

ABSTRACT

GUPTA, DEEPAK. An Analysis of Disruptions in the U.S Apparel Manufacturing Industry and Identification of Continuity Planning Strategies (under the direction of Dr. Hodge, Dr. Cassill, and Dr. Kilduff).

The purpose of this research is to conduct an exploratory analysis of the disruptions in the United States apparel manufacturing industry. The specific research objective is to identify and determine the nature of disruptions and the continuity strategies in the US apparel manufacturing industry. The research was conducted in two phases. The Phase I research gathered quantitative data using a three-page survey questionnaire developed by the researcher. The questionnaire was structured by a designated set of questions that were separated in relation to the disruptions and business continuity planning. The questions were structured to obtain an understanding of the types of business disruptions and the business continuity planning in the US apparel industry. The Phase II research gathered qualitative data from 10-K SEC filings of ten randomly selected US apparel companies. Data was gathered on the risk of disruptions and the response strategies used by companies to handle those risks. Companies were selected based on convenience sampling, as this study explores the current status of continuity planning in the industry to form the basis of future research.

The risk of disruption to companies in apparel industry is significant due to the international nature of the business, large supply base, and the ever changing trade and customs regulations. The movement of the United States apparel manufacturing industry to low wage countries, increased use of independent and contract manufacturers, and the trend towards full-package sourcing has increased the industry risk exposure. The business continuity planning culture is not well developed in the industry. Most companies studied have not completed their risk assessment and

business impact analysis. The budget is not usually allocated for the development and implementation of continuity plans, and no training programs for employees were identified to effectively handle a disruption.

Results will benefit industry personnel by providing insights into today's dynamic apparel manufacturing environment as well as identifying key disruptions. Future research studies relating to this topic were identified.

**AN ANALYSIS OF DISRUPTIONS IN THE U.S APPAREL
MANUFACTURING INDUSTRY AND
IDENTIFICATION OF CONTINUITY PLANNING STRATEGIES**

By:
Deepak Gupta

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APPROVED BY:

Dr. George Hodge

Dr. Nancy Cassill

Dr. Peter Kilduff

To my parents and sisters for their unconditional love and support
To all those directly and indirectly affected by events of September 11, 2001

BIOGRAPHY

The author of this research study, Deepak Gupta, was born in New Delhi, India on April 5, 1979 as the eldest child of Mr. Mahesh Gupta and Mrs. Sushila Gupta. He has two younger sisters Anushree Gupta and Neha Gupta.

Deepak received his elementary and high school education in New Delhi. He entered the Technological Institute of Textile & Sciences, Bhiwani, India, in May 1997. After four years of study, in June 2001, he graduated with a Bachelor of Technology Degree in Textile Technology. He came to North Carolina State University in August 2001, to pursue Master of Science degree in Textile Management Technology.

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TABLE OF CONTENTS

LIST OF FIGURES	VII
LIST OF TABLES	VIII
CHAPTER 1	1
INTRODUCTION	1
OVERVIEW	1
PURPOSE OF THE STUDY.....	3
<i>Disruption Research Statement</i>	3
<i>Continuity Research Statements</i>	3
SIGNIFICANCE OF THE STUDY	3
LIMITATIONS OF THE STUDY	4
DEFINITION OF TERMS ¹	4
CHAPTER 2	7
REVIEW OF LITERATURE	7
SUPPLY CHAIN MANAGEMENT	7
HISTORICAL PERSPECTIVE OF SUPPLY CHAIN	8
US TEXTILE INDUSTRY AND SUPPLY CHAIN	9
RISK AND DISRUPTION	12
<i>Cost of Risk of Disruption</i>	14
<i>Disruption in Supply Chain</i>	14
<i>Sources of Risks to Business Continuity</i>	18
<i>Factors of Supply Chain Exposure</i>	26
RISK MANAGEMENT	28
<i>Business Continuity Management</i>	29
CHAPTER 3	34
RESEARCH METHODOLOGY	34
PURPOSE	34
<i>Disruption Research Statements</i>	34
<i>Continuity Research Statements</i>	34
RESEARCH DESIGN	34
<i>Phase I – Quantitative Research</i>	35
<i>Instrument Development</i>	35
<i>Sample Procedure</i>	38
<i>Sample for Phase I</i>	41
<i>Data Collection</i>	41
<i>Data Analysis</i>	42
<i>Phase II: Qualitative Research</i>	42
<i>Instrument Development</i>	42
<i>Sample Procedure</i>	43
<i>Data Collection</i>	45
<i>Data Analysis</i>	45
CHAPTER 4	46
RESULTS	46

RESULTS PHASE I.....	46
<i>Sample Description</i>	46
<i>Results</i>	50
<i>Company A</i>	50
<i>Company B</i>	52
<i>Company C</i>	55
<i>Company D</i>	56
<i>Company E</i>	58
<i>Company F</i>	60
RESULTS – PHASE II.....	62
<i>Results</i>	65
<i>Company 1</i>	65
<i>Company 2</i>	66
<i>Company 3</i>	67
<i>Company 4</i>	68
<i>Company 5</i>	70
<i>Company 6</i>	71
<i>Company 7</i>	71
<i>Company 8</i>	72
<i>Company 9</i>	74
<i>Company 10</i>	75
<i>Final Results – Phase II</i>	76
CHAPTER 5.....	80
CONCLUSIONS AND RECOMMENDATIONS.....	80
SUMMARY.....	80
SUMMARY OF RESULTS.....	81
<i>Disruptions</i>	81
<i>Continuity Planning</i>	82
CONCLUSIONS.....	85
FUTURE RESEARCH.....	85
REFERENCES.....	87
APPENDIX – A¹.....	92
APPENDIX - B.....	94
APPENDIX – C.....	97

LIST OF FIGURES

Figure 1: The textile and apparel production distribution chain.....	10
Figure 2: The physical supply chain	15
Figure 3: When disaster strikes.....	16
Figure 4: Supply Chain Complexity.....	17
Figure 5: Environmental sources of risk.....	19
Figure 6: The risk spectrum	22
Figure 7: The business continuity management cycle	30
Figure 8: Sample selection procedure-Phase II	44

LIST OF TABLES

Table 1: Disruptions.....	23
Table 2: Disruption Categories.....	36
Table 3: Instrument Development.....	37
Table 4: Phase II Research Instrument	43
Table 5: Sample Description.....	46
Table 6: Phase I Survey Results.....	47
Table 7: Phase I Sample Companies Affected by Disruptions.....	50
Table 8: Company A – Survey Results.....	51
Table 9: Company B – Survey Results.....	53
Table 10: Company C – Survey Results.....	56
Table 11: Company D – Survey Results	57
Table 12: Company E – Survey Results.....	59
Table 13: Company F – Survey Results	61
Table 14: Results: Phase II.....	63
Table 15: Disruptions Identified by Phase II Sample Companies.....	65

CHAPTER 1

INTRODUCTION

Overview

The consequences of the September 11, 2001, terrorist attacks have been far reaching as they not only altered the world's political and military landscape but also the global business environment. The September 11th attack on World Trade Center tested the continuity plans of American businesses. More than 15 million square feet of office space and telecom and computer equipment worth 2-5 million was damaged (Arnold, 2002). The attacks had a great effect on businesses close to and far away from the site of the attacks. The country braced for war and the already volatile business environment was marked with further uncertainty. The US border security was tightened, and shipments from around the world were delayed due to security checkpoints and grounding of flights for the fear of more attacks (Betts, 2001).

The security measures that followed the terrorist attacks created bottlenecks in air transport, and prolonged delays at border crossings. Widespread delay in transportation resulted in costly inventory shortages and plant shutdowns for many U.S. manufacturers and goods shortages for many retailers (Martha & Subbakrishna, 2002). It was a major *disruption* for business organizations. Companies found themselves reassessing commonly accepted strategies for sourcing, transportation, demand planning and management, and inventory. The companies that had business continuity plans were able to do business with minimum downtime and minimum loss of data (Arnold, 2002). As businesses throughout the world attempted to return normal, a need for continuity plans was revived.

In the aftermath of disruptions that result from the natural disasters, terrorism or equipment breakdown, organizations have recognized the need to be prepared, as shortages caused by disruptions can erode productivity and cause permanent customer loss (Ericson, 2001). The issue of supply chain disruption becomes more significant with the economy's emphasis on speed and efficiency (Griffy-Brown, para 2). The Quick Response and Just-in-time delivery philosophies that now characterize the business have been credited for the revitalization of American industrial economy (Ericson, 2001). For multinational corporations or for companies that depend on suppliers' abroad, disruptions have made clear the unpredictability of business operations. In light of new risks and new tradeoffs, companies must adapt their supply chain designs and risk management strategies. (Martha & Subbakrishna, 2002)

The textile and apparel industry is characterized by high demand uncertainty and long lead times (Abernathy, Dunlop, Hammod & Weil, 1999). Any disruption in the textile-apparel supply chain can compound the effect downstream (Leung, 2002). Apparel manufacturers sourcing from overseas count on supplier penalties to ensure quality and timeliness, but disastrous events brings invisibility in information (Ericson, 2001). Revisiting the supply chain technologies and assessing their adequateness to give the desired visibility in unexpected events and to be able to react to those events has become vital for organizations.

Profound changes in global business risk environment have resulted in the behavioral change of its entities and channels. The need for organizations to adapt to the dynamics of environment stresses the identification and reassessment of all kinds of risks and risk management strategies (Kessler, 2001).

Purpose of the Study

The purpose of this research is to conduct an exploratory analysis of the disruptions in the United States apparel manufacturing industry.

The specific research objective is to identify and determine the nature of disruptions and the continuity strategies in the US apparel manufacturing industry.

There are four primary research questions that shall be answered through this research.

Disruption Research Statement

1. What are the disruptions that are occurring in the U.S apparel manufacturing companies?

Continuity Research Statements

2. Do companies have back up or continuity plans for the disruptions?
3. What is the status of business continuity planning in the US apparel industry?
4. What is the strategic nature of the continuity plans?

Significance of the Study

The research will provide insight on the issue of disruptions in today's dynamic apparel manufacturing environment. This is of particular interest due to the significant impact of events of September 11, 2001, that caused massive supply chain disruptions and revenue loss. The current literature lack research on the disruptions and continuity plans in the apparel manufacturing industry, that by itself is characterized by high demand uncertainty, fierce competition, and long lead times. The general trend of offshore sourcing in search of low cost labor further increases the

vulnerability of business in this industry to the frequency and impact of a disruption. This study will provide a better understanding of the disruptions.

Limitations of the Study

There are some limitations of this study. First, research will focus solely on the apparel manufacturing industry, which is one segment of the textile and apparel complex. Any disruption in the textile-apparel-retail supply chain will have a significant impact on the apparel manufacturing. Second, the research is exploratory in nature. Therefore, only a select sample of US apparel companies will be studied. The results cannot be generalized to the population of the apparel manufacturing industry.

Definition of Terms¹

Disruption:	Discontinuity from normality.
Business Continuity Plan (BCP):	A clearly defined and documented plan for use at the time of a business continuity emergency, event, incident and/or crisis. Typically a plan will cover all the key personnel, resources, services and actions required to manage the business continuity management process. The term is interchangeable with business contingency plans, business recovery plans, and recovery plans.
Hazard:	A source of potential harm or a situation with a potential to cause loss.

Impact:	The potential level of impact and effect of a Business Continuity event, incident or crisis over time on an organization. The level of impact and effect is usually relative to the size of the organization and its BCM resilience. The types of business impact are usually described as financial and non-financial and are further divided into specific types of impact.
Lead-time:	The time it takes for a supplier of equipment, product or service to make them available.
Loss:	A negative consequence, which may be financial e.g. loss of cash, or non-financial e.g. loss of information or loss of goodwill.
Organization Risk Management:	Where both current and emerging risks are managed in an integrated way across the whole organization.
Outage:	Period of time that a service, system, process or business function is expected to be unusable or inaccessible which has a high impact on the organization, compromising the achievement of the

organization's business objectives. An outage is different to 'downtime' where process or system failures happen as a part of normal operations, and where the impact merely reduces the short-term effectiveness of processes.

Outsourcing:	The transfer of business functions to an independent (internal and/or external) third party supplier.
Risk:	The potential variation in outcome.
Risk Assessment:	The overall process of risk identification, analysis and evaluation.
Uncertainty:	The doubt in minds concerning our ability to predict future.
Cost of risk:	The cost imposed on organizations because of the presence of risk.

1. Source: Glossary of general business continuity terms [Online]. Retrieved January 2003 from <http://www.thebci.org/frametrial.html>

CHAPTER 2

REVIEW OF LITERATURE

The review of literature is divided into three parts. The first section introduces the concept of Supply Chain Management and developments over the years. The second part discusses the US textile complex highlighting the trends and dynamics in the textile, apparel and retail industry. The third section introduces the concept of business risk and disruption, discussing the sources of risk, and business continuity planning as a process of risk management.

Supply Chain Management

‘Supply Chain Management’ (SCM) and other similar terms such as ‘network sourcing’, ‘supply pipeline management’, ‘value chain management’, and ‘value stream management’ have, in recent years been receiving increasing attention from academics, consultants and operational managers (Romano & Vinelli, 2001). Supply chain management has received a lot of attention and the terminology has been used by companies to describe the set of manufacturing and logistics processes that result in delivering a product to their customers (Lovejoy, 2001).

Handfield (2000, pg. 2) gave a broader definition of the supply chain that covers all the aspects of supply chain management.

“The supply chain encompasses all activities associated with the flow and transformation of goods from the raw materials stage, through to the end user as well as the associated information flows. Supply chain management is the integration of these activities through improved supply chain relationships, to achieve a competitive advantage”.

Supply chain is a network of entities formed to manage coordinated information, material and financial flow, plant operations and logistics (Lee & Billington, 1993).

Historical Perspective of Supply Chain

Tremendous developments in supply chain practices have been observed in various industries in the last two decades. The period from 1960-1975 saw a vertically integrated structure, where the optimization of activities were based on the internal functions. The vendor relationships were a win-lose interaction and often adversarial. Manufacturing systems were based on Material Requirements Planning (Chandra & Kumar, 2001). From 1975-1990, the industry remained vertically aligned but was involved in process mapping and analysis to evaluate their operations, identifying the points of inefficiencies. Organizations realized and benefited from the integration of functions such as product design & development and manufacturing (Chandra & Kumar, 2001). This period also saw a rise in quality related corporate philosophies such as Total Quality Management as well as various ISO standards.

The increased global competition and demanding customers forced many organizations to look for strategic alliances (Elmuti & Kathawala, 2001). The firms felt competitive pressure to introduce new products of improved quality and at lower price. This period also saw an increase in use of information technology to enhance manufacturing as well as serviceability. Enterprise resource planning, distribution requirements planning, e-commerce, product data management and collaborative engineering are examples of such technologies (Helms, Etkins & Chapman, 2000). Agile manufacturing, Just-In-Time and Quick Response were the new mantras of the manufacturing and retail industry (Chandra & Kumar, 2001). The firms' total cost focus shifted to 'source to customer' as opposed to extracting the lowest costs from immediate vendors (Turbide, 1997). Outsourcing for both manufacturing and services increased, with simultaneous reduction in suppliers and vendors, and increased sharing of information (Yu, Yan & Cheng, 2001).

A greater trend has been observed towards customized products and services. This has resulted in greater organizational and process flexibility and greater coordination between the customers' customer as well as suppliers' supplier (Chandra & Kumar, 2001). The dynamics of business environment coupled with other factors discussed above have led to the philosophy of supply chain management.

US Textile Industry and Supply Chain

The textile complex consists of supply chain of fiber to fabric through the end use of apparel, interior furnishings and industrial fabrics and the retail companies, who partner to manufacture and distribute textile and apparel goods (Ostic, 1997; Dickerson, 1999). Dickerson (1999) proposed the textile and apparel production distribution chain as shown in Figure 1.

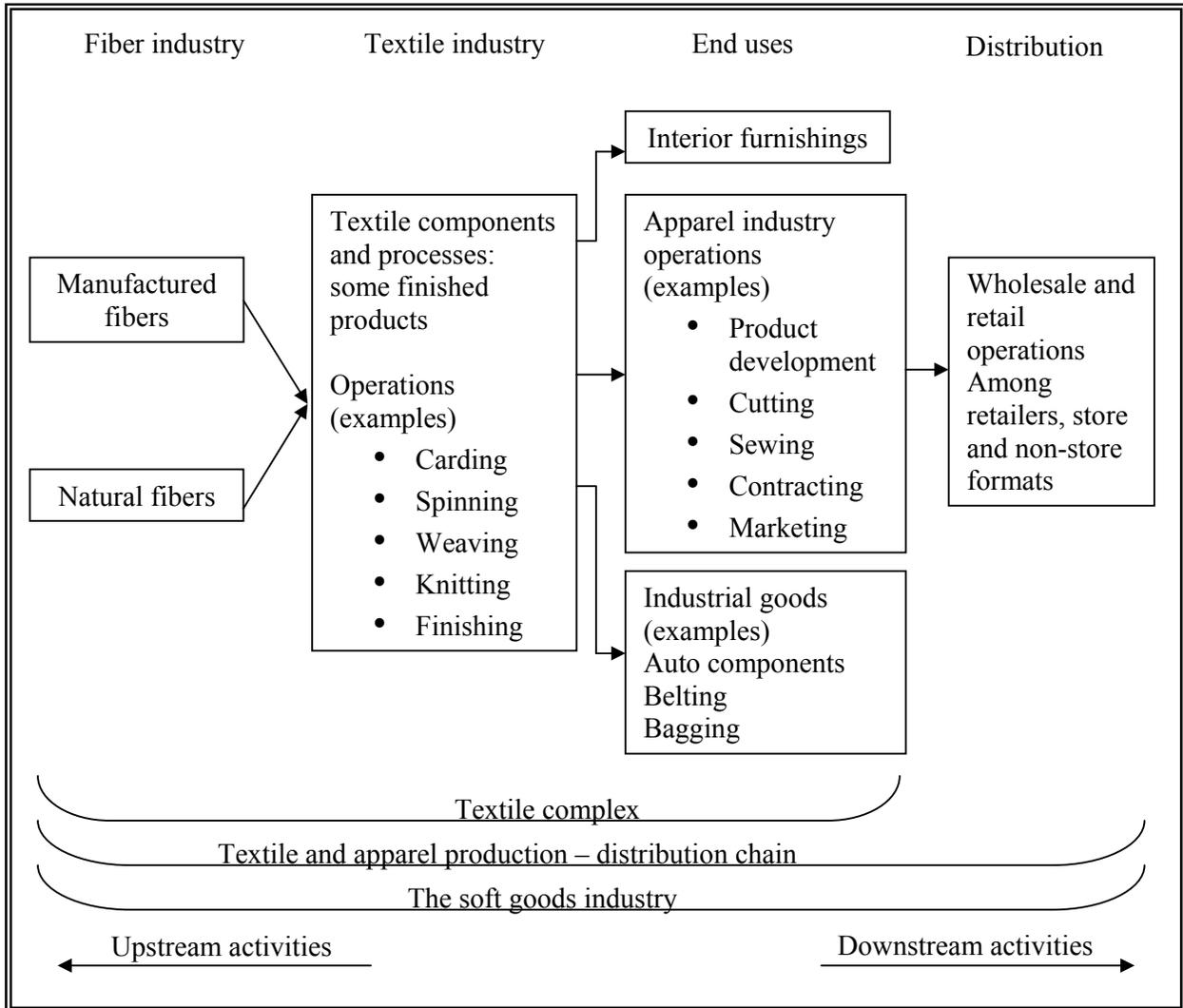


Figure 1: The textile and apparel production distribution chain. Source: Dickerson, K. (1999). Textiles and apparel in global economy. (3rd ed.), pg. 19, Upper Saddle River, NJ; Prentice Hall.

The textile complex is in a state of transition facing increased global competition and has altered dramatically over the last decade (Ostic, 1997; Kilduff 2000; Divita & Cassill; 2002; Khanna, 2002). Major industrial restructuring, internationalization of manufacturing and services, vertical disintegration and outsourcing, and the move to being customer driven and incorporation of technology (Rubin, 1999) are some of the widely evident changes.

The industrial trends confronting US textile industry are challenging. Global competition in textile and apparel complex has increased over the years. The U.S

manufacturing has experienced a tremendous capacity transition to the developing countries in Far East and North Africa (Abernathy et al, 1999; Rubin, 1999). Comparative labor costs even after allowing for productivity, quality, transport costs, timing issues, taxes and duties have been the main cause behind this shift. Low cost of imports has presented a major threat to the industry's stability. The shift in sourcing has seen the reduction in the extent of ownership and direct control of factories (Hunter, King & Nuttle, 1992; Abernathy et al, 1999; Rubin, 1999). The tradition of mass production along the textile supply chain to optimize costs is no longer a profitable strategy (Hunter, 1990). With falling of trade barriers and quotas, textile and apparel industry has seen new partnerships and structures that are difficult to decipher with certainty (Abernathy et al, 1999).

Time to market and supply saturation are other problems confronted by apparel and retail industry (Abernathy et al, 1999). Innovations in material development and production technologies led to product proliferation and shorter product life cycles. The increase in average per capita with a rise in active lifestyle, informal corporate culture and casual wear created a demand for new fabrics and garments (Kilduff, 2000). The market further diversified creating niche and micro segments based on ethnicity, age, income, lifestyle and location. This in turn led to difficult and inaccurate forecasting, that has further increased the environmental dynamism and uncertainty (Leung, 2000). The consumers of textile and apparel have become more sophisticated demanding differentiated customized product, a wide variety, better service and lower prices (Khanna, 1996; Leung, 2000; Kilduff, 2000). Different manufacturing and retail business models diversified the market increasing competition and introduced more uncertainty in the market.

These changes have encouraged the development of more flexible manufacturing and supply chain technologies (Rubin, 1999). A new type of integration has also emerged from these changes. Corporate entities in different part of the supply chain in the world have moved to specialization concentrating on their core competencies and outsourcing the non-core functions (Leung, 2000; Cho & Kang, 2001). These discreet specialized units have intimately involved with the others operation in many key aspects, thus creating strategic alliances that have taken an international dimension as individual players have become involved in global supply chains (Cho & Kang, 2001).

Technology has played a major role in the reshaping of textile and apparel industry. Computer based manufacturing and distribution planning, computer aided design and management systems, and the developments in information technology based communication have made the international operations more feasible (Dufor, 1999; Boubekri, 2001). The need to react to changes in consumer preferences and deal with the volatility of the demand has led to the Quick Response strategy where the retailer places the order very near to demand to be delivered even nearer to the final point of sale and in smaller quantities (Hunter et al, 1992). Closer supplier-customer links are necessary for quick response to work effectively.

Risk and Disruption

The Webster dictionary defines risk as “the possibility of loss or injury; also, the degree of the probability of such loss.” Risk can also be defined as any source of randomness that may have an adverse impact on a person or corporation (Culp, 2001). In this view, risk management is the reaction to risk by individuals or businesses that attempt to ensure that the risk to which they are exposed.

In common usage, risk has different meaning people under varied conditions: fear of specific hazards, financial gain or loss, fear of malevolent forces of nature, fear of competence and trustworthiness etc (Jaeger, Renn, Rosa & Webler, 2001).

An organization may be subjected to two kinds of risks, physical and financial (Young & Tippins, 2001). The physical risks borne by a company, as the name explains, threaten the stability of the physical environment of the organization and may range from risks of fire, flood, and theft to the risks of exploding machines or chemical spills. The financial risks threaten the financial stability of the business that is required for normal conduct of business and may include vulnerabilities to changes in the market place, risk of operational failures, customer loss. Risk of loss of reputation can also lead to financial losses for an organization.

McGaughey, Ronald, Synder & Carr (1994) described risk through its four components: threat, resources, modifying factors and consequences. The first component, *Threats*, are broad range of forces that are capable of producing adverse consequences. *Resources*, the second component of risk, are those elements that might be affected by a potential threat; thus resources consist of assets, people, or earnings. *Modifying factors* are the internal and external factors that influence the probability of a threat becoming reality, or the severity of consequences when the threat materializes. *Consequences* represent the effect of a threat on the resources and the extent of those effects.

The perception of risk varies from organization to organization (Culp, 2001). The most accepted notions of risk are disaster, crisis and uncertainty that can cause a disruption to the normality of business operation continuity (Culp, 2001). Disasters are irreversible situations or events, and the actions following such situations are directed towards the repair or an analysis to determine how the situation was managed

or could have been prevented. Crisis is an emergency, a situation requiring urgent attention or action. Crisis represents an unstable period of time for an organization, with a possibility of an undesirable outcome that could disrupt the normal operations of business, or damage the bottom line, or put in risk the positive public image. Uncertainty is situation when a firm faces some randomness that cannot be expressed in terms of probabilities of alternate outcomes (Doughty, 2001; Frost, Allen, Porter & Bloodworth, 2001). Uncertainty is a central element of risk (Jaeger, Renn, Rosa & Webler, 2001). The risk, be in form of disaster, crisis or uncertainty, creates chaos in operations of an organization and often causes disruptions to normality.

Cost of Risk of Disruption

Risks of disruption have an important impact on organizations as they exact a cost (Ritchie, 1993). The cost of risk is a widely discussed topic in risk management literature. The most visible cost that risk imposes on an organization is the cost of losses (William, Smith & Young, 1998). The destruction of property, human loss and injury, financial loss (e.g. due to a court ruling against organization), or the time loss in resumption of activities of financial gains will burden the balance sheet of an organization. A second cost of risk is the “cost of uncertainty” itself. Uncertainty can cause a cost even if no losses occur. Uncertainty may lead to misjudgments and misallocation of resources as organizations do not employ their resources in an optimal manner as uncertainty clouds the judgment, or because the fear of losses discourages investment in certain activities (William, Smith & Young, 1998).

Disruption in Supply Chain

An organization, apart from its internal risks, face risks from its physical market – input, output and the supply chain- in which the firm may be operating.

Many firms face the risks from the adverse events that may occur at any point along a physical supply chain or the chain that connects the inputs to the firm's production process to its outputs (Culp, 2001). For a typical manufacturing firm, the physical supply chain is shown in the Figure 2:

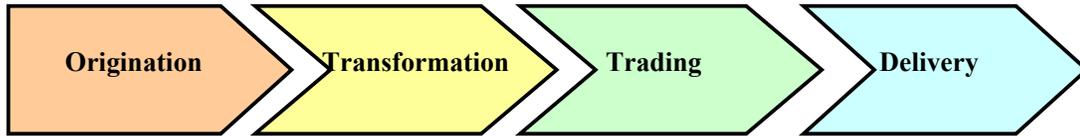


Figure 2: The physical supply chain. Adapted from Culp (2001). The Risk management process Pg. 279. John Wiley and Sons.

Problems may arise at any juncture in the supply chain. A disruption at any spot in the supply chain will have a direct or indirect impact on the other entities involved. The degree of integration of an organization over different aspects of the physical supply chain determines in large part the degree of exposure to the risks (Culp, 2001).

Anticipating and mitigating losses can be accomplished through a combination of operational moves that result in a flexible and robust supply chain. This requires a careful balance of speed, efficiency, and risk. Martha and Subbakrishna (2002) looked at disasters over the recent years and the response strategies taken by specific firms. These results are summarized in Figure 3.

Crisis	Impact	Prepared management	Unprepared Management
Hurricane Mitch in Honduras, Guatemala and Nicaragua (November, 1998)	Flooding destroyed banana plantations, damaging 10% of the worldwide crops	Chiquita leverages alternative sources of bananas to maintain deliveries	Dole suffered revenue declines and struggled to find alternative sources of supply
Earthquake in Taiwan (September 21, 1999)	Power outages and damaged equipment halted the supply of components to PC manufacturers	Dell influenced demand toward products with available components through direct sales model	Apple faced product backlogs due to component shortages and inability to alter product configurations on existing orders
Outbreaks of mad cow and foot and mouth diseases in Europe (Spring 2001)	Destruction of cattle and shortage of European hides to leather goods manufacturers	Natale, Gucci and Wilson leather had locked into supply contract; Naturalizer, Danier and Justin Boot relied on inventories	Manufacturers such as Etienne Aigner shifted purchases to other regions but faced stiff cost increases
Terrorist attacks on New York and Washington D.C. (September 11, 2001)	Increased security crippled transportation networks, causing cross border shipment delays to US auto manufacturers	Daimler Chrysler and Continental Teves used alternative modes of transportation and implemented contingency plans	Ford was forced to close five plants for several days

Figure 3: When disaster strikes. Martha and Subbkrishna (2002). Supply chain for inevitable next disaster, Supply chain management review, Sept-Oct 2002 v6 (5) pp 18(6).

Modern supply chain are very complex with many parallel physical and information flows occurring in order to ensure that right products are delivered in the right quantity, at right place, at the right time, in a cost effective manner (Chapman, Christopher, Juttner, Peck & Wilding, 2000). The extremely competitive environment, pressures of cost reduction and high standards of serviceability with the ability to achieve reasonable profits in highly competitive market have seen a drive towards supply chain integration and lean manufacturing management. Supply chain concepts like Quick Response and Just-In-Time have become tremendously popular among all sections of manufacturing and retail industry (Youngdhall & Loomba, 2000). This drive toward the more efficient supply networks during the recent years has resulted in these networks becoming more vulnerable to disruptions. The firms have been pushing towards zero or near zero inventory system. Thus, there often tends to be

little or no inventory in the system to buffer the interruptions in supply. Any disruption can have a severe impact across the supply chain. Owing to the close interrelationships between many supply chains, the impact of such disruption can be far reaching (Chapman et al, 2000).

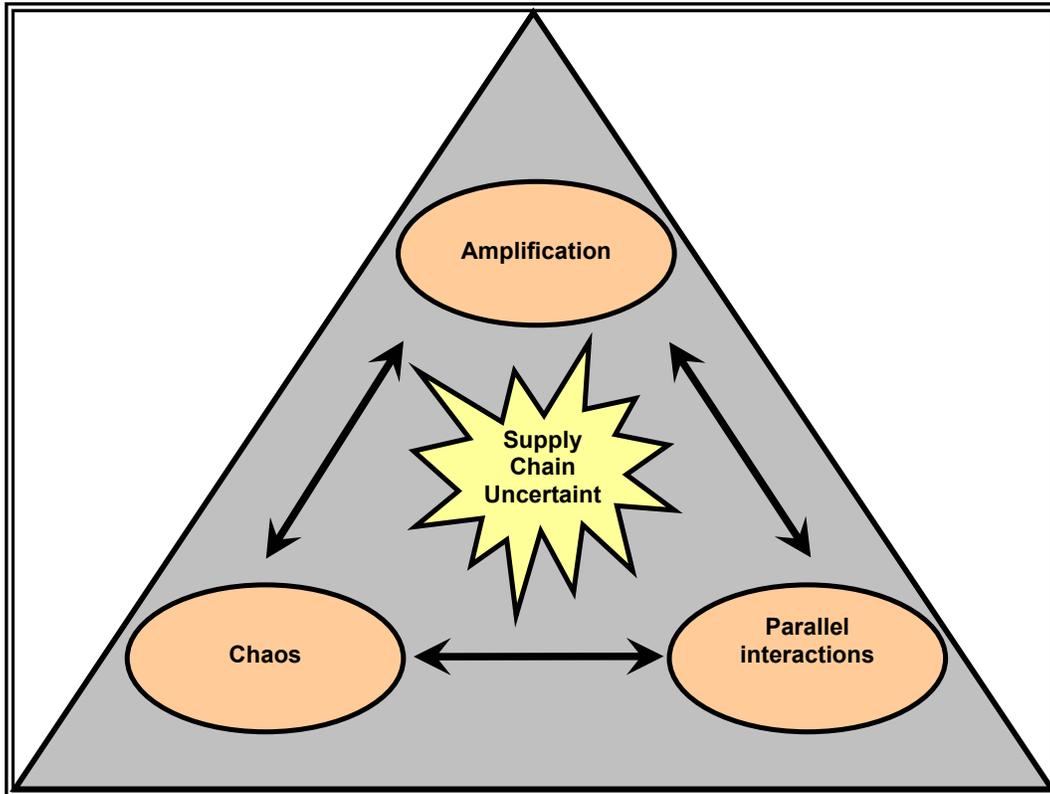


Figure 4: Supply Chain Complexity. Wilding, R. (1998), The supply chain complexity triangle: Uncertainty generation in the supply chain. *International journal of physical distribution and logistics management*, 28(8), 599-616.

Chapman et al (2002) classifies the risks to a supply chain as those “internal” and “external” to the supply chain. The internal risks arise in a supply chain from the interactions between its constituent organizations. It is caused by sub-optimal interaction and cooperation between the entities along the chain. Such risks may arise from the lack of visibility in supply chain, mistrust, inaccurate forecasts, and misapplication of supply chain practices.

External risks may arise from interactions between the supply chain and its environment. Such interactions include disruptions caused by strikes, terrorism and natural catastrophes (Chapman et al, 2002). Any disruptions at any stage in a supply chain that can be linked to environmental causes are termed as external risks.

The supply chain risks in whole threaten the continuity of supply chain operations. Often, the interaction of such risks can add further chaos in the chain that can intensify the loss potential (Wilding, 1998). Supply chain vulnerability can be reduced by identification of the potential risks and proactive action to minimize the probability of occurrence or the adverse consequences of the risks (Frost et al, 2001). Developments in business thinking that led to improvement in internal efficiency have reduced the supply chain vulnerabilities to everyday commercial supply chain risks that practically can be managed with in the organization and do not have any practical effects on the supply chain (Peck & Juttner, 2002).

Sources of Risks to Business Continuity

Business continuity can be disrupted due to various reasons. The likelihood of sources of disruptions can be varied from business to business. Different classifications and definitions are used in literature to identify the sources of risks to business continuity.

A general classification of sources that is most noticeable in literature is as physical, social and economic sources. Young and Tippins (2001) gave a broader classification based on the environment in which they arise. Figure 5 shows the Young and Tippins' (2001) classification of risks.



Figure 5: Environmental sources of risk. Young & Tippins (2001), *Managing Business Risks*, pp 71.

The various risk environments have been discussed by various researchers (Ritchie, 1993; Young & Tippins, 2001; Culp, 2001; “Disruption defense”, n.d.). The following defines these environments using the above references:

Physical Environment

Physical environment is the fundamental source of risk. Geological and climatic risks arise from the physical environment. Natural disasters like earthquakes, storms, flooding, and landslides lead to serious losses.

Social Environment

The changes in people’s values, human behavior, and state of social structure and institutions are all sources of risk. Civil unrest, social riots, and strikes are events underlining the importance of social environment as a source of risk. The difference in social values and culture creates a high level of uncertainty. This is particularly true when businesses become international in nature, and are exposed to varied socio-cultural sensitivities.

Political Environment

Political environment is an important source of risk to all businesses. The political risk to business is defined as the probability of damage/disruption to the business emanating from a variety of political actions some of which may or may not be insurable. A new government may move the nation into a policy direction that can have dramatic effects on particular organizations. In the international economic structure, the political environment is even more complex. A dramatic change in trade pacts, quotas, and tariff and non-tariff barriers can be a major source of risk of disruption to a business.

Operational Environment

Organizational process and procedures of business may create a risk that can be a potential cause of disruption. Unfavorable working condition, non-compliance to standards, business malpractices, and formal procedures of human resource management may bring in legal liability. The manufacturing process may put employees at risk of physical harm. Activities of organization may result in harm to the environment. International business may suffer risk and uncertainty due to unreliable logistics systems. Furthermore any breakdown in operational environment can cause a disruption of business for whole supply chain.

Economic Environment

While social, political and legal environments often influence economic environment, but global economic dynamics produce its own risks. Although a particular government's action may affect international capital markets, control of capital market is certainly beyond the reach of single nation. Inflation, recession and

depression are examples of the global economic environment. On the local level, the interest rates and credit policy can impose a significant risk to finances of a company.

Legal Environment

The formalized legal system establishes rights, duties and norms of conducting business that create risk for organizations. Not only are the standards of conduct upheld and punishments enforced, the legal system creates risk by disparity of new laws to the environment that may not be fully anticipated. In the international business domain, the complexity and uncertainty increases because of the dramatic variation in legal standards from country to country.

Cognitive Environment

The managers' or a firm's ability to reveal, understand and assess the risk might not be perfect. The difference between the perception and reality for different people is an important source of risk for an organization. The cognitive environment is a challenging source of risk to identify and analyze.

An event of business disruption can originate in one of the several environments (Culp, 2001; Young & Tippins, 2001). For example, fire can originate in physical environment (lightening, forest fires) or social environment (arson, civil unrest). Sources of risk are not major concern to an organization unless it is exposed or vulnerable to the perils that arise from those environments. The Kloman's risk spectrum model (Figure 6) supports this statement. Kloman (1998) gave a descriptive diagram summarizing the organizational risks. An organization is influenced by global risks and uncertainties (represented as outer circle encircling the "organizational risks"). These global uncertainties are often not manageable but have

significant strategic effects upon an organization. The global risks surround the organizational risks that are more susceptible to organizational control.

Kloman (1998) argues that organizational risks have been viewed and tackled individually over the years. The increasing complexity of organizational structure and processes, along with ever increasing global uncertainties have a cumulative effect on the organization. Many organizational risks may arise from a single event. In this view, all risk shall be considered interconnected and therefore, risk management should take an integrated approach.

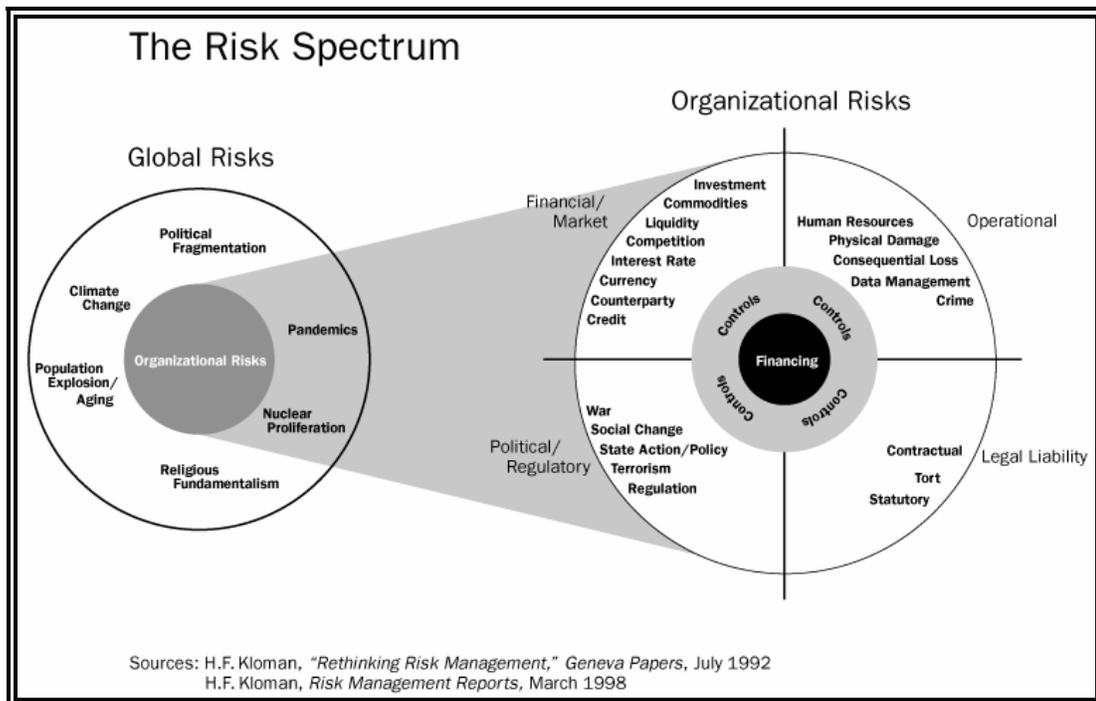


Figure 6: The risk spectrum. Kloman, H. F., (1998). The risk spectrum [Online]. Retrieved January 2003, from Risk management reports, <http://riskreports.com/spectrum.html>.

The universe of risk is ever changing (Frost, Allen, Porter & Bloodworth, 2001; Kessler 2001). Risk evolves over time due to various factors like technological changes, environmental and regulatory changes and therefore, there is a continuous need for risk assessment and risk management.

A risk of disruption to business though may originate in one or more of the environments discussed above, it may impact the whole industry or a particular organization. The continuity planning strategy will largely depend on the level of impact (micro or macro) of the disruption. Thus it is important to understand the origination of a disruption as well its level of its impact.

An example of classification of disruption is shown in Table 1. Appendix A lists the detailed sources of disruptions.

Table 1: Disruptions	
Disruption	Examples
Exogenous	Natural disaster, terrorism, diseases
Internal	Process/product, workforce, financial, utility, system and communications
International	Political, trade, economic,
Legal	Compliance regulations, business practices, health and safety regulations, copyright issues
Social	Riots, public demonstrations.
Supply base	Lead time, quality
Transportation disruption	Shipment delays

Source: Handfield, R., B. (2003). Proposal to National Science Foundation.

Exogenous Disruptions

The disruptions emanating due to the factors external to an organization are often uncontrollable. Natural disasters and acts of terrorism are some examples of exogenous risk factors.

Internal Disruptions

The risks of disruption emanating from the organization's internal processes are defined as internal disruptions (Frost et al, 2001). This includes the production planning problems, raw material shortage, quality problems, disruptions due to physical, financial or technological infrastructure of the focal firm and work force related problems. Internal disruptions can happen at any point in the supply chain and will affect the both upstream and downstream members.

International Disruptions

International disruptions may emanate from the international nature of the business.

Political environment: The political risk to business emanate from a variety of political actions. Political disruptions involve the possibility of financial losses due to government actions such as expropriations, imposition of legal restrictions, a freeze of assets, politically motivated sanctions, insistence or divestment, or disruptions from various types of popular agitations and civil disorders (Raddock, 1986). Other disruptions to business can come in form of trade sanctions/embargoes that can be a result of diplomatic relation between two or more countries. The political environment affects some financial risks like currency devaluation.

Economic disruptions: At macro level, financial or economic risks entails currency and related problems such as devaluation, interconvertability, delay in payments, rescheduling of external debt, faults and deposit blockages (Clark & Marois, 1996).

Legal Disruptions

Legal disruptions are a constant threat to businesses, though by nature they might be preventable. At the macro level, businesses can run into a variety of legal problems that can cause a disruption to normality of business operations or financial losses in the form of fines, liabilities and reputation loss (Young & Tippins, 2001). Disruptions arising out of legal environment at the macro level can be related to business malpractices related to the industry or segment of an industry and/or litigations against a particular nature of business. At micro level, businesses can run into a variety of legal problems including health and safety regulations, workplace harassment, contract disputes, hiring and firing, copyright disputes, and employee discrimination (Frost et al, 2001).

Social Disruptions

Riots, public demonstrations, and civil disturbances have become common in the past thirty years. A business may be affected by the demonstration or disturbances in the area of its location. People may turn to violence in response to a political turmoil, government suppression, or perceived criminal activity by some organization or group and the resulting aggression is rarely well focused (“Disruption defense”, n.d.). Dangerous instances of civil unrest occur with high frequency in many foreign countries. Business people traveling to certain countries may face the risk of terrorism or kidnapping simply because they represent an American company. The 1992 Los Angeles riots impacted thousands of business and individuals that resulted in loss of 20,000 jobs immediately after the riots.

Supply Base Related Disruptions

Problems may arise at any juncture in the supply chain. A disruption at any spot in the supply chain will have a direct or indirect impact on the other entities involved. The degree of integration of an organization over different aspects of the physical supply chain determines, in large part, to the degree of exposure to the risks (Prater, Biehl & Smith, 2001). Delayed lead times, supplier quality, and failure to fulfill orders are some of the disruptions that arise from the supply base (Frost et al, 2001). Supply base disruptions can be mitigated through effective supply chain management, proper communication and trust building.

Transportation and Logistics Disruption

Transportation is part of the lifeblood of companies that provide or require shipping, mailing, or trucking services. An unexpected break in the transportation process could create a ripple effect throughout the supply chain and a loss of revenue for businesses dependent on just-in-time inventory. Transportation disruptions such as traffic accidents, flight or ship delays, and lack/loss of drivers occurring at any business could cause employee stress, loss of work hours, reputation damage, and delay of receipt of merchandise, packages and/or mail, as well as present the potential for human injury or death (“Disruption defense”, n.d.).

Factors of Supply Chain Exposure

The degree of supply chain exposure depends on a number of factors. Parter, Biehl & Smith (2001) have characterized these exposure factors.

i. Extent of the geographic area covered by the supply chain

Specific geographic areas can have distinct transportation problems. For example, shipping of goods from Southeast Asia to North America has only two

choices-sea or air. Shipping by air is faster but more costly than shipping by sea. Even within North America, with an excellent integrated road network, shipping good by trucks across the continent involves risk due to notoriously variable weather and reconstruction of roads. Thus, logistically difficult geographic regions and the number of regions covered by the supply chain increases uncertainty and supply chain exposure.

ii. Political areas and borders crossed

Each political area or the border that a supply chain must cross can cause problems for the supply chain. Issues of political stability, risk of war, changing trade regulations etc can be few of the events. These are defined as events or a series of events that can affect the physical assets, personal or operations in foreign land. This contributes to the increased complexity, uncertainty and supply chain exposure.

iii. Transportation mode and their speeds

Intermodal transportation modes add complexity and delays to the supply chain. The off-shore sourcing may include more than one of the transportation systems like train and truck, ships or air. Speed is also inversely proportional to the cost and volume of products that can be shipped. The speed of transportation increases from sea to rail to truck to air while the cost and the volume that can be transferred decreases.

iv. Technical infrastructure and the degree of its Use

Some countries lack the technical and communication infrastructure to allow firms to operate efficiently. Or otherwise, there might be compatibility issues between the technologies used by trading firm in the supply chain.

v. *Random occurrences*

Some events are beyond the control, such as earthquake, floods, avalanches etc. other random events can be foreseen but unavoidable. For example, the ship might be delayed in typhoon season, as it must avoid it.

Risk Management

Risk management is the science and art of recognizing the existence of threats, determining their consequence to resources, and applying modifying factors in a cost effective manner to keep adverse consequence within bounds (Carr & Synder, 2002). Historically, risk management was seen as mainly an insurance-based discipline (Sharp, 2001). Using historical data and experience, assessments were made of the likelihood of an occurrence of predictable events. It was principally based around the financial loss of life or capital assets. Using actuarial techniques the probability of occurrence was calculated thus enabling a premium to be established for insurance purposes (William, Smith & Young, 1998). In today's complex and uncertain business environment, it is not possible to predict events that can seriously affect organization's ability to maintain continuity of business.

Thus, risk management, on a broader perspective, can be defined as "a general management function that seeks to assess and address the cause of uncertainty and risk on an organization" (William, Young & Tippins, 1998). The discipline of risk management has seen a shift away from the traditional insurance-based risk management of loss, to one closely linked to the operations of the organization (Frost et al, 2001). The term Operational Risk Management has been established, the focus of which is to identify occurrences that can disrupt business (Frost et al, 2001). Thus, risk management is the analysis of subsequent actions to be taken to ensure the continual operations under the unforeseeable adverse conditions.

MeulBroek (2002) gave the concept of integrated risk management. Integrated risk management is the identification and assessment of the collective risks that affect firm value, and the implementation of a firm-wide strategy to manage those risks. Integrated risk management looks beyond the set of traditionally insurable risks, seeking to address all of a firm's risks within an organized and coherent framework. It is often not possible or desirable to eliminate all risk, but to implement cost effective processes that reduce risks to an acceptable level, reject unacceptable risks and transfer other risks through insurance or other means, or by organizational intervention i.e. business continuity management (Doughty, 2001) .

Business Continuity Management

Business continuity is the ability of the business to continue its operations with minimal disruption or downtime in the advent of natural or intentional disaster (Pereira, 2002). Business continuity management is an ongoing process. The business continuity management process begins with business continuity planning. Plans must be kept up to date as the organization changes. External environments and influences are constantly in a state of flux and so the process, to be valid, must continue throughout the life of the organization. The Figure 7, shows a pictorial view of the business continuity management cycle.

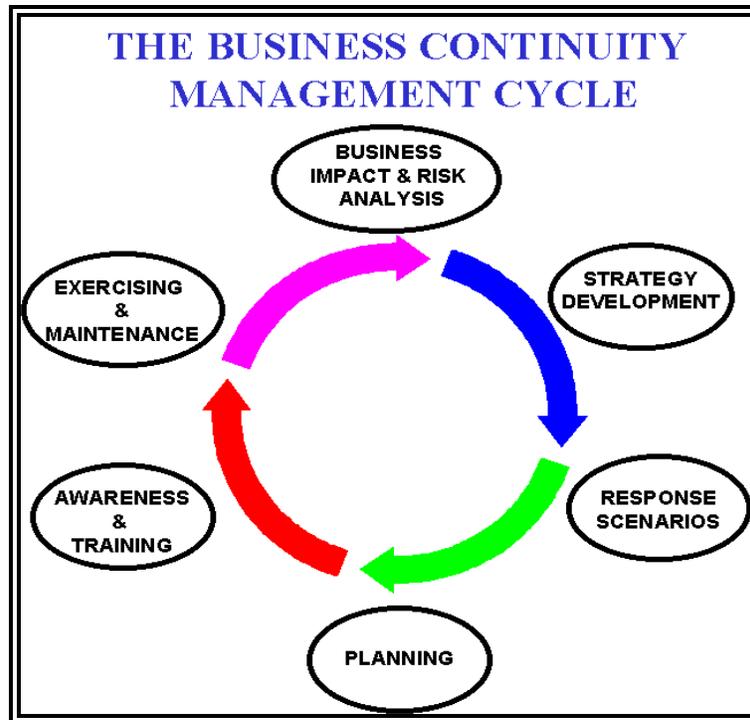


Figure 7: The business continuity management cycle. Sharp, J., The origins and current state of the art in risk and business continuity management, The business continuity institute, <http://www.thebci.org/BCAWKA1.htm>

Business continuity begins with a plan that addresses all risks and secure systems that are vital to business operations (Doughty, 2001). Business continuity plans are based on every day operations that allow an organization to recover from disaster and an event of disruption to the procedure. Business continuity planning specifies the methodology, structure, discipline and procedures needed to back up and recover disrupted operations (Smith, 2002).

Business Continuity Planning has five major elements (Ellhott, Swartz & Herbane, 1999; Culp, 2001; Doughty, 2001; Smith, 2002).

i. Risk and business impact analysis

The hazards/disruptions that a company faces from its operations or environment must be identified and analyzed for the potential impact. This is a key to

the planning process since the assessment of the operational and financial impact of impact of a disruption will establish the priorities and the cost of containing them (Ellhott, Swartz & Herbane, 1999). Ranking the major operations and functions helps determining the expected downtime for individual operations. The organization's internal operations assessment and the external environment assessment shall generate a wealth of data to assess the nature and cost of any disruption.

Risk assessment and analysis involves a methodological investigation of the organization, its resources, personnel, procedure and objectives to determine points of weakness (Doughty, 2001). Finding such vulnerable and weak points, managers overtly control the risk by passing it to someone else (insurance/outsourcing) or strengthening the weak points by changes or building redundancies.

ii. Strategy development

Using the risk and business analysis, and having predicted the likely effects of different types of disruptions, the organization must evaluate the internal and external alternatives available for the continuation of all operations and the feasibility and time requirements. This shall be done at three levels (Smith, 2002):

- a) *Organizational level strategy* - corporate image, brand and public relations, media, shareholders, regulators
- b) *Process level strategy* - internal process recovery
- c) *Resource recovery strategy* – supplier and vendors, human resources, customers

The factors like cost, feasibility and benefits shall be considered while designing continuing strategies and selecting alternative plans. The first task

of recovery objects is to set a target time for the recovery and resumption of operations.

iii. Response scenarios

Response scenarios to any event of disruption shall be identified at three levels of strategy development. External bodies and organizations to outsource risk shall be identified, along with alternate manufacturing/service sites, vendors and suppliers. Emergency responses and communication with different organizations shall also be identified at this stage. The resources required for resumption of operations shall be identified along with emergency strategies.

iv. Planning

The procedures to activate the continuity plans are documented. The specific functions to the alternative or back up plans, location of back up facilities, along with their detailed objectives and functions are documented. The plan must identify the ways to procure alternative resources to carry out business activities, restoration of the original facilities/business operations; allocate responsibilities and notification procedures for all the stakeholders.

v. Awareness and testing:

The plan must be reviewed by management and approved by all functions/departments. It must be then documented and distributed to key personals with additional copies secured off-site. The plan shall include a schedule for periodic review and updating. This is particularly important with regards to continual changes in operating environments (both internal and external) and thus the relative changes to the threats and disruptions.

vi. *Exercise and maintenance:*

Training and implementation is an important part of Business continuity planning, as every stakeholder must understand what is expected of them in an event of disruption. The key personnel responsible for execution of the plans should be apprised of their specific assignments and trained to execute them in an effective and timely manner.

CHAPTER 3

RESEARCH METHODOLOGY

Purpose

The purpose of this research is to conduct an exploratory analysis of the disruptions in the United States apparel manufacturing industry.

The specific research objective is to identify and determine the nature of disruptions and the continuity strategies in the US apparel manufacturing industry. There are four primary research questions that shall be answered through this research.

Disruption Research Statements

1. What are the disruptions that are occurring in US apparel manufacturing companies?

Continuity Research Statements

2. Do companies have back up contingency plans for the disruptions?
3. What is the status of Business Continuity Planning in US apparel manufacturing industry?
4. What is the strategic nature of the continuity planning?

Research Design

No empirical research has been done on the disruptions and continuity plans in the United States apparel manufacturing industry. Therefore, the nature of this research is exploratory. Exploratory studies are used when the existing literature or the knowledge base is insufficient, and some uncertainty exists about the major aspect of the study (Yin, 1994). A mixed methods approach is chosen to analyze the

disruptions in apparel manufacturing industry, and the nature of continuity plans. The mixed method approach of data collection involves gathering both qualitative and quantitative information. This approach is useful when it is desired to generalize the findings to a population set, and develop a view of meaning of a phenomenon or concept for individuals (Creswell, 2003). In choosing the mixed method research approach, as compared to strictly qualitative or quantitative study, the primary benefit is that the data collection involves both numeric information and text information, so that the final database represents both qualitative and quantitative information.

The research is done in two phases. In Phase I of the research, quantitative data is gathered through a survey. In Phase II, qualitative data is gathered on disruptions in apparel manufacturing industry. Secondary data is used from the annual 10-K SEC filings of apparel manufacturing companies to gather the qualitative data.

Phase I – Quantitative Research

Instrument Development

Data were gathered through a three-page questionnaire (Appendix B) developed by the researcher. A detailed list of disruption was developed from the review of literature (Ritchie & Marshall, 1993; McNamee & Selim, 1998; Koller, 1999; Broder, 2000; Caponigro, 2000; Frenkel, Hommel & Rudolph, 2000; Culp, 2001; Frost, Allan, Porter & Bloodworth, 2001; Young & Tippins, 2001). Table 2 represents the broad disruption categories as it relates to a business organization's operational disruptions.

Table 2: Disruption Categories

Changes in custom regulations/procedures
Country economic crisis (e.g. Asian economic crisis)
Exchange rate fluctuation
Global war on terrorism
IT related disruption
Logistics (e.g. late or cancelled shipments)
Natural disasters
Process failure
Product Quality related disruption
Standards compliance issues
Supplier related (loss of key supplier,
Terrorism
Trade regulations
Utility (e.g. Power, water, oil, gas)
Workforce (e.g. strikes, union)

Source: Ritchie & Marshall, 1993; McNamee & Selim, 1998; Koller, 1999; Broder, 2000; Caponigro, 2000; Frenkel, Hommel & Rudolph, 2000; Culp, 2001; Frost, Allan, Porter & Bloodworth, 2001; Young & Tippins, 2001.

The questionnaire was structured by a designated set of questions that were separated in relation to the disruptions and business continuity planning. The questions were structured to get an understanding to the types of business disruptions and the business continuity planning culture.

The questionnaire is divided into four sections. Each section relates to the research objectives. Within each section, questions further explored the issues outlined in the research statement. The questions address the business disruptions facing the US textile and apparel industry and the continuity response to those disruptions as it relates to corporate strategic planning. Table 3 represents a matching of the instrument items and research statements.

Table 3: Instrument Development	
Research Statement	Instrument Item
Disruptions	
1	I (i) (1-15), II (i)
Continuity	
2	I (ii), II (v)
3	II (ii-iv), III (iii-v)
4	I (ii), III (i, ii, vi)

Question I (i) was used to determine the events that have caused operational disruptions to apparel manufacturers (RS 1). Question I (ii) was used to determine the information regarding the corporate strategy that was used to handle a disruption. Namely, four most common response strategies that were found in literature were listed. These are - “do nothing”, “modify process”, “insurance”, and “business continuity planning” (RS 2, 4).

Question II (i) was used to determine information regarding the importance and risk value associated by individual firms to their operational disruptions (RS 1). The question addressed if the past disruptions were documented and lessons learned from them.

Questions II (ii-iv) were used to determine information regarding the business continuity status in the apparel industry (RS 3). The questions addressed if the specific risks of disruption have been identified (Q iii), have business impact for disruptions assessed (Q iv), and if the process downtime in case of a disruption has been assessed in relation to the financial losses that might incur from it.

Question II (v) was used to determine the current Business continuity planning status of the participant (RS 2). This question addressed the current status of the

organizations continuity planning, and if the nature of planning was formal or informal and, the status of documentation. Based on the response of this question, the participants were asked to continue to the next section or jump to demographics section. The participants who did not have a business continuity plan were asked to skip the section III that deals with the strategic nature of continuity planning.

Questions III (i, ii, vi) were used to determine information regarding the strategic nature and drivers of continuity planning in the industry (RS 4). The questions addressed the primary drivers of business continuity for an organization (Q i), the key entities that are accounted for in a continuity plan (Q ii), and if the suppliers and vendors were required to have their own continuity plans (Q vi).

Questions III (iii-v) were used to determine information regarding the general practices of business continuity planning (RS 3). The questions addressed the budgeting (Q iii) and the training (Q iv and Q v) for the business continuity planning.

The Questions IV (i-v) collected the demographic information for the participant organizations. The questions gathered the information regarding the nature of the business (Q i), annual sales as a variable to determine the size of the company (Q ii), the global business nature of the company (Q iii), the extent trade relation with foreign countries (Q iv), and the location of supplier base (Q v).

Sample Procedure

The research sample consisted of companies from three sources:

- National Register of Apparel Manufacturers – Men’s and Boy’s wear; Women’s and children wear
- APICS Textile and Apparel discussion board
- Contacts from College of Textiles, NC State University

The three sources of sample selection are discussed below in detail:

National Register of Apparel Manufacturers – Men’s and Boy’s Wear; Women’s and Children Wear

National Register of Apparel Manufacturers was consulted to obtain a listing of companies in the US apparel industry. The register consists of two parts – “Men’s and boys wear” and “Women’s and children wear”, each listing companies in the respective segment of the industry. The register lists over 8000 apparel companies that are manufacturer, contractor, importer, exporter, private label manufacturer, retailer or licensor of apparel and related products.

Sampling criteria were developed to narrow down the companies for the research purpose. Research sample was chosen based on the following criterion:

i. *Apparel manufacturers as defined by NAICS code 3152*

The companies were narrowed down according to the NAICS classification “3152- Cut and Sew apparel manufacturing”. Appendix C gives detail definitions of this industry group and its sub-classes.

ii. *Annual revenue (2001)*

Companies were further narrowed down based on their sales dollar for year 2000. Of the companies that fulfilled criteria 1, companies with annual sales revenue (for fiscal year 2001) of \$500 million or higher were chosen. This narrowed the sample size to 99 companies. An Excel spreadsheet was used to organize the information of the selected 99 companies. This list was sorted for the annual revenue in increasing order of revenue. Thirty companies with the highest sales revenue for 2001 were chosen as sample.

iii. *Convenience*

The chosen 30 companies were further narrowed down based on the identification, availability, and accessibility of an appropriate contact in the organization. Corporate leaders for the functional areas of Operations or Supply Chain were targeted to be the potential respondents. Twelve companies were selected with appropriate respondent identified with contact information.

APICS Textile and Apparel Discussion Group

American Production and Inventory Control Society – APICS is a non-profit international educational society for resource management. The group consists of eight Specific Interest Groups (SIGs), with the Textile and Apparel group being one of SIG. The “Textile and Apparel Specific Industry group (TA-SIG)” consists of professionals and organizations in the area of soft goods such as clothing, footwear, upholstery, and industrial textiles.

The research topic was posted at the “Textile and Apparel” discussion board at APICS site (www.apics.org), requesting members to respond. The group has over 600 plus membership, comprise executives from the US textile and apparel industry. The request was posted on July 14, 2003 and a ten day time period was set as the data collection period (posting July 14, 2003 – July 24, 2003).

Industry Contacts from College of Textiles, NC State University

Industry contacts were sought from professors, fellow students, and the Office of Student Services at the College of Textiles, North Carolina State University.

Sample for Phase I

The above three sources were used for the sample for Phase I. A participation request was sent via e-mail along with the research questionnaire to the identified contacts. A total of three companies responded and agreed to participate. The remaining companies either did not fulfill the request for the participation or did not respond. One response was obtained from the survey posted at APICS Textile and Apparel SIG discussion board. Two contacts were obtained through the College of Textiles, NC State who agreed to participate in the survey. In total, six companies agreed to participate in the research by filling out the research questionnaire.

The six companies, that agreed to respond, requested to complete the questionnaire by email or fax rather than the telephone and attributed this request to convenience and availability of time.

Data Collection

Quantitative data was collected in the Phase I through the survey questionnaire. The data was collected over a three week period time during Summer 2003. Corporate leaders for the functional areas of Operations or Supply Chain for the selected companies were contacted through email or phone, depending upon the availability of contact information. Obtaining interviews was a challenging task due to the busy schedule of the respondents. The respondents requested to respond to the questionnaire via email or fax, and then conducted follow up questions on phone. Questions were asked as per the questionnaire outlined in Appendix B. Company details and other information was gathered through company websites and SEC filings. In cases where this information was unavailable through external resources, a direct request was made for such information to the company.

Data Analysis

Survey responses of each company were assessed and organized in a table format (Table 6, Chapter 4).

Phase II: Qualitative Research

Instrument Development

A spreadsheet chart was developed by the researcher using MS Excel to organize the qualitative information that was gathered in Phase II. 10-K SEC filings of companies available at www.sec.gov were used to gather the qualitative information pertaining to business disruptions and strategic planning. Specific sections of the 10-K SEC filings (e.g., “qualitative and quantitative market risk”, “market risk”, “business risk”) and were used to gather information. The list of disruptions in Table 4 was the same disruptions listed on the questionnaire (Appendix B).

Table 4: Phase II Research Instrument										
	Company									
Data Items	1	2	3	4	5	6	7	8	9	10
Disruptions										
Changes in custom regulations/procedures										
Country economic crisis										
Exchange rate fluctuation										
Global war on terrorism										
IT related disruption										
Logistics										
Natural disasters										
Process failure										
Product Quality related disruption										
Standards compliance issues										
Supplier related										
Terrorism										
Trade regulations										
Utility (e.g. Power, water, oil, gas)										
Workforce (e.g. strikes, union)										
Other disruptions identified										
Continuity plan										

Sample Procedure

Ten companies were selected at random from the list of 30 companies identified in Phase I (refer to Phase I “Sample Procedure”). The sample selection of the ten companies (from the total of 30) was carried in a sequential manner (see Figure 8).

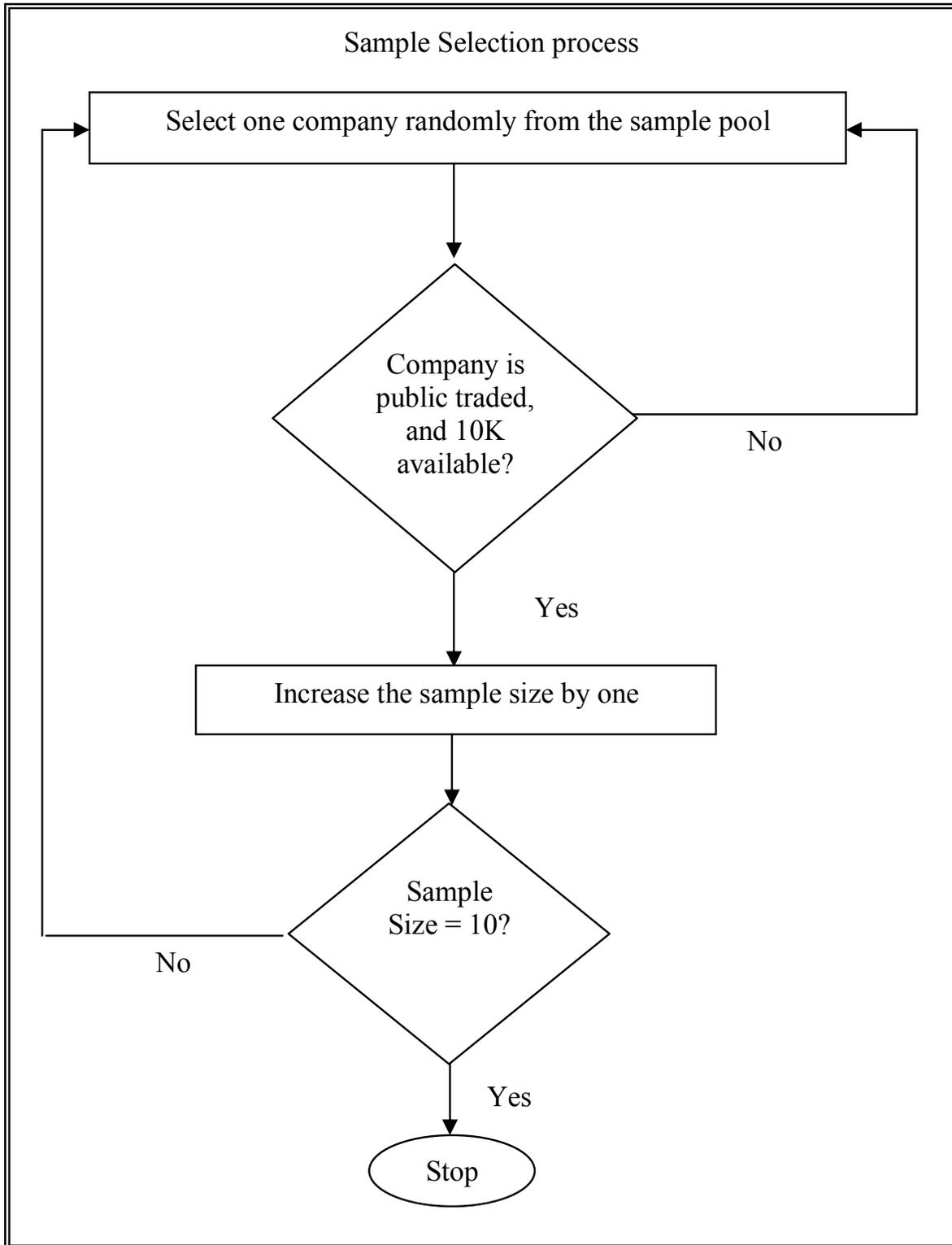


Figure 8: Sample selection procedure-Phase II

One company was selected randomly from the pool of thirty companies. The company was checked for being a “public traded” or “privately held”, and if the 10-K SEC filing was available at www.sec.gov. If the 10-K SEC filing was available, the company was chosen as part of the sample, else rejected. The process was repeated until the sample size for Phase II reached ten.

Data Collection

The 10-K filings for the fiscal year ending December 2002 were analyzed for each of the ten companies in the sample. Data that related to the company’s business operations, risks and disruptions was gathered. The data was organized using the instrument shown in Table 4.

Data Analysis

The risks of disruptions were identified for each company as it relates to the nature of their business operations and the general business environment. Data across the sample was analyzed to determine the most common risks of disruptions and particular characteristics of business that they relate.

CHAPTER 4

RESULTS

Results Phase I

Sample Description

Quantitative data were collected using a questionnaire as a research instrument. Six apparel manufacturing companies responded to the survey. Table 5 provides demographic information about respondent six companies.

Company	Locations	National/ Multinational	International Suppliers/ Vendors	Domestic Suppliers/ Vendors	Number of countries products are sourced	Sales (2001)
A	2-5	National	200	500	2-5	\$100-500 m
B	>25	Multinational	>300	<100	>40	>\$1 b
C	>25	Multinational	40	10	16-20	>\$1 b
D	<25	Multinational	8	26	11-15	\$501m-\$1b
E	2-10	National	4-5	20	2-5	\$101m-500m
F	<25	Multinational	10	12	2-5	< 25 m

Table 6 summarizes the survey responses from the six companies. “Yes” or “No” indicates whether the company has been affected by the respective disruption category or not. In cases where the response was “yes”, the parenthesis indicates the continuity strategy used by the company.

Table 6: Phase I Survey Results

	Company - A	Company - B	Company - C	Company - D	Company - E	Company - F
Section I						
<i>Have you been affected by</i>						
1. Changes in custom regulations/ procedures	No	Yes (BCP)	Yes (Modify process)	Yes (Modify process)	Yes (Modify process)	Yes (Modify process)
2. Country economic crisis (e.g. Asian economic)	Yes (Modify process)	Yes (a general BCP)	No	No	Yes (Modify process)	Yes (Modify process)
3. Exchange rate fluctuations	No	Yes (Do nothing)	No	Yes (Modify process)	Yes (Modify process)	No
4. Global war on terrorism	No	Yes (BCP)	No	No	No	No
5. IT related disruption	No	Yes (BCP)	No	Yes (Modify process)	No	No
6. Logistics	Yes (Do thing)	Yes (BCP)	Yes (Modify process)	Yes (Modify process)	Yes (Insurance)	No
7. Natural disaster	Yes (BCP)	Yes (a general BCP)	Yes (Modify process)	No	No	Yes (Modify process)
8. Process failure	Yes (Modify process)	Yes (Modify process, BCP)	No	Yes (Modify process)	No	No
9. Product quality related disruptions	Yes (Modify process)	Yes (BCP)	Yes (Modify process)	Yes (Modify process)	Yes (Modify process)	No
10. Standard compliance issues	No	Yes (Modify process)	No	No	Yes (Modify process)	No
11. Supply base related	No	Yes (BCP)	No	Yes (BCP)	Yes (Modify process, Insurance)	Yes (BCP)
12. Terrorism	No	Yes (a general BCP)	No	No	No	No

	Company - A	Company - B	Company - C	Company - D	Company - E	Company - F
13. Trade regulations	Yes (Modify process)	Yes (Modify process)	Yes (Insurance)	Yes (Modify process)	Yes (Modify process)	Yes (Modify process)
14. Utility (power, water, oil, gas)	Yes (BCP)	No	Yes (Modify process)	No	No	
15. Workforce related (strikes, union)	Yes (BCP)	No	No	No	No	No
Section II						
<i>Q1. Do you maintain a record of business disruption experienced in past?</i>	Informal history, not documented	Informal history, not documented	Informal history, not documented	Informal history, not documented	No history is maintained	Informal history, some documentation
<i>Q2. Have your organization identified specific risks of disruption to the business and assessed their likelihood?</i>	Risks have been identified, but not for all business processes/units	Risks have been identified, but not for all business processes/units	Risks have been identified, but not for all business processes/units	Risks have been identified, but not for all business processes/units	Risks have been identified but not their likelihood	Risks have been identified, but not for all business processes/units
<i>Q3. Have you conducted a Business Impact Analysis (BIA) to identify effects of a disruption for your organization?</i>	Have conducted BIA, but only not for all processes, systems, resources and infrastructure	Have conducted a thorough BIA, but it is not documented	Have Not conducted a BIA	Have conducted BIA, but only not for all processes, systems, resources and infrastructure	Have conducted a thorough BIA, but it is not documented	Have conducted BIA, but only not for all processes, systems, resources and infrastructure
<i>Q4. Have you assessed the maximum downtime for each process that your business can take without significant financial/operational losses?</i>	No	Yes	No	No	Yes	Yes
<i>Q5. What best describes your BCP?</i>	No formal policy but discussions have been made	Some documentation	No BCP	Some documentation	Formal Documentation	No formal policy but discussions have been made

	Company - A	Company - B	Company - C	Company - D	Company - E	Company - F
Section III						
<i>Q1. What are the primary drivers BCP in your organization?</i>	Shareholders, public relations, customers	Regulations, previous disruptions vendors/suppliers, Shareholders, customers	None	Vendors/suppliers , Customers	Regulations, previous disruptions vendors/suppliers, public relations, Shareholders, customers	vendors/suppliers, customers
<i>Q2. Does your BCP account for the following?</i>	No answer	personnel, contractors, customers, suppliers	none	contractors, customers, suppliers	personnel, contractors, customers, suppliers	personnel, contractors, customers, suppliers
<i>Q3. Has an adequate budget been allocated for the handling business disruptions</i>	Budget is allocated every year, but is not sufficient to develop and maintain the BCP	No Budget	No Budget	No Budget	Budget is sufficient but only for the current period	No budget-comment: part of everyday functioning
<i>Q4. Do you have a BCP training program for employees?</i>	We have no BCP training program	We have no BCP training program	We have no BCP training program	We have no BCP training program	Have a program, but not very well established	Have a program, but not very well established
<i>Q5. How often do you train your employees about BCP?</i>	Never	Never	Never	Never	Not sure	Not sure
<i>Q6. Do you have specific requirement for your vendors/suppliers to have their own BCP program?</i>	No requirement	No requirement	No requirement	No requirement	No requirement	Only critical vendors and suppliers

Table 7 list the number of companies affected by a disruption category in past five years, as identified in Phase I research.

Table 7: Phase I Sample Companies Affected by Disruptions	
Risk of Disruption	Companies affected
Trade regulations	6
Changes in customs regulations	5
Logistics	5
Product quality	5
Country economic crisis	4
Natural disasters	4
Supply base	4
Exchange rate fluctuations	3
Process failure	3
IT related disruption	2
Standard compliance	2
Utility	2
Global war on terrorism	1
Terrorism	1
Workforce related	1

Results

Company A

Company A is a designer, manufacturer and marketer of products for the home fashion and apparel markets, and markets its apparel fabrics to a diverse group of customers for use in a wide array of finished products including career apparel, sportswear, dress shirts, home textiles and upholstery. The company also manufactures specialty engineered yarns and woven fabrics for use in industrial products.

The company is a national company, with less than 10 locations nationwide, and has predominantly manufacturing operations, with annual sales volume in range

of \$101-\$500 million. The company sources its material or services from over five foreign countries, and has a large base of approximately 500 domestic and 200 international suppliers/vendors.

Disruptions

Table 8 lists disruptions the company has faced since 1997, and the continuity strategy used to handle the disruption.

Table 8: Company A - Survey Results		
Disruption	Affected	Continuity Strategy
Changes in custom regulations/ procedures	No	
Country economic crisis (e.g. Asian economic)	Yes	Modify process
Exchange rate fluctuations	No	
Global war on terrorism	No	
IT related disruption	No	
Logistics	Yes	Do nothing
Natural Disaster	Yes	Business continuity Planning
Process Failure	Yes	Modify process
Product quality related disruptions	Yes	Modify process
Standard Compliance issues	No	
Supply base related	No	
Terrorism	No	
Trade regulations	Yes	Modify process
Utility (power, water, oil, gas)	Yes	Business continuity Planning
Workforce related (strikes, union)	Yes	Business continuity Planning

The company does not maintain a formal documented history of the disruptions, but claims to have an undocumented history. The company states to have identified the specific risks of disruption to their business. But the risks for all business processes or units have not been identified. Though certain risks have been identified, the likelihoods of their occurrence have not been assessed. The company

has conducted Business Impact Analysis for some of the risks of disruptions, but not for all risks to all the processes, systems, resources or infrastructure. The company has not determined the maximum business downtime due to the identified risks of disruption.

Business continuity planning

Company A has no formal continuity planning policy. The company does not have a formal corporate policy for the development, implementation and maintenance of business continuity planning to address the risks of disruption, but discussions have been made in recent times.

The company states shareholders, public relations and the customers to be the primary drivers of the continuity planning, while regulations, previous disruptions and vendors/suppliers play no significant role in its corporate policies regarding continuity planning.

On the issue of budgets for the continuity planning, Company A allocates a budget every year for the purpose, but the responder says that the allocated budget is not sufficient enough to develop and maintain the business continuity plans.

The company does not have any training program in place for employees to response and to deal with a disruption.

Company B

Company B designs and markets fashion apparel and accessories for both men and women. The company is largely in wholesale business. In addition, the company licenses to third parties to manufacture market and sell selected products bearing the Company's trademarks.

Disruptions

Table 9 lists the disruptions company has faced since 1997 and the continuity strategy used to handle the disruption.

Table 9: Company B - Survey Results		
Disruption	Affected	Continuity Strategy
Changes in custom regulations/ procedures	Yes	Business Continuity Planning
Country economic crisis (e.g. Asian economic)	Yes	<i>A general continuity plan</i>
Exchange rate fluctuations	Yes	Do nothing
Global war on terrorism	Yes	Business Continuity Planning
IT related disruption	Yes	Business Continuity Planning
Logistics	Yes	Business Continuity Planning
Natural Disaster	Yes	<i>A general continuity plan</i>
Process Failure	Yes	Modify process
Product quality related disruptions	Yes	Business Continuity Planning
Standard Compliance issues	Yes	Modify process
Supply base related	Yes	Business Continuity Planning
Terrorism	Yes	<i>A general continuity plan</i>
Trade regulations	Yes	Modify process
Utility (power, water, oil, gas)	No	
Workforce related (strikes, union)	No	

Company B's business operations have been disrupted by 13 of the 15 major business disruptions in last five years. The company has no formal documented history of the disruptions, but claims to have an undocumented history.

Specific risks of business disruptions have been identified, but only for the operations that are critical to companies business. No analysis of the likelihood or the frequency of occurrence of the identified risk has yet been done. The company has conducted a thorough business impact analysis for most risks of disruptions, but it is not yet documented.

The company has determined the maximum business downtime due to the identified risks of disruption that its business can take without incurring significant financial and operational losses. The significant loss has been defined by the company as more than 10%.

Business continuity planning

Company B has a formal corporate policy for the development and implementation of the continuity planning, and has “some documentation” of their business continuity planning. Table 9 shows that the continuity planning is in place for most of the risk of disruptions. For certain disruption sources like natural disaster, terrorism, and country economic crisis, the company reports to have “some kind of general” continuity planning in place. The respondent from the company mentions that strategic partnership and committed supply chain relationships have proved vital to overcome the effect of a disruption.

The prime drivers of business continuity planning for Company B are regulations, previous disruptions, vendors and suppliers, share holders and customers. But, Company B does not have any requirements for its contractors, suppliers, vendors or customers to have their own continuity plans. The company’s continuity planning accounts for its suppliers, contractors, personnel, as well as customers.

Company B does not allocate any budget for handling the business disruptions. It is considered very much a part of normal business operation. Despite a good continuity planning culture in the company, there is no established training program for the employees to handle disruptions.

Company C

Company C designs, markets, manufactures and sources apparel products and accessories for men, women, boys, and girls. The company's products include athletic uniforms, apparel and accessories for a variety of sports, outdoor and fitness activities, team uniforms and related apparel for college, high school and other organized sports teams. The company sells its products across multiple distribution channels in North America and over forty other countries. The company distributes products through mass merchandisers, sporting goods dealers, department and sports specialty stores, college stores and on-line retailers.

Disruptions

Company C has been affected by few major disruptions since 1997, but they do not have formal or informal continuity plans for any of the risk of disruptions. Table 10 lists the disruptions Company C has faced in last five years and the continuity strategy used to handle the disruptions.

Table 10: Company C – Survey Results		
Disruption	Affected	Continuity Strategy
Changes in custom regulations/ procedures	Yes	Modify process
Country economic crisis (e.g. Asian economic)	No	
Exchange rate fluctuations	No	
Global war on terrorism	No	
IT related disruption	No	
Logistics	Yes	Modify process
Natural Disaster	Yes	Modify process
Process Failure	No	
Product quality related disruptions	Yes	Modify process
Standard Compliance issues	No	
Supply base related	No	
Terrorism	No	
Trade regulations	Yes	Insurance
Utility (power, water, oil, gas)	Yes	Modify process
Workforce related (strikes, union)	No	

The continuity strategy often used in response to a disruption is to “modify the process” to suit the requirements at hand.

Business continuity planning

The company does not have any corporate program of development and implementation of business continuity planning. The company does not require its suppliers/vendors to have any type of continuity planning. The international nature of business operations exposes the company to the risk of currency fluctuation, which is managed by insurance.

Company D

Company D designs, manufactures and markets branded jeanswear, intimate apparel, occupational apparel, knitwear, outdoor apparel and equipment, children’s playwear and other apparel. Company D buys raw materials from numerous suppliers,

both domestic and international. Purchased fabric is cut and sewn into finished garments in domestic and offshore manufacturing facilities located in Mexico and the Caribbean Basin. Company D contracts some of its sewing operations to independent contractors. The company also sources finished products from independent manufacturers based in Asia and the Caribbean Basin.

Disruptions

Company D has been affected by business the disruptions that are listed in Table 11.

Table 11: Company D – Survey Results		
Disruption	Affected	Continuity Strategy
Changes in custom regulations/ procedures	Yes	Modify process
Country economic crisis (e.g. Asian economic)	No	
Exchange rate fluctuations	Yes	Modify process
Global war on terrorism	No	
IT related disruption	Yes	Modify process
Logistics	Yes	Modify process
Natural Disaster	No	
Process Failure	Yes	Modify process
Product quality related disruptions	Yes	Modify process
Standard Compliance issues	No	
Supply base related	Yes	Business Continuity Planning
Terrorism	No	
Trade regulations	Yes	Modify process
Utility (power, water, oil, gas)	No	
Workforce related (strikes, union)	No	

The company does not maintain a formal documented record of previous disruptions, but has an informal history of disruptions. Major risks to the company’s business operations have been assessed by the management, but it does not cover all business processes and units. The company has conducted the business impact

analysis for the identified risks, to assess the effect of risks on the normal continuity of its business operations. The impact analysis has only been done for few processes, systems, resources or infrastructure. The company has not yet assessed the threshold business downtime that it can take without incurring significant financial and operational losses.

Business continuity planning

The company has a business continuity plan in place to handle the supply chain disruptions, while it “modifies its process” for other identified disruptions to suit the situation at hand.

The drivers of business continuity planning for the company are its suppliers, vendors and customers, and its continuity planning accounts for contractors, suppliers and customers. There is no budget allocated for the implementation or maintenance of the continuity plans. The company has no formal training programs to educate employees on the course of actions to be taken in case of a disruption.

Company E

Company E designs, produces and markets branded and private branded apparel products. The company’s primary product lines include casual and dress-casual pants, shorts, denim jeans and woven and knit shirts for men, women, boys and girls. The products are marketed under various international and national brands. Company sells and distributes its products across all major apparel retail channels including department stores, discounters and mass merchants, wholesale clubs, national chains, specialty stores, catalog retailers, retail outlets and the Internet.

Disruptions

Table 12 lists the disruptions that have affected the business operations of Company E in the last 5 years.

Table 12: Company E – Survey Results		
Disruption	Affected	Continuity Strategy
Changes in custom regulations/ procedures	Yes	Modify process
Country economic crisis (e.g. Asian economic)	Yes	Modify process
Exchange rate fluctuations	Yes	Modify process
Global war on terrorism	No	
IT related disruption	No	
Logistics	Yes	Insurance
Natural Disaster	No	
Process Failure	No	
Product quality related disruptions	Yes	Modify process
Standard Compliance issues	Yes	Modify process
Supply base related	Yes	Modify process, Insurance
Terrorism	No	
Trade regulations	Yes	Modify process
Utility (power, water, oil, gas)	No	
Workforce related (strikes, union)	No	

No documented records of previous business disruptions have been maintained by the company. A thorough business risk assessment has been completed for all business processes and units. The company has not assessed the likelihood of identified risks to occur in the operational environments of the business. Company E has completed a thorough business impact analysis for the risks that may cause a business disruption, though the analysis is not documented. The company has assessed the maximum downtime its business can take in an event of disruption without causing a significant financial loss.

Business continuity planning

The company has a formal documented business continuity plan. The company's continuity plan accounts for its personnel, customers, contractors as well as suppliers. The main drivers of company's business continuity planning are the regulations, previous disruptions, the company's vendors and suppliers, shareholders and customers, and the public relations.

Company E has allocated a budget for the development and maintenance of its continuity plans. The budget is allocated for the current period, and is anticipated to be sufficient for the period allocated. Company E has a training program for its employees to educate them of the continuity plans, and the employees' roles and responsibilities, though the training program is not very well established at present. The company's respondent is "not sure" when the training is imparted to its employees.

Company F

The company started as a contract manufacturer providing sewing operations to its customers. The product line included knits, protective apparel, innerwear, and infant sleepwear. The company is also in the business of manufacturing narrow textiles and trims. The company has its manufacturing facility located in Latin America and distribution centers in the US.

Disruptions

Company F has no documented history of the disruptions that have affected its business in previously. Table 13 shows the disruptions to its operations in last five years, and the response strategy taken.

Table 13: Company F – Survey Results		
Disruption	Affected	Continuity Strategy
Changes in custom regulations/ procedures	Yes	Modify process
Country economic crisis (e.g. Asian economic)	Yes	Modify process
Exchange rate fluctuations	No	
Global war on terrorism	No	
IT related disruption	No	
Logistics	No	
Natural disaster	Yes	Modify process
Process failure	No	
Product quality related disruptions	No	
Standard compliance issues	No	
Supply base related	Yes	Business Continuity Planning
Terrorism	No	
Trade regulations	Yes	Modify process
Utility (power, water, oil, gas)	No	
Workforce related (strikes, union)	No	

The company does not document all disruptions but only those are related to the product or customers are documented. Having identified the risks to its business that may cause a disruption, the company has analyzed the impact of various events of disruptions. This business impact analysis has been done only for critical business operations, but not for all processes, systems, resources and infrastructure.

Business continuity planning

Company F has an informal, undocumented business continuity plan that addresses some, but not all of the critical functions of the company. The current status of their continuity planning is described as “in discussion”. The company does not have a standard operational procedure for handling a disruption, but the “what if” situations and their possible alternatives have been discussed. The company feels that with the dynamics of business and rapid flux in change, it is best to explore options at hand, and not turn to a previously planned continuity plan.

The company does not have a separate budget allocated specifically for the development and maintenance of continuity planning, but feels that it is part of everyday functioning. The company does not have a well established training program, but some sort of training is in place. The company's critical suppliers and vendors are required to have their own business continuity program in place.

Results – Phase II

Qualitative data was gathered for a random sample of ten apparel companies. The analysis of the 10 - K SEC filings did not divulge if the companies were affected by any of the risks identified in the filings. Only a few companies have disclosed information pertaining to their risk management and continuity strategies in their 10-K reports. This does not imply that other companies that have not reported any such information do not have the risk management programs. Also, the strategies disclosed might not be the only strategies in place, but just might be the part of the whole risk management program.

Table 14 gives the summary of the data collected for each of the ten companies. "Yes" denotes the company discussed the corresponding risk of disruption in its 10-K SEC filing.

Table 14: Results - Phase II

Disruption	Company 1	Company 2	Company 3	Company 4	Company 5	Company 6	Company 7	Company 8	Company 9	Company 10
Changes in custom regulations/ procedures		Yes								
Country economic crisis (e.g. Asian economic)	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes
Exchange rate fluctuations		Yes								
Global war on terrorism	Yes	Yes						Yes		
IT related disruption										
Logistics	Yes		Yes	Yes	Yes		Yes	Yes	Yes	Yes
Natural Disaster				Yes	Yes		Yes		Yes	
Process Failure		Yes	Yes							
Product quality related disruptions										
Standard Compliance issues										
Supply base related	Yes									
Terrorism	Yes	Yes		Yes				Yes	Yes	
Trade regulations		Yes								
Utility (power, water, oil, gas)	Yes			Yes						
Workforce related (strikes, union)					Yes					Yes

Table 14: Phase II Results (continued)

	Company 1	Company 2	Company 3	Company 4	Company 5	Company 6	Company 7	Company 8	Company 9	Company 10
Other risks identified	Retail trade consolidation; Hostile takeover/acquisition/merger; customer related disruptions	Political unrest; Dependence on independent contractors	None	Political unrest, limited control over international operations	changes in governmental policies (including U.S. policy toward the countries company have business with; political unrest;	Supplier related risks, customer credit risks, risks arising from political developments, laws and regulation in business market	Political instability	Financial health of retail customers, political instability	Political unrest in exporting countries,	Financial health of largest customers;
Risk management strategies	None mentioned	Derivative instrument-forward contracting; regularly assesses risks; have established policies and business practices for protection against the adverse effect of risk exposures	None mentioned	Insurance to mitigate financial effects of disruption in sources of supply; constant monitoring of import quotas; many manufacturing sources to minimize the disruption affect at any one	None mentioned	Use risk management control system for sensitivity analysis and estimating value at risk; hedging	Monitor exchange rate risk and other related risks via review of market value, sensitivity analysis and value at risk analysis	None mentioned	Produce in many countries; continuous monitoring of US trade policies and adjusting mfg. and sourcing accordingly	None mentioned

Table 15 lists the number of companies identifying a risk in the 10-K SEC filing.

Table 15: Disruptions Identified by Phase II Sample Companies	
Risk of Disruption	Companies affected
Supplier related disruption	10
Exchange rate fluctuation	9
Logistics	8
Changes in custom regulations	8
Country economic conditions	8
Trade regulations	8
Terrorism related events	5
Natural disasters	4
Global war on terrorism	3
Process failure	2
Utility	2
Workforce related disruption	2
IT related disruption	0
Product quality related disruption	0
Standard compliance	0

Results

Company 1

Company 1 is a manufacturer and marketer of apparel and soft good products, and conducts business in women’s sportswear, men’s sportswear, intimate apparel, children apparel and recreational soft goods. The company markets branded and private label apparel products to all the major distribution channels. Approximately 80% of the company’s products are sourced from contract manufacturers located in Asia, South America and Central American countries. The company produces its remaining product

requirements in its own manufacturing plants that are located in Central America and Asia.

The company identified the following risk categories as potential risk to its business:

- Country economic crisis, specifically the countries company is sourcing
- Exchange rate fluctuations
- Terrorism and war on terrorism
- Logistic disruptions for varied reasons
- Supply base related problems due to non-existent control over independent manufacturers; financial/ operational problems of supplier base

Other risks identified are:

- Retail (customer) consolidation leading to higher negotiating powers of customers
- Financial/operational problems of customers
- Political unrest and business conditions in countries of business operation

The company has not mentioned of any risk management or continuity strategies in their 10-K filings.

Company 2

The company is a designer, developer, marketer and distributor of men, women and children's apparel and accessory products. The company sells its products through independents retailers, department stores, athletic stores, company specialty sores, outlet stores, as well as the company's website, to United States, Western Europe and a few East Asian countries.

The company produces as little as 10% of its accessories volume and sources the rest of its accessories and all of the apparel goods from independent manufacturers located in Asia, Mexico, South and Central America.

The company has identified the following risk categories:

- Changes in customs regulation and procedures
- Country economic crisis especially current US economic situation
- Exchange rate fluctuations
- Terrorism and war on terrorism
- Process failure either at suppliers' facilities or company's own facilities
- Supplier related disruptions; dependence on independent manufacturers
- Trade regulations including import restrictions, anti-dumping investigations

Other risks identified are:

- Global economic and political uncertainties
- Inability to procure adequate raw material
- Risk associated with retail customers

The company mentions assessing risks inherent to nature of its business on a regular basis, and formulating business plans to mitigate such risks. The company uses derivative instruments, specifically contract forwarding, to manage the currency fluctuation risk exposure.

Company 3

The company designs, manufactures and markets knitwear, jeanswear, occupational apparel, sportswear, children's apparel and intimate apparel. The raw material is sought from numerous suppliers, both domestic and international. Purchased

fabric is cut and sewn into finished garments in domestic and offshore manufacturing facilities located in Mexico and the Caribbean Basin. Some sewing operations are contracted to independent manufacturers. The company is also sourcing full package from Asia and the Caribbean Basin. Approximately 80%-90% of the sale volume in the United States is procured internationally.

The company has identified the following disruption categories:

- Changes in custom laws and regulations
- Economic factors like general economic condition, country economic crisis, and interest rate
- Foreign currency risk due to international nature of business operation
- Logistic disruptions
- Supplier related disruptions including financial strength of suppliers
- Terrorist action or other hostilities
- Trade regulations that include quotas and duties

The other risk to its business that the company has identified is:

- Political factors like instability, politically motivated restrictions etc

The company did not mention in the 10-K SEC filing any continuity strategies it practices to handle disruptions.

Company 4

Company D designs, source and manufactures apparel products that include sportswear, active apparel, and swimwear for men, women, juniors and children, and intimate apparel. The company sells its products to wholesale customers that include department stores, independent retailers, chain stores and specialty stores, mass

merchandisers and other retailers in North America, Europe and Asia. The company also owns and licenses its brand names to third parties.

The company has its own manufacturing plants and warehouses in the United States and other foreign countries, of which some are leased out to third parties.

The company is identified the following risks that relate to nature of its business operations:

- Customs regulations and laws
- National, international and regional economic conditions
- Foreign currency exchange rates
- Logistics: disruption or delay in shipments due to weather and unfavorable supply conditions
- Disruptions due to natural disasters over which the company has no control.
- Supply base related disruptions
- Terrorism
- Various trade agreements and regulations, imposition of new quotas, duties, tariffs, and non tariff barriers, import and export license requirements

Other risks that are identified in 10-K SEC filing are:

- Federal, state and local laws and regulations
- Financial problem of customers
- Fluctuation in oil price
- Political risks

Company 4 has mentioned using insurance as a tool to mitigate the financial effects of disruption in sources of supply. The company regularly monitors the import

quotas and shifts manufacturing and sourcing to countries that have quotas. The company's strategy is to have many manufacturing sources to minimize the disruption effect at one supplier.

Company 5

The company is a private label manufacturer, primarily of women career and casual apparel, with over 95% of its sales going to single customer. The company sources and manufacture garments that are designed by the customers. A substantial proportion of sales volume is manufactured outside the US, either by the contract manufacturers or the company-owned facilities in South America.

The company has identified the following risk related to its business:

- Customs regulations.
- Country economic crisis, especially countries from where the company source
- Foreign currency fluctuations
- Transportation delays
- Natural disasters and its consequences including loss of facility, suppliers, or delayed or damaged shipments
- Supply base related disruptions
- Imposition of tariffs, and import-export regulations
- Work stoppages

Other disruptions identified are:

- Disruptions due to political instability or unrest
- Economic disruptions
- Changes in governmental policies (both US and foreign country of business)

- Customer related disruption will have adverse effect on the company as 95% of the companies sales are to a single customer

The company did not mentioned in the 10-K SEC filing of any continuity strategies to manage its risk exposure.

Company 6

The company is a manufacturer and distributor of intimate apparel, underwear, active-wear, leg-wear and casual apparel. The company sells its products through department stores, specialty stores, warehouse clubs and mass merchandisers in North America, South and Central America, Europe and Asia-Pacific.

The company has identified the following business risks in its 10-K filing:

- Custom laws and regulations
- Economic uncertainty
- Exchange rate fluctuations
- Financial health of customers and supplier, specifically customer credit risk
- Risks arising from changing political environment, and trade regulations that inhibits sourcing and manufacturing internationally.

The company uses risk management control system for sensitivity analysis and estimating value at risk. Hedging is used to manage the risk of currency rate fluctuations.

Company 7

Company 7 designs, develops and markets apparel, footwear and accessories, and sells its goods through retailers, independent distributors, licensees, and subsidiaries worldwide. The company manufactures approximately 5% of its total sales volume in

United States through independent contract manufacturers and the rest in Asian Pacific countries and Eastern Europe. The company also has contracts with independent manufacturers in Central and South America for the production of its footwear and accessory products.

The risks to companies operations as identified in 10-K are listed below:

- Customs
- Exchange rate fluctuation
- Delay or disruption in shipments due to various causes
- Natural disasters
- Failure on part of suppliers or service providers
- Trade regulations including quotas, duties, restriction on movement of funds, and anti-dumping duties

The other risk that company has identified is the political instability in a region or country of business operation. The company monitors exchange rate risk and other market risks through review of market, sensitivity analysis and value at risk analysis.

Company 8

Company 8 designs, sources, and markets branded apparel and private label apparel and footwear products internationally. United State is the primary market, but company has a significant presence internationally. Over 95% of the company's products are manufactured outside the US by over 200 contract manufacturers in the Far East, Indian subcontinent, Europe, South America and Caribbean countries.

The company has identified the following risk sources that might affect its business:

- Customs

- Foreign currency exchange rate
- Terrorism and US led global war on terrorism; Political or military conflict involving US (causing delay in movements of goods)
- Delay or disruption in shipments due to natural disasters, logistics problems, customs, and higher scrutiny due to heightened security threats
- Contract manufacturer and supplier related disruptions due to non compliance to rules, laws and regulations regarding environment, health and safety, safe work practices, working conditions etc; supplier's failure to deliver in time or the quality product may lead to missed delivery date requirements of the customers; labor related problems at supplier's site
- Trade regulations, tariffs, quotas, and duties

Other risks identified by the company in its 10-K report are:

- Environmental, health and other regulation
- Financial instability of retail customers
- Political instability in countries of business operation
- Political or military conflict involving US (causing delay in movements of goods)
- Restriction on transfer of funds.
- Heightened security concern leading to additional thorough inspections of imports, causing delay deliveries or impoundment of goods for extended periods.

No mention of any continuity strategy was found in the company's 10-K SEC filing.

Company 9

The company design, manufacture, market and sell apparel products through various distribution channels. Most of the company's customers are based in United States and includes national and regional chain stores, mail order and catalogue firms, discount stores, department stores, chain and independent specialty stores. Approximately 95% of the products sold by the company are produced offshore by independent contractors or at company owned facilities at Mexico, Caribbean, Central America and Asia.

The company's business is largely affected by the following risks of business disruption, as identified in its 10-K filing:

- Changes in United States import duties, tariffs, and other trade restraints
- Economic uncertainty
- Exchange rate fluctuation
- Logistics related disruptions
- Weather and natural disaster
- Supplier related risks like quality, delayed shipments etc.
- Global terrorism
- Trade rules and trade preference agreements

Other risks identified are:

- Political unrest in exporting country; changes in political and business conditions in countries where goods are manufactured
- Retail consolidation
- Financial condition of customer and suppliers

The company produces and source from many countries so as to minimize the effect of disruption in a region or the world. Company 9 continuously monitors the US trade policies and adjusts manufacturing and sourcing accordingly.

Company 10

The company's primary area of business are manufacturing and marketing of men's and women's, casual apparel, sportswear, dress furnishings, active-wear, career apparel and tailored suits. The products are sold under business and casual brands that are either owned or licensed, to a various retail and specialty stores. Substantially all goods are produced by independent contract manufacturers outside United States.

Following risks of disruptions may affect the business operations of the company:

- Economic uncertainty in the country where supplier is based
- Exchange rate fluctuation
- Weak economy
- Delayed, stolen, lost or damaged shipments
- Supplier related problems-failed or delayed deliveries, quality etc
- Labor related disruptions at supplier's site

The other risks identified are:

- Financial or other problems to company's major customers
- Political uncertainty in the country where supplier is based
- Decline in sales of major retail customers

The company has not mentioned of any continuity strategy in its 10-K SEC filing.

Final Results – Phase II

1. All the ten companies have identified the *supplier related disruptions* as major threat to their business. All the ten US apparel manufacturing companies studied in Phase II source or contract manufacture from suppliers located in foreign countries. Less control over the independent manufactures and suppliers was identified as the primary supplier related risk. Two companies that were studied prefer to have a large supply base, with no long term contract with suppliers so that a disruption at any one of the facilities will not have a material effect upon the company.
2. Nine of the ten companies identified *exchange rate fluctuations* as risk to their business and attributed it to the international nature of their business, as companies' trade in both US dollars and the local currency of the country where the supply source is located.
3. Eight of the ten companies have identified the disruptions due to *logistics, changes in custom regulations and procedures, country economic conditions, and trade regulations* as risk to their business operations.
 - US apparel companies are exposed to the risk of disruptions due to *logistic* issues. Delayed shipments, wrong shipments, undelivered, stolen or damaged shipments have been identified. Companies use different strategies to minimize the financial effect of the logistics disruptions. Insurance and real time shipment monitoring have been identified as the most common strategies.

- As most of the companies' source from countries all over the world, they are subjected to *federal custom laws, tariffs and quota restrictions*. Importation of goods may be subject to embargo if shipment exceeds quota limits. Changes in custom's procedure and increased scrutiny may also affect the timely entry of good into the country. One company reports that they manage this risk by regular monitoring of import quotas, and shifting the production to countries of available quotas. Two companies have also mentioned having many manufacturing sources spread geographically, so that a disruption affecting one manufacturing source will not materially affect the company.
 - The companies have reported to be at the risk of the *economic conditions* of countries where they are conducting business.
 - The companies have reported the *changing international trade regulations*, uncertainty of trade barriers and duties, charges and other fines as risk to their business. They report that these factors limit the strategic advantage of doing business internationally.
4. Five of the ten companies have identified the risk of being affected by *terrorism related events*. Of these five companies, only three identify the global war on terrorism as a risk of disruption to their business operations.
 5. Four of the ten companies studied have identified *natural disasters* as potential disruption to their business. Natural disasters can affect the company's own facilities or that of the supplier affecting the business.

6. Only two companies identified themselves being at the risk of *process failure* related disruption, while only one reported being at risk of workforce related disruptions.
7. Other disruptions that have been identified by the companies are:
 - Changes in *US governmental policies* towards the countries a company has business with.
 - Dependence and less or no control over *independent suppliers*, creating high uncertainty in doing business.
 - Increasing *retail trade consolidation* and bargain power of retail customers, leaving the companies to either comply with customer demands or face the risk of losing business to competitors.
8. Companies have reported *various methods to mitigate the risk of disruptions*. It has been observed that multiple methods of risk management are also used to manage different risks. Five companies have not reported any continuity strategy in their 10-K filings. These companies might have their continuity planning, but have chosen not to report them. Also, the other five companies that have reported some strategies might not have reported all continuity strategies for all risks. The following have been identified as different strategies of risk management.
 - Regular assessment of risks
 - Establish policies and business practices for protection against effects of risk exposure
 - Insurance

- Have many manufacturing sources to minimize the effect of disruption at any one supplier
- Risk management control system for sensitivity analysis and estimating value at risk
- Hedging to manage financial risks

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Summary

The purpose of this research is to conduct an exploratory analysis of the disruptions in the United States apparel manufacturing industry. The specific research objective is to identify and determine the nature of disruptions and the continuity strategies in the US apparel manufacturing industry. The research was conducted in two phases. The Phase I research gathered quantitative data using a three-page survey questionnaire developed by the researcher (Appendix B). The questionnaire was structured by a designated set of questions that were separated in relation to the disruptions and business continuity planning. The questions were structured to obtain an understanding of the types of business disruptions and the business continuity planning in the US apparel industry. The Phase II research gathered qualitative data from 10-K SEC filings of ten randomly selected US apparel companies. Data was gathered on the risk of disruptions and the response strategies used by companies to handle those risks.

Companies were selected based on convenience sampling, as this study explores the current status of continuity planning in the industry to form the basis of future research.

Summary of Results

Disruptions

RS 1 What are the disruptions that are occurring in the US apparel manufacturing companies?

US apparel manufacturing companies are at risk of disruptions from varied sources. The Phase I research identified the risk that had affected the sample subjects in last five years. The Phase II research identified the risks that companies thought they were at risk of. It is difficult to identify the most serious risks as this research did not assess the frequency and the cost of the disruptions. The comprehensive list of all disruptions identified in this research is below:

- Changes in custom regulations and procedures
- Country economic crises
- Exchange rate fluctuation
- Financial soundness of retail customer
- Global war on terrorism
- IT related disruptions
- Laws and regulations
- Logistics
- Natural disasters
- Political unrest
- Process failure
- Supply base related disruptions
- Standard compliance issues

- Trade regulations
- Terrorism
- Utility disruptions
- Workforce

Continuity Planning

Note: Phase II study could not clearly identify the continuity planning among the sample subjects. Though five of the ten sample subjects had identified specific risk management strategies, the overall picture could not be established as companies might not have disclosed this information. The research statement 2 and 3 results are presented on the basis of Phase I research.

RS2 Do companies have back up or continuity plans for the disruptions?

Following continuity strategies were identified from the analysis of Phase I results:

- Business continuity planning does not exist for major of the disruptions among most participant companies.
- Majority of the participating companies reported to have an informal or undocumented continuity plans.
- The continuity plan does not cover all process and units, personal and resources.
- The continuity plans have been developed only for some of the risks of disruptions.

RS3 What is the status of business continuity planning in the US apparel industry?

- Most respondents reported to having an “informal, undocumented history of disruptions”, while only one respondent claimed of not having any sort of disruption recordkeeping. The view that emerged from the discussions is that, managers believe

it to be a continuous learning process, and bookkeeping of day to day operational disruptions seems unpractical.

- Companies have some sort of risk assessment in place their organizational business processes, but risk assessment for all the business processes has not been done. Similarly, business impact analysis has been done only for a few business processes.
- Only half of the respondents mentioned of having assessed the maximum business downtime for critical processes that may lead to significant financial or operational losses.
- Customers, and vendors and suppliers are reported to be the primary drivers of disruption management in most companies. This is in contrast to the response, where managers were asked if their suppliers/vendors were required to have their own continuity planning for risk of disruptions. Most managers reported to not having any such requirement for suppliers/vendors, while only one company mentioned to having these requirements in cases where the supplier/vendor is very critical to the organization. Shareholders were the next most important driver of continuity planning in the participant organizations, while regulations public relations and previous disruptions were the least possible drivers of business continuity in the organizations.
- It emerged from responses that there is no practice of allocating any budget to the continuity planning or planning for risk of disruptions. Most companies take it on “as it happens” basis. Only one company responded to have a yearly budget, while another reported to have allocated only for the current year.
- On the issue of training to tackle the disruptions, most companies responded to not having any such training program. Only two companies stated to have a training

program, but their program is informal and not documented. Moreover, the managers were “not sure” of the training period, or when the employees were trained.

RS4 What is the strategic nature of continuity plans? (Phase I and Phase II results)

- The continuity strategy reported by most participants to a disruption was to “Modify process”, rather than “Business Continuity Planning”, “Insurance”, or “Do nothing”. Companies prefer to modify the process according to the disruption situations, and try to remain as flexible as possible. For some specific disruptions, the managers claimed to have devised continuity plans, or have insurance, but not for all the risks of disruptions.
- Companies mitigate supply base disruptions by having many suppliers and reducing the dependence on selected suppliers.
- It emerges from the qualitative data analysis (Phase II) that companies may be using other methods of risk management like risk management control systems software.

Conclusions

1. The risk of disruption to companies in apparel industry is significant due to the international nature of the business, large supply base, and the ever changing trade and customs regulations.
2. Diverse disruptions were reported by industry. Trade regulations, supply base related issues, changes in customs regulations, logistics, natural disasters, and product related issues are the most common sources of business disruptions.
3. Two companies reported to have many supply sources to minimize the supply base disruption risk as any disruption to one supplier will minimally affect the company.
4. Though companies have reported the use of a large supply base to minimize the risk of disruption, having a large supply base increases the risk exposure as the company has little or no direct control over their supply base.
5. Business continuity planning is informal in the industry, with most companies having not completed their risk assessment and business impact analysis for the risk of disruptions.
6. The business continuity planning seems not to be a significant part of corporate strategy as insufficient or no budget is allocated for the development, implementation and maintenance of the continuity plans.

Future Research

1. A broader study of the disruptions in apparel industry could be conducted to identify the variables of risk exposure and corporate response strategies in relation to variables like company size, nature of business, and business models.

2. Future studies could assess the implication of the nature of business continuity planning (formal v/s informal; highly budgeted v/s low budgeted) on the performance, as it is related to the improvement in a company's bottom-line.
3. A future study could assess various sources of disruptions in relation to possible failure modes and supply chain models in the textile supply chain complex.
4. Future studies could attempt to identify specific failure modes and risks that can arise due to current and/or speculated developments in trade regulations, custom regulations, regional politics.
5. Another future study could examine the role of IT in business continuity planning, with a detail analysis of various continuity planning softwares and their effectiveness in improving the bottom-line of a company.
6. Future studies could analyze the relationship between the costs of continuity planning to the cost of risk of disruptions as it relates to supply chain continuum.
7. Future studies could examine the current supply chain contingency planning practices in textile complex for their effectiveness in handling specific situation of disruptions, in relation to various failure modes.
8. Future studies could examine the organizational business strategies to overcome the supply chain disruptions, and the effect of supply chain management practices in the mitigation of business continuity risks as it relation to customer/supplier relationship management.
9. Future study could examine the new risk factors that are developed out of supply chain practices like quick response, Just-In-Time, and having minimum supplier base.

REFERENCES

Abernathy, F. H., Dunlop, J. T., Hammod, J. H., Weil, D. (1999). *A stitch in time: Lean retailing and the transformation of manufacturing: Lessons from apparel and textile industries*. New York, Oxford University Press, ISBN 0195126157.

Arnold, R. L. (2002). Recovery from September 11 events is slow process [Online]. *Disaster Recovery journal*. Retrieved February, 2003 from <http://www.drj.com/special/wtc/drjwctspeciall.pdf>.

Betts, M. (2001). Just in case. *Computerworld*, December 2001, pp. 46.

Boubkeri, N. (2001). Technology enablers for supply chain management. *Integrated manufacturing systems*, 12(6), 294-399.

Broder, J. F. (2000). *Risk analysis and the security survey*. Second edition, Boston, Butterworth-Heinmann Publications.

Caponigro, J. R. (2000). *The crisis counselor: A step by step guide to managing a business crisis*. Chicago, Contemporary Books.

Carr, H. H., Synder, C. A. (2002). *The management of telecommunications*. Irwin, McGraw Hill College, ISBN: 0072489316.

Chapman, P., Christopher, M., Juttner, H., Peck, U., Wilding, R. (2002). Identifying and managing supply chain vulnerability. Retrieved March, 2003. <http://www.som.cranfield.ac.uk>.

Chandra, C., and Kumar, S. (2000). An application of system analysis methodology to manage logistics in textile supply chain. *Supply chain management: An international journal*, 5(5), 234-244.

Chandra, C., and Kumar, S. (2001). Enterprise architectural framework for supply-chain integration. *Industrial management and data systems*, 101(6), 290-303.

Cho, J., Kang, J. (2001). Benefits and challenges of Global sourcing: perceptions of US apparel retail firms. *International marketing review*, 18(5), 542-561.

Clark, E., Marois, B. (1996). *Managing risk in international business: Techniques and applications*. London, International Thomson Business Press.

Cresswell, J. W. (2003). *Research design: Qualitative, quantitative and mixed methods approaches*. Second edition, Thousand Oaks, Sage publications.

- Culp, C. L., (2001). The risk management process: business practices and tactics. New York, John Wiley and Sons publication, ISBN: 0-471-40554-X.
- Dickerson, K. G. (1999). Textile and apparel in global economy. 3rd Ed., New Jersey, Prentice Hall, ISBN: 0-13-647280-X.
- “Disruption defense”*, n.d. Retrieved on January 2003 from <http://www.contingencyplanning.com/tools/bcphandbook/disruption.cfm>.
- Divita, L.R.& Cassill, N.L. (2002). Strategic partnership in the domestic textile complex: exploring suppliers’ perspective. Clothing and textile research journal, 20(3), 156-166.
- Doughty, K., (2001). Business continuity Planning: protecting your organization’s Life. London, Auerbach publications, ISBN: 0-8493-0907-7.
- Dufor, J. M., (1999). Electronic commerce in textile-clothing chain: Innovation and creativity. Annual conference report, ITMF, 24-27.
- Elliott, D., Swartz E., Herbane, B. (1999). Business continuity management: preparing for worst. London, Income data services, ISBN: 0-905525.
- Elmuti, D., Kathawala, Y. (2001). An overview of strategic alliance. Management decision, 39(3), 205-217.
- Ericson, J. (2001), Addressing supply-chain disruptions to stock or not to stock [Online]. Retrived Februry, 2003 from <http://www.line56.com/articles/default.asp?ArticleID=3015>.
- Frenkel, M., Hommel U., Rudolph, M. (2000). Risk management: Challenge and opportunity. Berlin, Springer.
- Frost, C., Allen, D., Porter, J., Bloodworth, P. (2001). Operational risk and resilience. Oxford, PricewaterhouseCoopers. ISBN: 0-7506-4395-1.
- Griffy-Brown, C. Just-in-time to just-in-case: Managing a supply chain in uncertain times [Online]. Retrieved March, 2003 from <http://gbr.pepperdine.edu/032/supplychain.html#note2>.
- Handfield, R., B., Nioloas, E. L. (2000). Introduction to supply chain management. New Jersey, Prentice Hall, ISBN: 0-13-621616-1.
- Handfield, R. B., (2003). Proposal to National Science Foundation, Unpublished.
- Helms, M. M., Ettkin, L. P., Chapman S. (2000). Supply chain forecasting: Collaborative forecasting supports supply chain management. Business process management, 6(5), 392-407.

Hunter, N. A. (1990). Quick response in apparel manufacturing. The Textile Institute, Manchester.

Hunter, N. A., King, R. E., Nuttle, H. L.W. (1992). An apparel chain system for QR retailing. *Journal of textile institute*, 83(3), 462-470.

Jaeger, C. C., Renn, O., Rosa, E. A., Webler, T. (2001). Risk, uncertainty, and rational Action. UK, Earthscan Publications Ltd. ISBN: 1-85383-770-9.

Kessler, D. (2001). Anticipating and managing risks in 21st century. *The Geneva papers on risk and insurance*, 26(1), January 2001, 1-7.

Khanna, S. R., (1996). Trends in US and EU textile and clothing imports, *Textile international outlook*, 63, 79-119.

Khanna, S. R. (2002). Trends in US textile and clothing imports. *Textile outlook international*, (99), 67-129.

Kilduff, P. D. F. (2000). Textile in new environment. *Textile Asia*, July 2000, 44-48.

Kloman , H. F. (2001). The risk spectrum [Online]. Risk management reports, Retrieved January 2003 from <http://riskreports.com/spectrum.html>.

Koller, G., (1999). Risk assessment and decision making in business and industry. Boca Raton, Fla., CRC press.

Lee, H. L., Billington, C. (1993). Material management in decentralized supply chains. *Operation research*, Vol 41Number 5, Pages 835-847.

Leung, S., Y., S. (2000). World class apparel sourcing enterprises and the restructuring of existing global supply chain. *Journal of textile institute*, 91(2), 73-93.

Leung, S., Y., S. (2002). Threats faced by sourcing enterprises in global supply chains. *Textile Asia*. August, 43-46.

Lovejoy, J., (2001). Principals of supply chain management [Online]. Retrieved January, 2003 from <http://dama.tc2.com/Pub/Prin.html>.

Martha, J., Subbakrishna S. (2002). Targeting a just-in-case supply chain for the inevitable next disaster. *Supply chain management review*, September 2002, 6(5), 18(6).

McGaughey, R. E., Synder C. A., Carr H. H. (1994). Implementation information technology for competitive advantage: Risk management Issues. *Information and management*, 26, 273-80.

McMichael, H., Mackay, D., Altmann, G. (2000). Quick response in Australian TCF industry. *International journal of physical distribution & logistics management*, 30(7), 611-626.

McNamee, D., Selim, G. M. (1998). Risk management: The internal Auditor's paradigm. The institute of internal auditors research foundation.

Meulbroek, L. (2002). The promise and challenges of integrated risk management. *Risk management and insurance review*, 5(1), 55-66.

Ostic, J. K. (1997). An introduction to USITC enterprise analysis Version 1.0 [Online]. Retrieved on October, 2002 from <http://dama.tc2.com/Pub/usitc.html>.

Parter, E., Biehl, M., Smith, M.A. (2001). International supply chain agility: Tradeoffs between flexibility and uncertainty. *International journal of production management*, 21-5/6, 823-839.

Peck, H., Juttner, U. (2002). Risk management in the supply chain [Online]. Retrieved March, 2003 from www.som.cranfield.ac.uk/som/search/centers/iscm/downloads/risk%20management.pdf.

Pereira, B., (2002). Business continuity: Implementing a business continuity plan [Online]. Retrieved on October 2002 from <http://www.networkmagazineindia.com/200208/cover1.shtml>.

Raddock, D.M., (1986). *Assessing corporate political risk*. New Jersey, Rowman and Littlefield publishers.

Ritchie, B., Marshall, D. (1993). *Business risk management*. London, Chapman and Hall.

Romano, P., Vinelli, A. (2001). Quality management in a supply chain perspective: Strategic and operative choices in a textile-apparel network. *International journal of operation and production management*, 21(4), 446-460.

Rubin, L. (1999). Global alliance and international textile and apparel industries. The 79th world conference of the Textile Institute, Manchester, 1-6.

Sharp, J. The origins and current state of the art in risk and business continuity management [Online]. Retrieved on December 2003 from <http://www.thebci.org/BCAWKA1.htm>.

Turbide, D. (1997). The new world of procurement. *Midrange ERP*, July-August, 12-16.

Vose, D. (2000). *Risk analysis: A quantitative guide*. Second edition, New York, John Wiley and Sons Ltd.

Yin, R.K. (1994). *Case Study Research: Design and Methods*. Second Edition, CA, Sage Publications.

Young, P. C., Tippins, S. C. (2001). *Managing business risk: An organization wide approach to risk management*. New York, Amacom.

Youngdahl, W. E., Loomba, A.P.S. (2000). Service driven global supply chains. *International journal of service industry management*, 11(4), 329-347.

Yu, Z., Yan, H., Cheng, T. C. E. (2001). Benefits if information sharing with supply chain partnerships. *Industrial management and data systems*. 101(3), 114-119.

Wilding, R. (1998). The supply chain complexity triangle: uncertainty generation in the supply chain. *International journal of physical distribution and logistics management*, 28(8), 1998, 599-616.

William, C.A., Smith, M. L., Young, P. C. (1998). *Risk management and insurance*. Irwin McGraw publications.

APPENDIX – A¹

Detailed List of Disruptions

Demand related disruptions:

- Sales forecast inaccuracy

Production related disruption:

- Quality/specification problem
- Equipment problem
- Internal logistics problem
- Planning problem
- Material shortage (Cause as well as effect of disruption)
- Change in customer demand

Natural Disasters

- Flood
- Storm
- Earthquake
- Tornado
- Cyclone
- Drought

Social Disruption

- Riots
- Strikes/demonstrations/shut downs

Acts of terrorism

Epidemic diseases

Thefts/vandalism

Fraud

Fire

Power disruption/water disruption

Suitability/disclosure and fiduciary

- Fiduciary breaches/guideline violations
- Suitability/disclosure issues
- Retail consumer disclosure violations
- Breach of privacy

- Aggressive sales
- Account churning
- Misuse of confidential information
- Lender liability

Improper business or market practices

- Antitrust
- Improper trade/market practices
- Market manipulation
- Insider trading (on firm's account)
- Unlicensed activity
- Money laundering

Systems

- IT infrastructure disruption
 - Hardware
 - Loss of information
 - Software
 - Network failure
 - Inability to accept electronic payment or make e-transactions
- Telecommunications
- Utility outage/disruptions

Exchange rates

Supplier lead time

Supplier quality

Manufacture yield

Transportation delays

Stochastic costs

Political environment

Customs regulations

Price fluctuations

1. Sources: Ritchie & Marshall, 1993; McNamee & Selim, 1998; Koller, 1999; Broder, 2000; Caponigro, 2000; Frenkel, Hommel & Rudolph, 2000; Culp, 2001; Frost, Allan, Porter & Bloodworth, 2001; Young & Tippins, 2001.

APPENDIX - B

SURVEY OF DISRUPTIONS IN THE US APPAREL INDUSTRY

Business disruption is defined as any event, whether anticipated or unanticipated, which disrupts the normal course of business operations at a corporate location.

Please provide responses to the following questions. Your answers will be confidential.

Section I: Identification of major disruptions and respective business continuity strategies

Instructions: Please check (X) No/Yes for each box.

If your response is “Yes” please specify the continuity strategy according the following guide:

1. **Do nothing:** commercially acceptable disruption
2. **Modify the process:** deciding to alter existing procedures
3. **Insurance:** financial recompense / support in the event of loss
4. **Business Continuity Planning (BCP):** A clearly defined and documented plan for use at the time of a business continuity emergency, event, incident and/or crisis. A typical BCP plan will cover all the key personnel, resources, services and actions required to maintain the business continuity.

I. Has your company been affected by any of the following business disruptions since 1997?			II. Continuity Strategy			
	No	Yes	Do nothing	Modify process	Insurance	BCP
1. Product Quality related disruption						
2. Process failure						
3. Workforce (e.g. strikes, union)						
4. Utility (e.g. Power, water, oil, gas)						
5. IT related disruption						
6. Supplier related (loss of key supplier,						
7. Logistics (e.g. late or cancelled shipments)						
8. Natural disasters						
9. Terrorism						
10. Global war on terrorism						
11. Changes in custom regulations/procedures						
12. Country economic crisis (e.g. Asian economic crisis)						
13. Exchange rate fluctuation						
14. Trade regulations						
15. Standards compliance issues						

- Budget is allocated every year, but is not sufficient to develop and maintain the BCP
- Budget is sufficient but only for the current period
- Sufficient funds are allocated every year to maintain BCP

IV. Do you have a BCP training program for employees?

- We have no BCP training program
- We have a program but not very well established
- We have a well established program

V. How often do you train your employees about BCP?

- | | |
|---|--|
| <input type="checkbox"/> Never | <input type="checkbox"/> Annually |
| <input type="checkbox"/> Every six months | <input type="checkbox"/> Monthly |
| <input type="checkbox"/> Not sure | <input type="checkbox"/> During new employee orientation |

VI. Do you have specific requirement for your vendors/suppliers to have their own BCP program?

- There is no such requirement for our vendors/suppliers
- Our suppliers/vendors are required to have a BCP

Section IV: Demographics

I. Is your business predominantly (*check one*)

- | | |
|--|---------------------------------|
| <input type="checkbox"/> Manufacturing | <input type="checkbox"/> Retail |
| <input type="checkbox"/> Other _____ | |

II. Annual Sales Volume (*Check one*)

- | | |
|--|---|
| <input type="checkbox"/> Less than \$25 million | <input type="checkbox"/> \$25 million to \$50 Million |
| <input type="checkbox"/> \$51 million to \$100 million | <input type="checkbox"/> \$101 million to \$500 million |
| <input type="checkbox"/> \$501 million to \$1 billion | <input type="checkbox"/> over \$1 billion |

III. Is your company (*check one*)

- Multinational with 25 or more locations
- Multinational with less than 25 locations
- National with 10 or more locations
- National with 2-10 locations
- Single site

IV. How many countries do you source, service and/or products from? _____

V. How many supplier/vendors does your company conduct business with?

- | | |
|----------------|---------------------|
| _____ Domestic | _____ International |
|----------------|---------------------|

Thank you for your contribution. Your responses will be confidential.

APPENDIX – C

3152 CUT AND SEW APPAREL MANUFACTURING

This industry group comprises establishments primarily engaged in manufacturing cut and sew apparel from woven fabric or purchased knit fabric. Included in this industry group is a diverse range of establishments manufacturing full lines of ready-to-wear apparel and custom apparel: apparel contractors, performing cutting or sewing operations on materials owned by others; jobbers performing entrepreneurial functions involved in apparel manufacture; and tailors, manufacturing custom garments for individual clients. Establishments weaving or knitting fabric, without manufacturing apparel, are classified in Subsector 313, Textile Mills.

31521 Cut and Sew Apparel Contractors

This industry comprises establishments commonly referred to as contractors primarily engaged in (1) cutting materials owned by others for apparel and accessories and/or (2) sewing materials owned by others for apparel and accessories.

315211 Men's and Boys' Cut and Sew Apparel Contractors

This U.S. industry comprises establishments commonly referred to as contractors primarily engaged in (1) cutting materials owned by others for men's and boys' apparel and/or (2) sewing materials owned by others for men's and boys' apparel.

315212 Women's, Girls', and Infants' Cut and Sew Apparel Contractors

This U.S. industry comprises establishments commonly referred to as contractors primarily engaged in (1) cutting materials owned by others for women's, girls', and infants' apparel and accessories and/or (2) sewing materials owned by others for women's, girls', and infants' apparel and accessories.

31522 Men's and Boys' Cut and Sew Apparel Manufacturing

This industry comprises establishments primarily engaged in manufacturing men's and boys' cut and sew apparel from purchased fabric. Men's and boys' clothing jobbers, who perform entrepreneurial functions involved in apparel manufacture, including buying raw materials, designing and preparing samples, arranging for apparel to be made from their materials, and marketing finished apparel, are included.

31523 Women's and Girls' Cut and Sew Apparel Manufacturing

This industry comprises establishments primarily engaged in manufacturing women's and girls' apparel from purchased fabric. Women's and girls' clothing jobbers, who perform entrepreneurial functions involved in apparel manufacture, including buying raw materials, designing and preparing samples, arranging for apparel to be made from their materials, and marketing finished apparel, are included.

31529 Other Cut and Sew Apparel Manufacturing

This industry comprises establishments primarily engaged in manufacturing cut and sew apparel from purchased fabric (except men's, boys', women's, and girls' apparel). This industry includes establishments manufacturing apparel, such as fur apparel, leather apparel, infants' apparel, costumes, and clerical vestments