking at the same stuff and using their own set of rules. It gets to be a never-ending cycle of correcting this and correcting that, finding out this and finding out that. (Fox)

This example shows that this company traded off the benefits of reduced labor costs with poor information flows. As such, they are often unable to meet requirements for doing business in Mexico. The only way the company saw to address these problems was to hire a “compliance officer” to oversee all of the various agencies that the company was responsible to. This represented another significant cost of doing business that offset the comparative advantage of lower wage rates in Mexico.

Integration Issues

Another key problem discussed by our participants was the difficulty in integrating the supply chain due to the challenges inherent in managing a multi-national workforce and developing ways to train and integrate the workforce to achieve maximum efficiencies. The logistical problems encountered by goods at the border are also encountered by workers who must migrate from one country to the other daily, as the following example shows:

The fastest I’ve been able to cross [the border] is about twenty or thirty minutes. An hour is about average, which is why it starts to really affect the companies on both sides and the workers, as well. The upper management is always on this side. Usually, they have to cut out about 3:30, just to deal with the traffic. ... That’s pretty much the biggest complaint, dealing with the Mexican traffic, not only on the bridge, but in general. People say, “God, it’s crazy, I’d much rather drive in L.A. than in Mexico.” ... As soon as they cross the border, they have a feeling of insecurity. They just don’t feel

comfortable knowing that they're in another country. They're in Mexico and, I guess, they feel there's no law. You're considered guilty before ---.

This informant, who is a customs broker working with a number of Maquiladoras, points to additional stressors on U.S. managers, especially the sense of alienation. A manager whose firm relocated to the U.S. side of the border after an unsuccessful venture in Mexico echoed this sentiment. His comments provided support and a rationale for similar administrative wages on both sides of the border, but suggest that Maquilas may be hampered by problems hiring and retaining qualified management skill.

If I was approached and they said, "OK. I'll pay you a hundred thousand dollars to run a plant in [Mexican city]. I would think twice. I really would. It [the salary] would be a big jump for me, but I'll probably be dead in five years, just from the hassles and nerves, it's a tough job. I have a neighbor who leaves at 6:30 in the morning and he's home by 6:30 every night.

To alleviate some of the problems associated with using U.S.-based managers, many of the Maquiladoras have attempted to hire and train Mexican managers to run the companies. Most have experienced a small degree of success in these efforts; with most of our informants reporting around 50% of the managers are Mexicans. However, the Mexican managers tend to be found in the more mid-Management ranks and not in the highest echelons of the firms. This process; however, progresses discontinuously, as suggested by the following:

It's kind of a catch 22 for us over time. It seems like, just when we get that high potential individual, we have to put him through his Masters, given them various work experiences, and the Maquiladoras next door steals him. ... It's a very competitive market, that skill set, those types of people, are not readily available. They're just not out there. You can go find some for a premium -- (automotive supplier)

Supporting this is the statement of one of our informants:

There's a lot of transitory-type people that are coming up here. They want to make a little bit of money, and they're going to go back home. Their families are back there. There's kids coming up here, I think there is a group or at least a segment that want to hook into a Maquila, get their college degrees, and go back home.

(automotive supplier)

These two examples depict the problems with hiring and training Mexican managers. Nearly every company we spoke to had experienced these problems. Given that domestic talent is heavily sought, those who are well trained are also in high demand and willing to jump to another Maquila for a significant increase in pay and/or benefits. An important aspect of the second quote is the use of the word "kids." The Maquila workers are indeed kids, as the average age is approximately 18 in many of the plants. These workers join the Maquilas to gain an education and also to support their families at home in the interior portions of Mexico. Once they feel they have reached their goals, they leave. These employee problems add up to a significant cost to the Maquila to hire and train good workers. Turnover is a major concern. Because of this, there is another tradeoff between inexpensive labor and costs of professional development.

Discussion, Suggestions, and Conclusion

The results of our study show that Maquiladoras experience many of the same problems as other companies in terms of managing the cross-border supply chain. Key factors such as distance, comparative advantage and integration of the workforce cause problems everyday for the managers involved. There are a couple of solutions that offer hope for the lagging industry.

First, the owners of the Maquilas need to embrace the value chain concept and realize that bottom line costs are not only impacted by inexpensive labor rates. Several of our

participants discussed the fact that the owners of the Maquilas were beginning to look to China and Latin America for procurement and also product assembly. China already has its own booming Maquila industry. The managers of these firms were frustrated by the fact that owners would trade off 12 week delivery time for \$2 an hour in wage rates. As our examples show, trading off low wage rates can be detrimental to the bottom line through increasing transportation, warehousing and inventory costs. Thus, it is vitally important that firms utilize a least total cost strategy when planning and implementing multi-national endeavors. As Porter (1990) suggests, firms must capitalize on advantages in each part of the value chain in the countries that offer those advantages.

Second, although not a solution for all the logistics problems facing the Maquiladoras, domestic sourcing appears to offer promise for improving supply chain performance, thereby improving firm profitability and survival. Domestic sourcing reduces the distance over which materials must be shipped to meet the manufacturing demands of the Maquiladora industry. Reduced distance reduces transportation costs while increasing flexibility achieved through more rapid transit. Removing border crossings further enhances these objectives.

Domestic sourcing also exponentially increases the comparative advantage achieved through differential wages in the labor factor. Currently, with 82 percent of process materials emanating from the U.S. the impact of wage differentials is limited to those experienced in the assembly of these materials. If domestic sources are utilized, the wage differential experienced in the manufacture of process materials arguably reduces acquisition costs of these materials – thereby reducing manufacturing costs of Maquiladora products.

Finally, for the Maquilas to regenerate and begin to grow again, efforts must be made within the NAFTA trading block to further eliminate barriers between the countries. As our

study shows, transportation across borders is a time consuming and sometimes very expensive proposition for both goods and workers. The continuing fights between Mexican trucking firms and the Teamsters Unions in the U.S. must be settled to open the highway systems to all transportation providers in both countries. Only then, will the power of NAFTA come to fruition for those involved.

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Appendix 1

ISSUE GUIDE

- Differences between managing a cross-national supply chain versus a purely domestic one.
- Benefits and problems associated with cross-national supply chain management.
- Logistics issues: What opportunities/problems exist and how do they affect the quality of the relationships?
- Tactics for managing constraints by several governments, both local and national.
- Security issues: how have the borders changed?
- Future challenges and plans for adapting to change.
- Future opportunities and plans to capitalize on them.