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Abstract

Trading arrangements such as GATT, NAFTA, ASEAN, and EC have a major influence on forcing companies that have been traditionally domestic become global. This in turn forces the information technology (IT) organization to change its strategies and networks. We wanted to identify strategic initiatives that IT managers could use when faced with globalization issues. In order to derive these initiatives, we studied the changes that have happened in the textile industry in the USA and the changes in the IT architecture of a specific company, Russell Corporation.

Introduction

During the past 10 years, a number of regional trade and economic blocs in North America, Western Europe and Asia have evolved. These agreements among developed and developing countries are listed in Table 1. In this article, we focus on the impact of NAFTA on textile industry and describe how the IT architecture of one company has changed since the adoption of NAFTA. According to the NAFTA, all barriers to trade between the US, Mexico and Canada will be eliminated by the year 2009. This would create the world's largest free market with more than 365 million consumers (Bahaee and Theeke, 1997). Similarly, the Uruguay Round of GATT is the most far-reaching global trade agreement in history. Some economists estimate that it could boost world output by $270 billion a year in 2005 (*Wall Street Journal, 1993*). Together, these trading blocs represent about 23 percent of the world's population and produce 70 percent of its output (Orr, 1991). At the same time, there are a lot of controversies surrounding these agreements and many have objected to these arrangements from labor, environmental, and financial issues.

Table 1. Global Trade Agreements

Trade Agreement	Members
GATT(General Agreement on Tariffs and Trade)	World Trade Pact negotiated by 124 countries
NAFTA(North American Free Trade Agreement)	Canada, Mexico, US
ASEAN(Association of Southeast Asian Nations)	Brunei, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, Vietnam, and dialogue partners
EU(European Union)	EMU members plus Denmark, Greece, Sweden and the UK. EMU members include Austria, Germany, France, Italy, Spain, Portugal, Belgium, Netherlands, Ireland, Luxembourg, and Finland.

The trade alliances shown in Table 1 have a substantial impact on the profits and strategies of firms. Although information technology (IT) structures and networks have a strong influence on global strategies, their role when joint agreements between

countries occur is not well understood. Researchers in the strategic management literature have reported that the firm's industry, its competitive strategy, and size are important indicators that can affect a firm's strategic response to a new global environment (Harris and Katz, 1991; Meyer, 1982). They state that this new competitive environment requires knowledge of the business, leadership skills, building effective relationships with stakeholders (international partners, customers, suppliers, etc.), transformational skills, and a global perspective (Hitt et al.,1998). They expect that managers will be challenged in developing business processes and adapting to the increasingly complex competitive environment. Many of these researchers do not describe the role that global IT networks play in facilitating commerce.

This paper investigates two major research questions:

- Does a joint trade agreement between countries lead to changes in the profitability of an organization and compel it to become a global company?

- As a particular organization becomes global, how does its IT architecture evolve? What are the lessons that could be learned from this experience?

The research methodology adopted to study the first question is an industry analysis of companies in the US apparel industry, a sector that has been heavily impacted by the NAFTA agreement. The second question is answered by studying the changes in the IT structure in a single company, the Russell Corporation. In the next section, we develop the research model. Then the methodology for the research is presented. Following that, both research questions are answered by an analysis of the data on the companies. The final section generalizes the findings to deduce lessons for IT managers in other companies in developing and developed countries.

Research Model

The research model used in this paper is based on a study by Karimi, Gupta, and Somers (1996). Their research study showed that competitive strategy, IT maturity, and size influence firms' willingness to use IT as part of their strategic response to globalization. These firms had to develop new competitive strategies that are increasingly reliant on IT. We revised their model so that we can answer the research questions. The model is shown as Figure 1. The components of this model are defined below:

Firm's Strategic Response

A firm's strategic response is the rate at which a firm changes its products or markets to maintain alignment with its competitive environment. Firms with different competitive strategies are likely to react differently to the new trade agreements. Competing firms within an industry exhibit patterns of behavior representative of four basic competitive strategies: defenders, prospectors, analyzers, and reactors.

Size

Common operationalization of a firm's size includes gross sales or gross value of assets. Large firms are those with more than 500 total employees and /or annual sales over $1 billion. We categorize small firms as those with 500 or fewer total employees and /or annual sales of $1 billion or less. Size is one of the most important organizational factors that affect a firm's behavior in response to new market environments.

Year Went Off-Shore

This refers to the year the company started operations off-shore for the first time.

Profitability

This refers to the ratio of profits to sales per year expressed in percentage.

IT Architecture

This refers to the network configuration that is deployed by the company. The major configurations are: Centralized, Decentralized, and Integrated (Sankar, Apte, and Palvia, 1991).
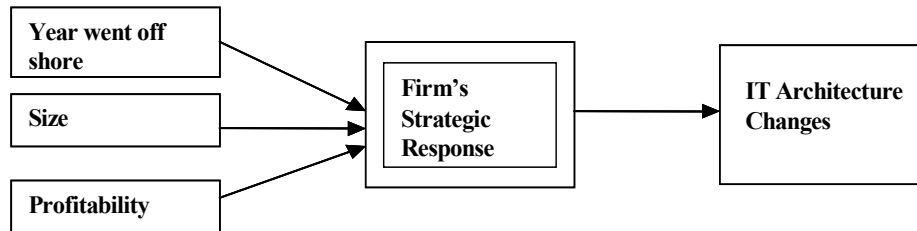

Figure 1. Research Model

Methodology

Based on this model, the first research question is answered by looking at how the factors of size, year went off-shore, and profitability impact a firm's response to globalization. We studied companies in the U.S. apparel industry, since they are one of the industries where major changes happened due to the NAFTA agreement. We collected data from public sources in order to obtain data on the size of the companies, the year they moved operations offshore, and their profitability. These data were analyzed in order to answer the first question.

The second research question dealt with whether an organization's IT architecture changes as it becomes global. Since answering this question required in-depth knowledge of an organization's IT architecture, we used a case study methodology to study one company, the Russell Corporation. We compare the IT architecture of this company before and after globalization. This in-depth study leads us to propose five strategic initiatives that IT managers could adopt when faced with globalization pressure within their company.

The Impact of Globalization on the Profitability of Organizations

In order to answer the first research question, we collected data on the major companies in the apparel industry (Vanity Fair, Liz Claiborne, Fruit of the Loom, The Gap, Sara Lee, Nike, and Russell Corporation) and their profitability ratios for the past 20 years. Table 2 their market capitalization, year they moved overseas, percentage of business offshore, owned or contracted facilities, effect of NAFTA on operations, and future trends.

Profitability Comparison among the Companies

Figure 2 compare the profits among the different apparel manufacturers, and the impact of NAFTA on their domestic operations. They show that NAFTA did lead to changes in the profitability of the organizations, forcing the firm to become global. Figure 2 shows the abrupt changes in profitability of apparel companies after the passage of NAFTA. The chart also shows that larger firms moved their businesses offshore prior to medium and small sized firms. The profitability of all the companies has decreased considerably. After the advent of NAFTA, the profitability spectrum has become much narrower than it was prior to NAFTA.

Prior to NAFTA, larger firms such as VF Corp., the GAP, and Nike had resources to achieve economies of scale and grow rapidly. However, the profits of these high performers have reduced since NAFTA and they seem to have lost the old basis of comparative cost advantage. The much narrower profitability spectrum implies that there is less profitability differentiation among these competing firms.

Table 2. Comparison of Companies in Apparel Industry

	Products	Market Cap(mil)	Year Moved offshore	% of business Offshore	Owned/ Contract facilities	Effect of NAFTA on operations	Future Trends
VF Corp	Intimate apparel	3,678	1995	57%	Contract	Relatively no effect	Customized products and low-cost basic products
Liz Claiborne Inc	Apparel, accessories and fragrances	2,057	1995	85%	Contract	Much lower profit margins on sales	Dramatic shift from in-house staff to contractors
Fruit of the Loom	Casual wear	238	1994	80%	Contract	Profit margins suffered considerably	Increase advertising and lower capital spending
Gap Inc	Casual apparel	31,519	1985	73%	Contract	Positive effect on earnings	Targeting other global Markets
Sara Lee Corp	Personal and household items	21,982	1979	30%	Owned	Consistent earnings stream	Marketing premium brands overseas
Nike Inc	Footwear and Athletic Apparel	15,437	1985	60%	Contract	Negative effect on earnings	Focusing on brand extension and diversification
Russell Corp	Active wear	510	1996	40%	Both	Lower profit margins	Transition to consumer marketing company

Classification of Companies in the Apparel Industry

The strategic responses of these firms were then classified following the postulate of Miles and Snow (1978) that competing firms within an industry exhibit patterns of behavior representative of four basic competitive strategies: defenders; prospectors; analyzers; and reactors. A more stable environment allows defender firms to engage in less environmental scanning. They are expected to defend on a single-core technology for cost reduction and favor IT developed internally. Prospectors tend to pursue an aggressive competitive strategy, spending more time scanning the firms' environment looking for opportunities for differentiation of products, markets, and services. In terms of IT, prospectors spend more time scanning their firm's environments for adoption of emerging information technologies. They also link IT management strategies to their firm's business strategies. Analyzers seek effectiveness through both efficiency and new products and markets. IT leaders in these firms are expected to spend time scanning their environments, while adopting a technologically stable approach in traditional lines of business. Reactors are firms with no distinct competitive strategic orientation. Decisions are made in a reactive rather than a proactive mode.

A chart was drawn with the X-axis depicting percentage of business offshore and the Y-axis depicting profitability for 1998 (Figure 3). The companies in the apparel industry were then classified into the four classifications depending on how they grouped together. Based on this classification, Gap, Liz Claiborne, and Fruit of the Loom are classified as prospector firms since they had moved a majority of their production offshore and their profitability is high compared to the others. VF Corp. and Nike are classified as analyzer firms since they have moved about half their business offshore and their profitability is moderate in the group. Sara Lee and Russell are classified as reactor firms since they have less than 40 percent of their business offshore and their profitability is low amongst the group. Prospectors such as Gap have a higher percentage of business offshore (mostly contractual arrangements) and have a relatively higher profitability than analyzer firms. Analyzer firms such as VF Corp. have a moderate percentage of business offshore and are seeking economies of scale through new locations and markets. These firms exhibit relatively higher profitability than reactor firms. Reactor firms such as Russell have a smaller proportion of business overseas and a lower profitability relative to their competitors. These firms tend to have a firmly entrenched market position and react to changes in the environment and develop strategies to deal with the change instead of actively seeking change.
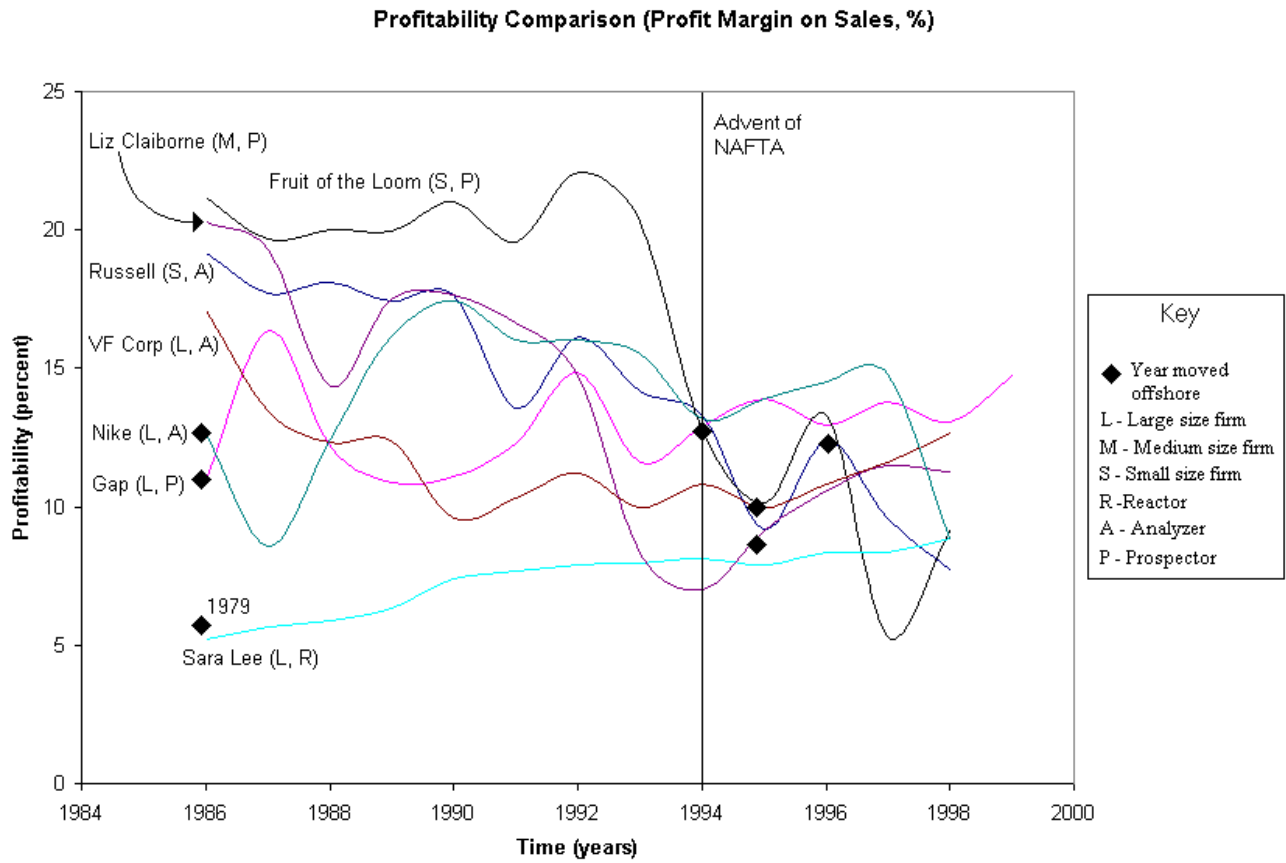
Profitability Comparison (Profit Margin on Sales, %)

Figure 2. Change in Profitability with the Advent of NAFTA

Profitability vs. % of Business Offshore
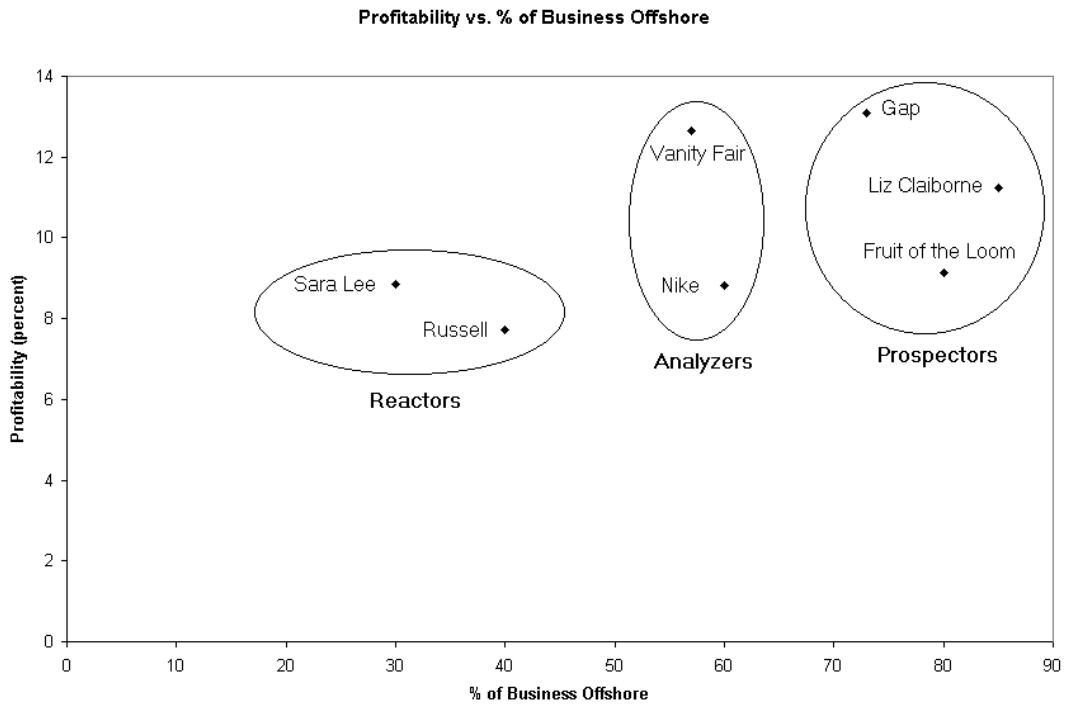

Figure 3. Classification of Companies

Future Trends

Given the small spread of profitability as shown in Figure 2, these firms are forced to compete on the basis of time, quality, or product as opposed to cost leadership alone. The "profitability squeeze" as a result of NAFTA, led firms such as Russell, Fruit of the Loom, and Liz Claiborne to develop low-cost, global strategies as well as the need to restructure their domestic operations. Domestic restructuring forced these firms to further align their business processes and outsource a larger percentage of their garment manufacturing overseas. Changes in the profitability of these companies ultimately led these firms to seek location economies and increased their drive for greater production efficiencies.

Change in IT Architecture as an Organization Becomes Global

We have so far discussed the changes in the strategic response of the major US firms in the apparel industry due to NAFTA. Now, we study how the IT architecture of one firm, Russell Corporation, changed due to the strategic change made by the company due to NAFTA.

IT Architecture at Russell, 1978-1993

Russell Corporation is a 100-year old company that has major roots in the Russell County, Alabama, and is one of the major employers at Alexander City, AL. The company has evolved to be a middle-size firm by 1978. At this time, the orders in this plant were run through a single manufacturing system, thereby managing by process rather than by product. Up to 1993, Russell's business strategy had a domestic focus. The manufacturing operations (Spinning, Weaving, Dyeing, Sewing, etc.) and distribution facilities were vertically integrated. Most of the production facilities were located at Alexander City, AL, and the other manufacturing was in plants that were less than 400 miles from the headquarters. Because of the centralized nature of its business operations and processes, Russell's IT structure was fairly straightforward. The company had a mainframe at Alexander City that maintained data links with Russell's main distribution center in Wetumpka, AL. This architecture was changed in 1990 when another mainframe was located at Mt. Airy, NC since the company had bought a few companies in the NC area. As the top two networks of Figure 4 show, the IT architecture was a centralized STAR configuration that connected scanners and automated readers at the different plants to mainframes. The major equipment vendors were IBM for the mainframe and Digital Equipment Corporation for the plant automation equipment. Most of the software was written using COBOL and assembly level language.

Impact of NAFTA on Russell

When Sara Lee Corp. and other apparel manufacturers started locating their plants offshore, Russell began to feel the impact of paying their laborers $320 per week in the USA whereas the competitors paid $28 per week offshore. The cost differential in labor and the shrinking margin in the T-shirt business forced Russell to follow the other companies to remain competitive. NAFTA cut the cost of apparel manufactured in Mexico by nearly 30 percent on average by eliminating tariffs. Such pricing worked against American manufacturers. An important factor was the consumers' unwillingness to pay full price (Dowdell, 1998). Last, pressure from Wall Street investors to keep sales and profits growing and costs down drove companies to seek wholesale bargains overseas. Cost competitiveness has been problematic at Russell for years as many of its rivals chased efficiencies overseas while the company clung to an overwhelmingly domestic production base.

Change in Russell's Business: 1993-1999

Russell made a gradual shift from a domestic company to a global corporation, with its corporate boundaries expanding to require wide area networks. From the period 1994-1999, the company transitioned from a manufacturing focus to a customer-driven sales and marketing focus by shifting manufacturing operations offshore (Table 4). A new CEO, Jack Ward, took over the company's operations. Jack Ward instituted fundamental changes in an entrenched corporate culture at Russell. His strategic plans included – "shifting of substantial amounts of production overseas; the segmentation of Russell into more clearly defined strategic business units to foster greater autonomy and accountability; and intense market research to uncover consumers perspectives about the company" (Dowdell, 1998). He has also changed the headquarters of Russell Corporation from Alexander City, AL, a small town, to Atlanta, GA, a large metropolitan area.

As a result of these structural changes, Russell's offshore operations are a combination of company owned plants and contract arrangements with large contractors. The changes at Russell are summarized in Table 3.

Table 3. Changes at Russell

Past Operations	Present Restructuring	Effects of Nafta	Offshore Strategy
Manufacturing driven	Global consumer marketing driven	NAFTA eliminated tariffs on imported goods	40 percent of Russell's production overseas
Domestic production base	Substantial amounts of production overseas	Garment producers forced to compete with non-union, cheap labor	Strategic business partnerships with contractors
Single manufacturing system managed by process rather than by product	6 new strategic business units – product oriented	Consumer unwillingness to pay full price	Cost competitiveness and cost leadership
Large distribution center geared toward the needs of smaller customers	New supply chain organization	Pressure from Wall Street to keep sales and profits growing	Cost competitiveness and cost leadership
Inefficient production flow	Simplified product flow	Increasing automation and increased competition from sweatshops	Increased efficiencies overseas
Single headquarters – Alexander City	Dual headquarters in Atlanta and Alexander City		

Change in Russell's IT Architecture: 1993-1999

Russell changed its IT architecture to a ring architecture. They have an IBM mainframe in Alexander City, and another in Mount Airy, NC, which is the headquarters of their Cross Creek strategic business unit. The mainframes are bridged via dedicated circuits. Russell uses ITC Delta Com and Sprint backbones to connect the mainframes. The company has approximately 90 mid range VAX machines for their Local Area Networks (LAN). They are used in the manufacturing environment for process control and also function as LAN (Local Area Network) servers. Russell has a Private Branch Exchange (PBX) in Alexander City in the form of a Nortel 81C switch, which allows them to run voice over data between Alexander City and Atlanta. They use Cisco routers to connect to outside facilities that include both domestic and offshore.

The IT transition has led the company to take a closer look at its domestic IT infrastructure. Dedicated T1 lines are being used between Alexander City and Atlanta (one for data, one for voice). ITC Delta Com is the provider of T1 lines and the frame relay circuit. ITC Delta Com has a POP (Point of Presence) in Russell's switch rooms in Alexander City. As a result, Russell avoids almost all-local loop charges, which results in considerable long distance savings for the company. The only local loop utilization is now for local calling area connections, e.g., within the community.

Russell's IT Architecture at Honduras

In order to facilitate its overseas operations, the company is running a T1 line to Opelitka, FL, which in turn connects to a satellite uplink. The satellite dish is a pole mount that connects their first plant in Zipcholoma, Honduras via a 64Kbps circuit. Approximately a mile away, in another industrial park is Russell's second plant in Zipcholoma. The local provider in Honduras has installed a RF modem for the two plants to communicate with each other. The third plant in Zipcholoma is located at a 25 miles distance with a mountain range between the first plant. A repeater is being installed at the top of the mountain to enable RF communications. There are four lines for voice and one for data. Figure 5 shows Russell's IT architecture in Honduras.

The dedicated network makes it possible for Russell Corporation to use a 4-digit extension to connect the plants in Honduras and in the USA. This makes it easy for the employees to talk to each other although they are in different countries. In addition, the use of voice over IP makes it possible to use the same network for both data and voice thereby saving significant amount of money on telecommunications.
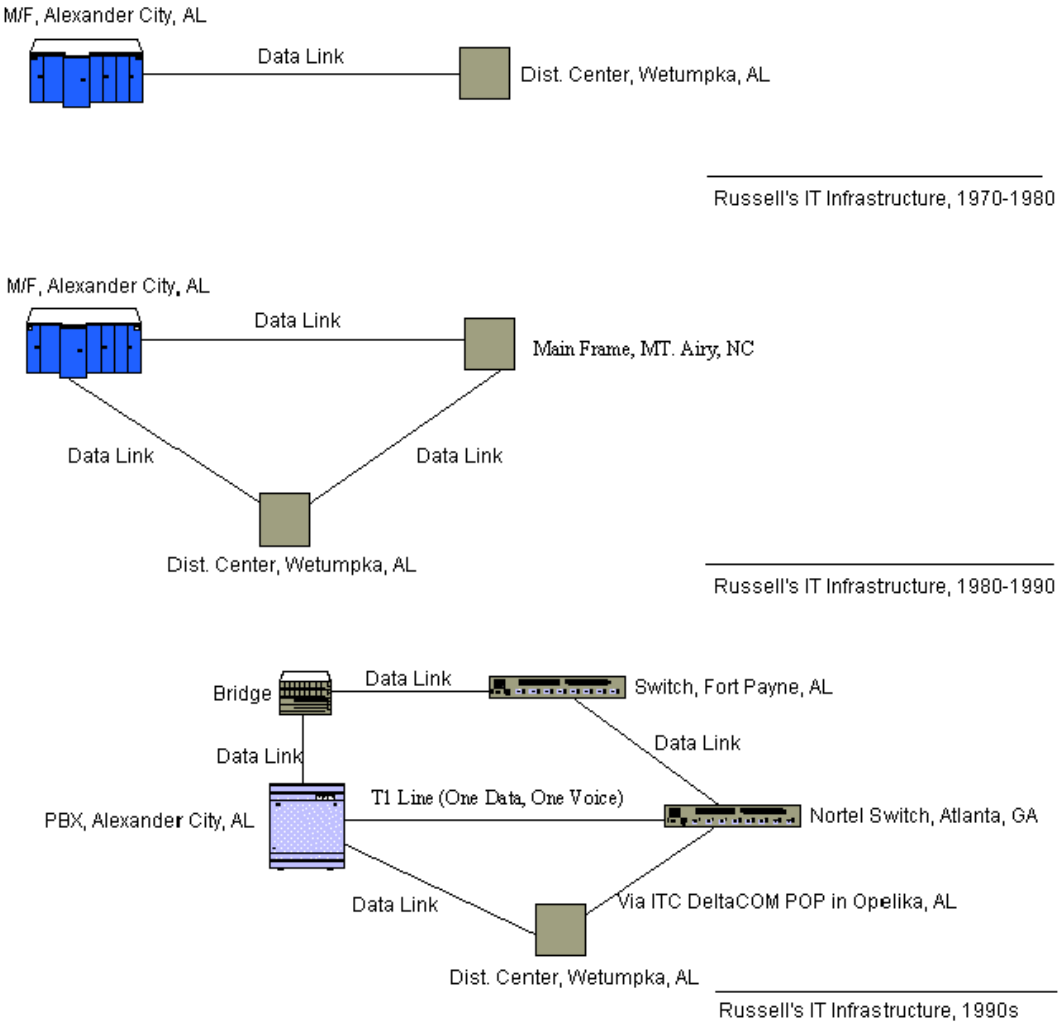
Figure 4. IT Evolution at Russell Corporation

Russell's IT Architecture at Mexico

The Russell Corporation has 3 plants in Chihuahua and 2 plants in the Yucatan Peninsula. The company uses Sprint and Mexico's Telmex as backbones to connect to Alexander City via a 128K circuit to 3 plants in Chihuahua. From Chihuahua, a 128Kbps circuit connects to the other two plants in the Yucatan Peninsula. Once again, similar to to the configuration in Honduras, Cisco routers are used to generate and transmit back manufacturing information to headquarters. Overall five lines are available for transmitting data, fax, and voice.

Russell uses the combined services of SCSI and Delta Com for their Mexican operations. Russell expects to increase the bandwidth to 384 Kbps to take advantage of video conferencing. In a decade or less, the company hopes to have their own satellite links in Mexico.

Summary of Change in IT Architecture at Russell

Table 4 summarizes the IT transition adopted by Russell Corporation. In the next section, we describe how the IT division at Russell Corporation responded to the change in the strategy of the company. These strategies could be of use to IT managers of other companies that are faced with similar globalization issues.
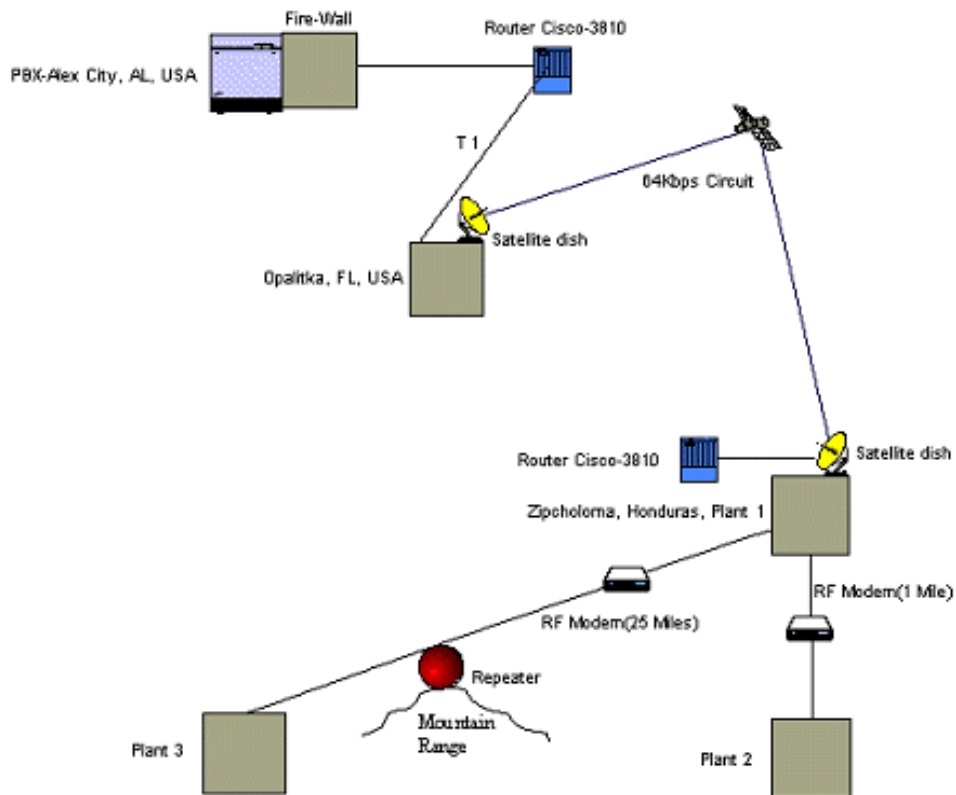
Figure 5. Russell's IT Architecture at Honduras

Table 4. Russell's IT Transition

Time Period	Business	Manufacturing Strategy	IT Structure
1978-1993	Domestic focus	Vertically integrated	Centralized STAR architecture, Local area networks
1994-1999	Global focus	Consumer marketing emphasis	RING Topology, Wide area networks

Strategy Initiatives for it Managers at Companies That Are Impacted by Globalization

As EC, ASEAN, GATT, and other trade treaties are implemented, many labor-intensive manufacturing industries such as the tire industry, automobiles, agriculture, oil, and others would be faced with the need to reduce costs further by sourcing part of their manufacturing operations offshore to gain competitive as well as comparative advantages. The study of the companies in the apparel industry and the IT architecture of Russell Corporation leads us to propose five major strategies that IT managers could adopt when faced with similar situations:

• refocus to incorporate global IT architecture,
• develop IT as the leader of change,
• learn from global IT operations and apply it in domestic setting,
• align IT with modular product designs, and
• create IT networks that are flexible and that foster strategic alliances.

We explain these recommendations below and show examples of how Russell Corporation has adapted them in their operations.

Refocus to Incorporate Global IT Architecture

The IT management at Russell Corporation has become more cost conscious and is finding solutions that legacy systems might not allow. The company is in the process of installing a Nortel switch in the DeSoto Mills location so they can bridge the switches between Alexander City and Fort Payne, AL. Once the switches are bridged, the company plans to put in a dedicated circuit to run voice over data between the sites. Over the next two years, ITC DeltaCom plans to have a POP in Opelika, AL, a nearby city. This will enable Russell to have a continuous ring topology on the ITC DeltaCom long distance circuit. Presently the company has deployed reduced T1 rate between Alexander City and Atlanta. The redundant ring on the ITC Delta Com network would enable Russell to give up TI lines and replace the current loop with a frame relay network, resulting in substantial cost savings for the company.

Develop IT as the Leader of Change

Another key characteristic is that the IT division at Russell has become a leader in the company in making changes. It is no longer relegated to providing help and assistance to the other units as needed, but rather has assumed a central role in decision making. For example, they have implemented voice over IP to Honduras. Russell plans to construct three Russell owned facilities in Honduras. Russell is in the process of upgrading the bandwidth from 64K to 128K circuits. At the same time, the company will add a Cisco router at the third plant. This would allow them to have a STAR network, and provide good services to any number of plants at Honduras. In these implementations, the IT division has taken the leadership in making the changes thereby creating a global network that is cost effective and provide the services needed for the corporation.

Learn from Global IT Operations and Apply IT in Domestic Setting

Companies could learn valuable lessons from implementing IT solutions overseas and can create significant cost and competitive advantage by adapting these solutions to their domestic IT architecture. For example, Russell plans to use voice over data network in the near future for all of its domestic long distance circuits. When this happens, the PBX at Alexander City could become the basis of a CLEC, competitive local exchange carrier, competing with LECs such as BellSouth. This would provide added revenues to the company.

Supply chain integration is a future possibility that is being considered by Russell Corporation. As Russell develops its enterprise network, it is considering implementing Virtual Private Networks (VPN). Simultaneous voice/data communications is enabled by these high-speed networks through the use of IP telephony. This would require an Internet voice gateway incorporated into a networking device, a router. This change comes from the company successfully implementing voice over IP networks globally.

Align IT with Modular Product Designs

Another major change Russell Corporation has embarked is modular product design. A modular product design creates "standardized interfaces in a product architecture that permits a range of variations in components without requiring changes in the overall product design"(Hitt et al., 1998). With the use of modular product design and the IT network architecture, Russell is able to provide customers the same level of service as was provided when the company was domestic. Every three days, a ship-carrying container of cut parts lands at Porte Cortez, Honduras. Each container contains components for 168 garments (in dozens). At each point of the sewing process, the bar codes are scanned so that the company is able to accurately monitor the work-in-process that includes – status update, sewing operations, quality assurance, assembled garments, boxes leaving the plant, transport, customs, arrival at the port, receiving at the distribution site, and finished goods inventory (Snyder et al., 1999). Similarly, trucks carry containers with cut parts that land in Honduras, the garments are sewed within three days, and the finished garments are put on the container is driven back to the USA. Drivers working in shifts drive the containers without stops. The IT networks track the movement of the containers globally so that the customer is provided the same production turnaround time as was done earlier under domestic manufacturing process.

Create IT Networks that are Flexible And that Foster Strategic Alliance

The challenge for global manufacturing firms is to identify and exploit cross-border synergies, and balance local demands with the global vision for the organization. This requires networking flexibility (networks of relationships with external parties). "In periods of dynamic change that produce strategic discontinuities, organizational learning must be nonlinear and involve a configuration of skills and competencies " (Lei et al., 1996). Russell has shown that it could work with overseas partners effectively. Russell Corporation has positioned itself as a global entity by realigning its core business processes with its competitive IT strategy. The customer driven approach to global operations has enabled this company to take a closer look at its local competitors' environment. As a result, the firm is restructuring its domestic IT strategies to seek similar cost advantages that it gained overseas. The move to a "decentralized ring topology" structure facilitates that transition.

In a dynamic environment, it is extremely difficult for a single firm to develop internally all the skills and knowledge necessary to compete effectively. This is especially true when a firm is attempting to enter a foreign market. Globally competitive firms have increasingly become involved in alliances and joint ventures with competitors. Using these collaborative inter-organizational approaches, firms hope to gain knowledge and skills necessary to compete more effectively. Recently, network approaches (e.g., virtual private networks) have opened up a new area of inquiry into ways firms can collaborate in real time with one another. Through collaborative research pacts, research consortia, and satellite organizations, firms are able to develop new skills, leverage current skills, or compensate for current weaknesses (Powell et al., 1996). This also enables firms to share the risks for activities that are beyond the scope of a single entity.

Russell has shown its ability to form strategic alliances with foreign PT&T partners by creating networks that utilize satellite and land-based lines. The ability to create a 3-day production turnaround even though part of the manufacturing is overseas shows how the company has utilized strategic alliances with other firms and IT networks to position itself for the future.

Conclusions

This article shows that joint trade agreements between countries have strong impact on the profitability of companies and reduces the spread in profitability percentage in the apparel industry. We also saw that the IT architecture of a particular company, Russell Corporation, had to change drastically in order to cope with the changing business environment.

An examination of the IT architecture change for Russell Corporation shows that major changes take place when the business environment changes. IT had to become a leader in fostering change in the organization. No longer could it play the role of a follower. Another finding is that innovative technical solutions that have proven themselves overseas could be brought back to improve domestic IT operations. A third finding is that innovations in modular design become essential as the distances among the manufacturing plants increase drastically and cycle time expectations remain constant. A fourth finding is that the IT network has to be designed to be flexible to handle unexpected call volumes and data traffic and the reliance on IT networks becomes critical to sustain the strategic alliances formed by companies.

Overall, the challenges to IT management increase significantly as joint trade agreements between countries are executed. It is critical that future IT professionals in developing and developed countries be retrained to handle the changed responsibilities expected of them.

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