MANAGING SUPPLY CHAIN RISKS IN FRESH FOOD ITEMS

A Case Study on Makro-Habib Pakistan Limited – A Wholesale Chain in Pakistan

Master Thesis, 4FE02E, 15 hp
Spring 2010
Växjö, 2010-05-28

Authors:
Waqas Mehmood       (850420-1479)
Yasir Liaqat        (840211-5334)
Nauman Iftikhar     (850814-2554)
Raza Syed Hassan    (860620-T013)

Tutor: Petra Andersson
Examiner: Helena Forslund
ABSTRACT

Authors: Waqas Mehmood, Yasir Liaqat, Nauman Iftikhar, Raza Syed Hassan

Tutor: Petra Andersson

Examiner: Helena Forslund

Title: Managing Supply Chain Risks in Fresh Food Items – a case study on Makro-Habib Pakistan Limited – a wholesale chain in Pakistan

Background: In today's era, businesses are facing various types of risks which can be legal/political, social, operational/technical, natural and economic in nature. For this purpose, companies need to have effective risk management processes to mitigate these risks. Especially companies like Makro-Habib who heavily rely on effective and efficient supply chains can gain competitive advantage if they manage the risks within their supply chain network.

Research Questions: RQ-1: What are the most significant supply chain risks in fresh food items at Makro-Habib? RQ-2: How can significant supply chain risks in fresh food items of Makro-Habib be mitigated through proposed action plan?

Purpose: The purpose of this thesis is to contribute to the knowledge on how to manage risks in the fresh food supply chain

Method: The empirical data and the conclusions which are drawn from it are based on qualitative facts that are gathered through interviews and questionnaires. The results/conclusions drawn from responses of the interviews of fresh food section heads of Makro-Habib and the literature. This thesis is written from a positivistic perspective with a deductive approach.

Conclusion: Various risk mitigation strategies at strategic, operational and visibility level are suggested like coordination, information sharing, training, monitoring to counter the most significant fresh food supply chain risks which are wrong ordering, contamination of products and FIFO (loose practice).
ACKNOWLEDGEMENT

In a time-frame of ten weeks, we have had both the privilege and responsibility to accomplish a full study regarding the management of supply chain risks in fresh food section at Makro-Habib Pakistan Limited. First of all, we would like to extend our gratitude towards Makro-Habib fresh food section head Mr. Zeeshan Hamid who first gave us the opportunity to work with him and secondly he supported us throughout the whole research period by providing on time responses to our queries and empirical data.

We would like to thank our academic tutor Petra Andersson and examiner Helena Forslund at Linnaeus University, Växjö for constructive critique and suggestions for improvements. Furthermore, we would also like to thank our classmates and in particular our opposition-group for their valuable inputs that helped to improve this thesis.

We would also like to take this opportunity to appreciate the support our beloved parents who always pray for our success and encourage us to take all challenges in a stride.

Växjö, May 28, 2010

Waqaş Mehmood       Yasir Liaqat

Nauman Iftikhar      Raza Syed Hassan
# TABLE OF CONTENTS

CHAPTER – 1: INTRODUCTION ................................................................. 1
  1.1. Background ............................................................................... 1
  1.2. Company Presentation ................................................................. 2
  1.3. Problem Discussion ................................................................. 4
  1.4. Research Questions ................................................................. 6
  1.5. Purpose & Objectives ................................................................. 7
  1.6. Thesis Model ........................................................................... 8

CHAPTER – 2: METHODOLOGY ............................................................... 9
  2.1. Research Strategy ................................................................. 9
    2.1.1. Case Study ........................................................................ 9
  2.2. Scientific Perspective ............................................................. 10
    2.2.1. Positivism ........................................................................ 10
    2.2.2. Hermeneutics .................................................................. 10
  2.3. Scientific Approach ............................................................... 11
    2.3.1. Deductive Method .......................................................... 12
    2.3.2. Inductive Method ......................................................... 13
  2.4. Research Method ................................................................. 14
    2.4.1. Quantitative Method ....................................................... 14
    2.4.2. Qualitative Method ....................................................... 15
  2.5. Data Collection Sources ....................................................... 17
    2.5.1. Primary Sources .......................................................... 18
    2.5.2. Secondary Sources ....................................................... 18
  2.6. Validity and Reliability ......................................................... 19
  2.7. Summary of Methodology .................................................... 21

CHAPTER – 3: THEORATICAL FRAMEWORK ....................................... 23
  3.1. Supply Chain ............................................................................ 23
  3.2. Food Supply Chain ................................................................. 23
  3.3. Risk ......................................................................................... 24
Annexure – 1 (Questionnaire 1): .................................................................95
Annexure – 2 (Questionnaire 2): .................................................................96
Annexure – 3 (A3) (Risk Rating Matrices): ................................................97
   Table – A3:1 Risk Rating Matrix (Wrong Ordering)..............................97
   Table – A3:2 Risk Rating Matrix (Untrained Staff/Lack of Technical Training)......97
   Table – A3:3 Risk Rating Matrix (No Quality Control in Receiving)........98
   Table – A3:4 Risk Rating Matrix (Display Limitations)............................98
   Table – A3:5 Risk Rating Matrix (Under/Over Receiving)......................99
   Table – A3:6 Risk Rating Matrix (Quality Assurance).........................99
   Table – A3:7 Risk Rating Matrix (No Control over Storage) ..................100
   Table – A3:8 Risk Rating Matrix (Short Expiry Product Management) ....100
   Table – A3:9 Risk Rating Matrix (Mixing of Expired/Spoiled/Quality....)101
   Table – A3:10 Risk Rating Matrix (Buyer Orders without Store Consensus)101
   Table – A3:11 Risk Rating Matrix (Internal Purchase Procedure-Loose...)102
   Table – A3:12 Risk Rating Matrix (Contamination of Products) ..........102
   Table – A3:13 Risk Rating Matrix (No Control over Bakery Production....)103
   Table – A3:14 Risk Rating Matrix (FIFO-Loose Practice) ....................103

List of Figures:

Figure – 1.1: Supply Chain Risk Management........................................2
Figure – 1.2: Makro-Habib Supply Chain & Study Focused Area..................6
Figure – 1.3: Thesis Model........................................................................8
Figure – 2.1: Scientific Research Approach................................................12
Figure – 2.2: Deductive Research Method..................................................13
Figure – 2.3: Inductive Research Method....................................................14
Figure – 2.4: Summary of Methodology Choices.......................................21
Figure – 2.5: Thesis Model..........................................................................22
Figure – 3.1: Food Supply Chain.................................................................23
Figure – 3.2: The Cycle of Risks .................................................................25
Figure – 3.3: Categorization of Risks ..........................................................29
Figure – 3.4: Supply Chain Risk Management Process..............................31
Figure – 3.5: Grading Table – Jonsson Analysis.........................................35
Figure – 3.6: Risk Rating Matrix.................................................................37
Figure – 3.7: Thesis Model.........................................................................51
List of Tables:

Table - 2.1: Comparison of Qualitative & Quantitative Research Approaches...........16
Table - 3.1: Supply Chain Risk Categories with Examples...........................................26
Table - 3.2: Risk Mitigation Strategies in Supply Chain..................................................40
Table - 5.1: Risk Rating Matrix (All Identified Risks).....................................................62
Table - 5.2: Most Significant Fresh Food Supply Chain Risks ......................................63
Table - 5.3: Comparison of Impact Factors – Wrong Ordering.......................................65
Table - 5.4: Comparison of Impact Factors – Contamination of Products....................71
Table - 5.5: Comparison of Impact Factors – FIFO (Loose Practice).............................76
CHAPTER – 1: INTRODUCTION

This chapter sets the framework for this master’s thesis and provides some background knowledge of risk, supply chain risk and supply chain risk management to the reader. After background, information about the company is presented in this chapter. Later on problem discussion connected to risks associated with fresh food supply chain is described which led to research questions and objectives.

1.1. Background

Supply chain is the reality which has a long and the important history, either in a form of bartering or in the form of exchange of goods that would be an example of supply chain in the simplest form. The simple model for the supply chain was developed in the medieval communities and economies which were typically operated in the localized market place. Apparently much of the systems, structures the processes today’s supply chain were in existence already (Brindley, 2004).

In today’s competitive markets, companies strive for any advantage they can get over their competitors. This has been recognized by a number of companies that supply chain excellence is an opportunity to create such an advantage. A superior supply chain includes, on time delivery, lower cost products and manufacturing flexibility as compare to their competitor. Mentzer et al (2008) describes that "Supply Chain Management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, demand creation and fulfillment, and all Logistics Management activities. Thus, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. In essence; supply chain management integrates supply and demand management within and across companies." Hofman et al (2008) explains that how, where and when reliable value throughout the entire supply chain including flows of material, intellectual property and money in a global context can be created.

Womack et al (2003) discusses that the operational excellence of a firm has been demanded with the increased responsibilities of supply chain and more complex process are required for supply chain risk analysis then ever before. This includes lean manufacturing principles, process control theory, process mapping and modelling to the
entire supply chain. This phenomenon is also applicable to the concept of risk management in throughout the supply chain risk analysis in a broader term then ever before. Womack et al (2003) defines the risk as the chances or likelihood of something unwanted, unpleasant or unwelcome will occur. At the same time a new level of significance is taken into account with respect to the management, supply chain operations and the risks or incidence although these are not new concept or phenomenon. Juttner et al (2003, pp. 197) discusses that “Despite the increasing awareness among practitioners; the concepts of supply chain vulnerability and its managerial counterpart supply chain risk management are still in their infancy”. The companies who rely on their supply chains now looking into more innovative ways to manage risk into the supply chain with the insurance of its smooth operations.

According to Artebrant et al (2003, p. 49), the purpose of supply chain risk management firstly is to identify the potential areas of risks and secondly the implementation of proper actions to contain that risk. Hence it can be defined as the “identification and management of risk within the supply chain and risks external to it through a coordinated approach amongst supply chain members in order to reduce supply chain vulnerability as a whole”.

![Supply Chain Risk Management Diagram](image)

**Figure – 1.1: Supply Chain Risk Management**
*Source: Artebrant et al (2003)*

### 1.2. Company Presentation

**Makro**

Makro is a leading chain of wholesale centers with outlets in several countries of Asia and South America. Makro is an important link in the producer’s distribution chain, especially
to the small professional customer to whom direct delivery is becoming less and less economically viable. Makro is cash & carry wholesale company, with stores ranging in size from 4,000m² to 12,000m² offering food and non-food products to professional/registered customers. These customers include small and medium sized independent retailers, institutional customers like schools and hospitals and all varieties of professionals involved in the catering sector. Makro’s customers are themselves mainly service providers requiring quality products, consistency in supply and availability as well as competitive prices. Makro endeavor therefore to provide excellent customer service with the aim of developing long-term mutually beneficial relationships with their client base.

**Makro-Habib Pakistan Limited**

Makro-Habib demonstrated a commitment to grow in Pakistan by entering the wholesale sector in July 2005 with plans to invest around USD 300 million in the next four years. Pakistan's wholesale sector has been a grossly neglected segment of the economy; Makro-Habib pioneered into its age old customs and led the change by introducing modern and transparent rules of trade. Makro-Habib has also brought the latest technology and techniques to preserve and enhance the life of fresh farm produce. This will not only benefit the farmer but also the common man.

**Future Projection Plan**

30 stores in Pakistan - 12 stores by 2011

**Makro-Habib Business Model**

Makro-Habib is for the benefit of the people. Its controlled prices, guaranteed quality and an extensive product range of food (dry and fresh) and non-food products brings a novel shopping experience to the professional/registered customers in Pakistan. Makro-Habib caters equally to all socio-economic segments of the society with special emphasis on small and medium sized retailers, hotels, restaurants, catering services and many other business establishments. Makro-Habib’s professional customers find all their needs under one roof. (Internet - 1)
1.3. Problem Discussion

In the risk management, for static elements conventional risk management methodology is generally applicable, like a factory or a nuclear storage facility which has fixed boundaries for risk influence and is mostly a one-time assessment. Further the traditional risk assessment does not include the dynamics of real time variation and external environment risk in physical and the operational elements. Today's the interest in supply chain risk management contains the issues that result in a number of trends by which the supply chain flow are affected, and also, in most of the cases risk situation is changed. In today's competitive world, management of supply chain is becoming more and more challenging. The more the uncertainties in globalization of market and in demand and supply due to the increased number of manufacturers, logistics partners, distributors, the more and more complex the supply chain structure becomes which results into more exposure to the risks in supply chain. (Christopher et al, 2004)

"Risk management and mitigation is the process of identifying and analyzing the key threat elements within the supply chain, evaluating their results on the supply chain assets and implementing safeguards to mitigate the level of risk that the threats pose" (Pai, 2004, p. 20). Risk management can be applied to a variety of fields ranging from insurance risk to environmental risk. However, the basic risk management approach to all kinds of risks involved is more or less the same, the only difference lies between the threats that pose to the risk.

Rasmussen et al (2000) describes that developments are creating new and increased possibilities to deal with risks in supply chains for instance the introduction of information technology (IT). New risk management approaches are required in the present competitive and dynamic environment. Also, the swift progress in the field of information technology opens new horizons for developing effective decision support tools.

Currently, most of the companies are not aware about the supply chain risks and those who are aware need knowledge to lessen and mitigate these supply chain risks. So, there is a growing need to develop new generic models for managing supply chain risks. This is very much in line with the final conclusion by Juttner et al, (2003, p. 209), which was “we
believe that it is an academic responsibility to establish supply chain risk management as an important, if so far neglected, area of applied research”.

Wu et al (2006, p. 350) describes that “uncertainty also exists due to other factors such as changes in markets, technology, competitors, political issues, and governmental regulations. Recent examples include the 2002 US west coast port strike, terrorist attacks such as September 11, 2001, the 1999 Taiwan earthquake, and most recently, Hurricane Katrina in 2005. These types of uncertainties, though difficult to control, can be managed through efficient contingency planning”.

Climatic, economic and political situations in Pakistan are not very favorable compared to other Asian or South American countries where Makro has been operating. Resultantly, this may involve a number of risks ranging from environmental, IT to simple human error risks throughout the entire supply chain. Specially, these conditions are more critical for fresh food items due to their short-life and perish ability. This thesis will focus only on the supply chain activities within the store and will not focus on the upstream and downstream of the supply chain. This research provides risk managers and other concerned personnel in the company a new tool to manage risks in the supply chain. The mitigation action plan may be beneficial not only for the company management but also for all the stakeholders.
1.4. Research Questions

RQ-1. What are the most significant supply chain risks in fresh food items at Makro-Habib?

RQ-2. How can significant supply chain risks in fresh food items of Makro-Habib be mitigated through proposed action plan?
1.5. Purpose & Objectives

The purpose of this thesis is to contribute to the knowledge on how to manage risks in the fresh food supply chain. The objectives of the study are:

- To identify the various supply chain risks in fresh food items of Makro-Habib
- To rank/prioritize the most important supply chain risks in fresh food items of Makro-Habib
- To suggest an action plan to mitigate significant fresh food supply chain risks of Makro-Habib
1.6. Thesis Model

RQ-1
Identification of significant supply chain risks in fresh food section at Makro-Habib

RQ-2
Mitigation plan for significant supply chain risks of fresh food at Makro-Habib

Literature Review

Empirical Data

Methodology

Analysis

RQ-1

RQ-2

Conclusion

Figure – 1.3: Thesis Model
Source: Own

Authors: Waqas, Yasir, Nauman, Hassan
CHAPTER – 2: METHODOLOGY

This chapter describes theory and research design regarding research strategies, scientific perspective, scientific approach, research method, data collection sources and validity and reliability of the thesis. The research methodology in this thesis is that of qualitative case study. The aim of the chosen approach is to best answer the research questions.

2.1. Research Strategy

To start with the research it is necessary to have the idea what methodology is? Different authors have defined this term in their own way. According to online library source methodology is simply “A set of procedures or methods used to conduct research (Internet - 2)“.

Methodology according to Jonker and Pennick (2010) in a broad view is the way or procedure simply to conduct the research. The important thing is that the researcher should consider that in which way he is going to contact the company or any organization and the defined way he or she wants to conduct the research. In this situation the researcher decides that whether the research is done through questionnaire or he may collect the data by personal visit. Methods are selected as what he or she prefers and considers for a good research and also depends upon the questions accordingly. There are two categories to conduct research. In the first category, investigators conduct research through a well-defined research questions in a company. Often, these questions seem to have closed characters. This type of research is characterized by research activities that are accomplished in a definite order of rank. In second type of research, investigators use open-ended questions. Investigators don’t know in advance what exactly to find out or examine. These research questions are used as road signs that lead investigators from a very broader view to narrow problem.

2.1.1. Case Study

Merriam (1994) defines case study as research of a specific occurrence for instance an institution/organization, an events, program, person or social group.

In deciding whether case study research method is appropriate or not; factors like degree of control, and how the results are envisioned should be considered important. According
to Bryman and Bell (2007, p. 727), “A research design that entails the detailed and intensive analysis of a single case. The term is sometimes extended to include the study of just two or three cases for comparative purposes”. Yin (2003) argues that in situations when a “why” or “how” question is being asked related to contemporary set of events, over which investigators have very little or no control case study method has a unique advantage which has the prime focus on contemporary and real-life context. Like other research methods, case study method investigates the empirical problem/topic through pre-specified procedures. In this thesis we choose case study method as we are solving the particular problem of Makro-Habib with the objective to provide the action plan against the most significant fresh food supply chain risks.

2.2. Scientific Perspective

2.2.1. Positivism
Natural science has given the concept of positivism. Philosophers and the social scientist generally used this term. According to (Bryman and Bell 2007, p. 16), “Positivism is an epistemological position that advocates the application of methods of the natural sciences to the study of social reality and beyond. But the term positivism is starched beyond this principle though the constituent elements vary between authors”. There are two concepts that constitute the idea of positivism firstly the positivism is that “Methodological procedure” which is directly applicable to the social sciences and secondly with reference to the natural phenomena, the analysis must be drawn in laws or same kind of lay like generalizations (Cohen et al, 2003, p. 8).

Another definition of Positivism is described by Albarran as “It is the knowledge based on evidences and observations. The standard for inquiry is the ability to verify claims, and the primary purposes of research are to identify underlying causal processes and to produce useful knowledge that can be applied to solving problems” (Albarran et al, 2006, p. 574)

2.2.2. Hermeneutics
Hermeneutics is defined as “A term that is drawn from theology and that when imported into the social sciences is concerned with the theory and methods of interpretation of human actions. It emphasis the need to understand from perspective of social actors.”
(Bryman and Bell, 2007, p. 728). It is simply the way to interpret the Human behaviour. The main focus of this approach in the research is the interpretation of the shared experience by human beings and on the empathetic understanding. Hermeneutics believes that the Reality is created by Human.

Consciousness and interpretation and at the same time there are many ways to interpret the texts (Holloway, 1997). Another working definition of hermeneutics is given by John (1998, p. 43), “Hermeneutics is the theory of the operations of understanding in their relations to the interpretation of texts. So, basically the key idea is the realization of discourse as a text and the elaboration of the categories of the text will be the concern of subsequent study”.

*Scientific Perspective of Thesis*

In the scientific perspective, our thesis is based upon positivism because we have used books and articles for theoretical background, which are the interpretations by the humans after making the observations; whereas for empirical information, questionnaires, online interviews, emails have been used through which questions have been asked and the concerned personnel in Makro-Habib responded accordingly as per their observation and experience. The proposed action plan has thus been based upon literature knowledge and empirical facts.

**2.3. Scientific Approach**

Ethridge (2004) discusses scientific approach as the approach which is related with the interpretation of previously discussed information. This approach deals with identifications of problem/question, defining research objectives, developing the approach for achieving these objectives, conducting the analysis and then interpretation of results and drawing of conclusions.
Hyde (2000) and Perry and Jensen (2001) discusses that there are two general scientific research methods to reasoning which may result in the acquisition of new knowledge; first one is deduction method and the second one is induction method. Grumbine et al (2005) explains that both inductive and deductive methods are more or less presumed as learning style issue.

2.3.1. Deductive Method

Deductive research method is entirely initiated by theories (Ghauri et al, 2005). This method can be used in a systematic way on number of people based of established ideas (Neville, 2005). According to Svensson (2009, p. 192), “deductive research process/method starts with an idea that is developed and made explicit through the research objective. One or several research questions are formulated that are supposed to contribute to the fulfillment of the research objective. Support of the idea is gathered as part of the research process. Initially, it is based upon research literature. It is followed by the empirical data collection. Implications are articulated that are theoretical and/or managerial. Finally, the contribution of the research process is outlined. Conclusions are drawn and suggestions for further research are usually provided. The research process re-connects to where it all started, thereby completing the circle.”
2.3.2. Inductive Method

The inductive research approach is a theory development process that starts with observations of specific instances and seeks to establish generalizations about the phenomenon under investigation (Spens, 2005). As per Johnson (1996), inductive research method can be termed as the mirror image of the deductive method. It is also used in qualitative data analysis (Thomas, 2003). The involvement of induction method is used to develop a theory from the data. For qualitative research, it is commonly used, but it is suggested to use both types (Fook, 2002). If researcher wants to have a fresh way of looking at the subject in terms of reward he might use inductive approach (Neville, 2005). For management and sociology research, induction method is widely used (Perry and Jensen, 2001). Argumentation in this process moves from a specific empirical case or a collection of observations to general law, i.e. from facts/observation to pattern to tentative

Authors: Waqas, Yasir, Nauman, Hassan
hypothesis to theory (Andreewsky and Bourcier, 2000; Taylor et al., 2002), following the pattern of case – result – rule (Danermark, 2001).

![Inductive Research Method](image)

*Figure – 2.3: Inductive Research Method  
Source: Spens (2005)*

**Scientific Approach of Thesis**

Deductive approach has been used for our thesis because it’s a theory-based research leading towards the solutions. It’s a “top-down” approach and the theory part supports the findings which have been concluded in the end. Our findings have suggested Makro-Habib a mitigation action plan for the most significant supply chain risks in fresh food section. Empirical studies have been done at the “Makro-Habib” in collaboration with the employees of supply chain department. To gather the required information from Makro-Habib, questionnaires have been sent to the concerned person by Email, also online/telephonic interviews is conducted to carry out empirical studies whenever needed.

### 2.4. Research Method

#### 2.4.1. Quantitative Method

Sogunro (2001) defines quantitative research as “an inquiry into a social or human problem, based on testing a theory composed of variables, measured with numbers, and analyzed with statistical procedures, in order to determine whether the predictive generalizations of the theory hold true”. Thomas (2003) discusses that quantitative research method focuses on measurements and amount of the character displayed by the people and actions. Lakshman et al (2000) explains that quantitative research methods look at the effects of particular situations (independent variable) on an outcome of interest.
(dependent variable) in numerically shape. Quantitative methods have been extensively used due to scientific credibility of result that can be measured or counted over the unmeasurable.

2.4.2. Qualitative Method

According to Sogunro (2001), qualitative method is “an inquiry process of understanding a social or human problem, based on building a complex, holistic picture, formed with words, reporting detailed views of informants, and conducted in a natural setting”. Thomas (2003) argues that qualitative research related to study that use and gather variety of empirical material, introspection, individual experience, case-study, interview, observational, historical and visual texts which illustrate routine and problematic moments and meaning in people's lives. According to Lakshman et al (2000), qualitative research method applies where appropriate variables producing an outcome are not clear or outcomes in result of study are inadequate for numerical analysis. Qualitative methods are most revealing when contextual forces are ill-defined, uncontrolled or situational. Qualitative methods are also effective in the identification of ethnicity, social norms, socioeconomic status, intangible factors, gender roles and religion, whose role in the research issue may not be readily apparent.
## Comparison of Quantitative and Qualitative Research Approaches

<table>
<thead>
<tr>
<th></th>
<th>Quantitative</th>
<th>Qualitative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General framework</strong></td>
<td>Seek to confirm hypotheses about Phenomena</td>
<td>Seek to explore phenomena</td>
</tr>
<tr>
<td></td>
<td>Instruments use more rigid style of eliciting and categorizing responses to questions</td>
<td>Instruments use more flexible, iterative style of eliciting and categorizing responses to questions</td>
</tr>
<tr>
<td></td>
<td>Use highly structured methods such as questionnaires, surveys, and structured observation</td>
<td>Use semi-structured methods such as in-depth interviews, focus groups, and participant observation</td>
</tr>
<tr>
<td><strong>Analytical objectives</strong></td>
<td>To quantify variation</td>
<td>To describe variation</td>
</tr>
<tr>
<td></td>
<td>To predict causal relationships</td>
<td>To describe and explain relationships</td>
</tr>
<tr>
<td></td>
<td>To describe characteristics of a population</td>
<td>To describe individual experiences</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To describe group norms</td>
</tr>
<tr>
<td><strong>Question format</strong></td>
<td>Closed-ended</td>
<td>Open-ended</td>
</tr>
<tr>
<td><strong>Data format</strong></td>
<td>Numerical (obtained by assigning numerical values to responses)</td>
<td>Textual (obtained from audiotapes, videotapes, and field notes)</td>
</tr>
<tr>
<td><strong>Flexibility in study design</strong></td>
<td>Study design is stable from beginning to end</td>
<td>Some aspects of the study are flexible (for example, the addition, exclusion, or wording of particular interview questions)</td>
</tr>
<tr>
<td></td>
<td>Participant responses do not influence or determine how and which questions researchers ask next</td>
<td>Participant responses affect how and which questions researchers ask next</td>
</tr>
<tr>
<td></td>
<td>Study design is subject to statistical assumptions and conditions</td>
<td>Study design is iterative, that is, data collection and research questions are adjusted according to what is learned</td>
</tr>
</tbody>
</table>

*Table – 2.1: Comparison of Quantitative & Qualitative Research Approaches*

*Source: Mack et al (2005)*

Authors: Waqas, Yasir, Nauman, Hassan
Research Method of Thesis

This research study has been conducted qualitatively because this study is based on the experience of concerned personnel of Makro-Habib, on ground facts and related literature and not based on numerical figures. As per Mack et al (2005), qualitative methods allow the researcher the flexibility to investigate preliminary participant responses to ask why or how. The investigator must listen cautiously to what participants say, and encourage them to explain their answers. For this research work, semi-structured interviews have been conducted and have put up the questionnaires for the purpose of data collection from Makro-Habib. So, the feedback of questionnaires and data gathered from interviews has thus been the basis of our research work and further analysis to propose the action plan for significant supply chain risks. Data regarding supply chain risks within fresh food section along with the structure and process of Makro-Habib supply chain department have been collected by first questionnaire which is open-ended in nature. On the basis of this data, second questionnaire which is closed-ended in nature has been developed containing impact-likelihood of occurrence five-point Likert scale to rank the significance of fresh food supply chain risks. After that, risk management matrix has been used to rank/prioritize these risks as per their significance. After getting the desired responses, interviews have been conducted of the concerned person of Makro-Habib to elaborate the most significant supply chain risks in order to provide the action plan against these most significant fresh food supply chain risks.

2.5. Data Collection Sources

Smith (2005) explains that data collection sources/methodologies are considered very critical in conducting researches. Data can be gathered in different ways for instance observation, interviews, literature, industries surveys etc. Also, the way of collection of data may be questionnaires, e-mails; personal contact, telephone contact, fax etc. There are two types of collection of data which are primary source and secondary source.
2.5.1. Primary Sources

Two types of data collection involved in research methodology which are primary data and secondary data. Primary data collection aims to point out some specific problem or case. Personal interviews, survey and observations techniques are used to collect the information in primary data. (Malhotra and Briks, 2003) Interview techniques can be used in different forms such as personal direct contact, phone, e-mail or other communication media. (Neville, 2005)

Personal interviews can be divided into unstructured or structured. Structured interviews composed of pre-defined questions by the researcher and these questions may be open-ended or close-ended. Structured interviews assist in getting Uniform information which assures the data comparability. While on the other hand, in unstructured interviews, researchers do not follow the pre-defined pattern of questions from the interviewee. Pros side of this technique includes the freedom to the interviewer in the context of content and structure. This gives the option to the researcher to choose the way of communicating and words of questioning from the interviewee (Kumar, 2005). According to Malhotra and Briks (2003), researchers give preferences to questionnaire technique to collect data because of three reasons. First it emphasis on desired information in to a pre-defined set of question which to be answered by the interviewee. Second the interviewee; consider himself motivated due to the involvement in the interview. Also the reduced chances of error do appeal to this technique.

2.5.2. Secondary Sources

According to Rabianski (2003) Secondary data is the facts and information based on research of primary data which includes published and unpublished work. For instance, secondary data composed of written material such as researches, articles and books and one can access to this data and can be used for ones research. In order to gain more knowledge of the subject, most researcher use both primary and secondary data in their research work. (Nicholson and Bennett, 2009)

*Data Collection of Thesis*

In this thesis, both primary and secondary data has been collected. Interviews and questionnaire have been used to collect the primary data from Makro-Habib. Firstly,
structured interview of Mr. Zeeshan Hamid (Fresh Food Section Head-Morning Shift) and Mr. Adnan Bhatti (Fresh Food Section Head-Evening Shift) with open-ended questionnaire has been conducted in order to gain more knowledge about the problems/topic, on ground supply chain risks in fresh food section and other desired data. Then, based on received data, second interview with close-ended questionnaire has been conducted in order to rank/prioritize the significant risks. In addition, structured interviews have also been conducted to elaborate the most significant fresh food supply chain risks. Telephone conference and E-mail contact have been used to conduct the interviews along with company’s website is also utilized to get the desired data. Scientific articles, books and previous researches have been used to collect the secondary data. Literature has been searched in different ways, for instance, to find the scientific articles, books and reliable information; search engines like ELIN @ Linnaeus, Emerald, and Google-Books have been used. The literature of the thesis has mainly been searched by using key words like supply chain management, supply chain risk, risk management and risk management in food supply chain. In addition to this, information has also been collected from Makro-Habib Pakistan Limited’s website.

**Tools:** Questionnaires, Online or telephonic interviews, Emails

### 2.6. Validity and Reliability

Morse et al (2002) described that without rigor, research seem to be fiction and have no value. So, there is dire need of reliability and validity required in all research methods. (Hammersley, 1992; Kuzel and Engel, 2001; Yin, 1994) argued that as all the research papers aim to find the believable and credible outcome which demands the application of validity and reliability. “The literature on validity has become muddled to the point of making it unrecognizable, as Wolcott notes: whatever validity is, I apparently ‘have’ or ‘get’ or ‘satisfy’ or ‘demonstrate’ or ‘establish’ it” (Wolcott, 1990, p. 121). Morse et al (1999) discussed that qualitative research papers are reluctant in getting the fund and problems in getting published as well as being ignored by policy makers and practitioner’s since last two decades.
Ekwall (2009) explains that validity and reliability of the research are two factors that intend to verify the results of the research process and ensure the credibility of the research. Validity is a method and means to measure what is really supposed to be measured. There are more hurdles involved in getting valid information or data in qualitative pattern as compared to quantitative pattern because qualitative paradigm gives certain proximity to the researcher and the subject; this implies that researcher and subject influence each other. During the research process, researcher needs to be aware of how he or she may effects the subject and take that into consideration in order to shun the interaction towards the subject and vice versa.

Artebrant et al (2003) discussed that creditability of a study includes three dimensions validity, reliability and objectivity. Validity connects the theoretical and empirical area of the study, although it is difficult to connect but it must be present. While Reliability means to what extent reappearance of the research will generate the same result. According to (Coleman and Briggs, 2002, p. 60) “Reliability is the extent to which a test or procedure produces similar results under constant conditions on all occasions”. Wallen and Fraenkel (2001, p. 89) defines validity and reliability as “The meaningfulness, appropriateness, and usefulness of the inferences researchers make based on the data they collect, whereas reliability refers to the consistency of these inferences over time”.

Guba and Lincoln (1981) stated that although the nature of knowledge in each of the quantitative and qualitative paradigm is quite different but all research must have truth value”, “applicability”, “consistency”, and neutrality” in order to be rigor, so therefore, both paradigm needs specific criteria in order to considered worthwhile. Within the quantitative paradigm, internal validity, external validity, reliability, and objectivity are the criterion to reach the goal of rigor. While the qualitative research paper includes credibility, fittingness, audit ability, and conformability in order to be rigor.

“Verification strategies that ensure both reliability and validity of the data are activities such as ensuring methodology coherence, sampling sufficiency, developing a dynamic relationship between sampling, data collection and analysis, thinking theoretically and theory development” (Morse et al, 1999, p 11).
Thesis Validity and Reliability

As a matter of thesis validity and reliability by doing critically we hope to increase the level of validity. Ellram (1996) discussed that major criticism of case studies is the reluctant of getting the outcomes that may be generalized. Our objective is to identify the significant risk in fresh food supply chain and suggest action plan for that significant risk. Hence this may be beneficial to various companies for mitigation of risk in their supply chain. To achieve desired level of reliability of our thesis, during our data collection we contacted fresh food supply chain manager to make sure that the right respondents in the company are responsible to provide the answers to our queries and also careful interpretation of the findings is another aspect of research reliability. To acquire the desired level of validity, first questionnaire is developed in light of interview of fresh food section heads. Second questionnaire is then developed which is based on the findings of first questionnaire and then action plan for significant supply chain risks is proposed by the analysis of questionnaires and the related literature to meet the research purpose.

2.7. Summary of Methodology

![Diagram](Figure - 2.4: Summary of Methodology Choices)
Source: Own

Authors: Waqas, Yasir, Nauman, Hassan
**Thesis Model**

**RQ-1**
Identification of significant supply chain risks in fresh food section at Makro-Habib

**RQ-2**
Mitigation plan for significant supply chain risks of fresh food at Makro-Habib

**Literature Review**

**Methodology**
- Research Strategy
- Case Study
- Scientific Perspective
- Positivistic
- Scientific Approach
- Deductive
- Research Method
- Qualitative
- Data Sources
- Primary & Secondary

**Empirical Data**

**Analysis**

**Conclusion**

*Figure – 2.5: Thesis Model*

*Source: Own*

Authors: Waqas, Yasir, Nauman, Hassan
CHAPTER – 3: THEORATICAL FRAMEWORK

This chapter includes concepts like supply chain, food supply chain, risk, types of risks and food supply chain risks. In the further division of the chapter, risk management and supply chain risk management are discussed. Later on, the process of supply chain risk management is explained.

As the prime focus of the study corresponds toward significant risks identification in fresh food supply chain and to propose the action plans to manage those identified risks in supply chain so, the reader should be aware about what is supply chain and how it differs from food supply chain, also how to manage the risks in food supply chain, reader should be known about what is risk, risks in fresh food supply chain followed by various risk management strategies to mitigate the risks.

3.1. Supply Chain

The difficulty associated with term ‘supply chain’ is that it has uncountable number of definitions which are inconsistent with each other rather they are based on specific perspective. However, Spring and Stevensen (2007, p. 686) provide a generic definition of supply chain as “the supply chain is the network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customer.”

3.2. Food Supply Chain

According to Levinson (2009), a food supply chain is network of different companies in food-related business which involve in activities from farms to end consumers.

Figure – 3.1: Food Supply Chain
Source: (Levinson, 2009)
Lang and Ding (2008, p. 1421) describes the characteristics of food supply chain which are different from general supply chain as:

- “Seasonality in production, requiring global sourcing
- Variable process yields in quantity and quality due to biological variations, seasonality, and random factors connected with weather, pests, and other biological hazards
- Shelf life constraints for raw materials, intermediates and finished products, and quality decay while products pass through the supply chain. As a result there is a chance of product shrinkage and stock-outs in retail outlets
- Requirements for conditioned transportation and storage mean (e.g. cooling)
- Necessity for lot traceability of work in process due to quality and environmental requirements and product responsibility”

3.3. Risk
Technically, risk may be defined as the chance/probability of incurring a loss (Brindley, 2004). Sitkin and Pablo (1992, p. 9) define risk as “the extent to which there is uncertainty about whether potentially significant and/or disappointing outcomes of decisions will be realized.” MacCrimmon and Wehrung (1986) identify three components of risks: the magnitude of loss, the chance of loss and the potential exposure of loss.

3.3.1. Types of Risks
Traditionally main focus has been on those risks which can be insured or in other words commercial risks have been separated from non-commercial risks. Decisions that lead towards profit and have the hazard of negative outcome fall under commercial risks, while non-commercial risks leads only towards losses. Risks can also be categorized into dynamic and static risks. Dynamic risks are more or less same to that of commercial risks and static risks corresponds to non-commercial risks. “The circle of risks” by Gustav Hamilton shows the entire view of all types of risks and also illustrates the relationship between risks, actions and responsibilities. This has been divided into two halves i.e. the right half and the
left half. Right half illustrates the static risks which include property risks, environmental risks, operational risks and criminal acts. Whereas the left half of the circle encompasses dynamics risks outside the organization for instance market risks, liability risks and political risks. (Artebrant et al, 2003)

![Figure 3.2: The Cycle of Risks](source: artebrant et al [2003])

### 3.4. Supply Chain Risk

Waters (2007, p. 7) discusses that “supply chain management is responsible for the movement of material all the way from initial suppliers to final customer. Supply chain risk appears as an event that might affect this movement and disrupt the planned flow of materials. These risks might prevent deliveries, causes delays, damage goods, or somehow effect smooth operations. But these effects are only a beginning, and the consequences are much broader. There are basically two kinds of risks to supply chain 1) internal risks that
appear in normal operations such as late deliveries, excess stock, poor forecast, financial risk, minor accident, human error, faults in information technology system etc. 2) external risks that come outside the supply chain such as earth quake, hurricanes, industrial actions, wars, terrorists attacks, outbreak of diseases, price rises, problem with trading partners, shortage of raw material, crime, financial irregularities etc.”

Deleris and Erhun (2007) describe supply chain risk categories as below:

<table>
<thead>
<tr>
<th>Category</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational/</td>
<td>Forecast errors, component/material shortages, capacity constraints, quality problems, machine failure/downtime, software failure, imperfect</td>
</tr>
<tr>
<td>Technological</td>
<td>yields, efficiency, process/product changes, property losses (due to theft, accidents, etc.), transportation risks (delays, damage from</td>
</tr>
<tr>
<td></td>
<td>handling/transportation, re-routing, etc.), storage risks (incomplete customer order, insufficient holding space, etc.), budget overrun, emergence</td>
</tr>
<tr>
<td></td>
<td>of a disruptive technology, contract terms (minimum and maximum limit on orders), communication/IT disruptions</td>
</tr>
<tr>
<td>Social</td>
<td>Labor shortages, loss of key personnel, strikes, accidents, absenteeism, human errors, organizational errors, union/labor relations, negative media</td>
</tr>
<tr>
<td></td>
<td>coverage (reputation risk), perceived quality, coincidence of problems with holidays, fraud, sabotage, pillage, acts of terrorism, malfeasance, decreased</td>
</tr>
<tr>
<td></td>
<td>labor productivity</td>
</tr>
<tr>
<td>Natural/Hazard</td>
<td>Fire, wild fire, severe thunderstorm, flood, monsoon, blizzard, ice storm, drought, heat wave, tornado, hurricane, typhoon, earthquake, tsunami,</td>
</tr>
<tr>
<td></td>
<td>epidemic, famine, avalanche</td>
</tr>
<tr>
<td>Economy/Competition</td>
<td>Interest rate fluctuation, exchange rate fluctuation, commodity price fluctuation, price and incentive wars, bankruptcy of partners, stock market</td>
</tr>
<tr>
<td></td>
<td>collapse, global economic recession</td>
</tr>
<tr>
<td>Legal/Political</td>
<td>Liabilities, law suits, governmental incentives/restrictions, new regulations, lobbying from customer groups, instability overseas, confiscations abroad, war, tax structures, customs risks (inspection delay, missing data on documentation)</td>
</tr>
</tbody>
</table>

*Table – 3.1: Supply Chain Risk Categories with Examples
Source: Deleris and Erhun (2007)*
3.5. Food Supply Chain Risk

Zsidisin and Ritchie (2009) explain that a society needs a supply of food without any disruption. As Deep & Dani (2009) describe that food is a fundamental requisite for human life. Secure supply chain is important for the supply of food to general population but also important for the economy of country. Industries related to the agricultural products significantly contribute to the economic welfare by jobs and exporting opportunities (Rand Corporation 2003). Food that we eat exception of fish, wild nuts, comes from crops and livestock which are specially produce for this purpose (Lang and Ding, 2008). As per Deep and Dani (2009), increasing energy cost, demand, population, poor cultivation, and restriction on export resultant in pushed up price. The purpose of supply chain is to maximize the value of customer. Now a days, industries related to fresh food facing number of challenges, risks, for the efficient operation of supply chain. Governments, stakeholders, and consumer all looking forward for the secure and perfect supply chain process from farm to consumer but they are not giving attention where the failure occur in supply chain, and in this condition the company reputation and financial performance are at risk if company is operating supply chain itself. Companies need to be proactive for protect their customer by managing food-safety risks in supply chain.

More than ever, consumers always try to find the freshest and safe food at competitive fair price. Sale of store increases if stores are providing fresh food on the demand of customer. So it can be conclude that fresh food is one type of product that create competitive differentiation for big stores verses other types of trade. The demand for the different type of fresh food commodities are increasing so the food supply chain is facing more challenges to fulfill the customer need by freshest product at right place at right time. (American Lamb Board et al)

But in recent economic and market situation food chain are increasingly becoming more complicated. Fresh food supply chain is very complex compared to dry food products. Food supply chain start from agricultural and ends with ultimate consumer. From agricultural to consumption this supply chain includes number of entities like environmental, economic, political and social extremes and due to these entities the supply chain face many risks occurring from natural disasters, climatic change, law and order, terrorist threats that make the whole food supply chain at risk. (Deep and Dani, 2009)
Challenges related to food safety and supply of food is growing globally by locations, packaging, processing and market situation. Food supply chains are now uncovered to more points of disruption, spoilage and delay of goods, cleanliness issues, and participation of third party. Fresh food items and perishable food items have number of similar characteristics and these are different from other type of products. Fresh food items are handled very differently in store as compare to meat items. The basic requirement of fresh food is temperature control and handling product which is possible if supply chain is more efficient and well managed to avoid the loss of shrinking products. Reduction In supply chain cost and improving performance is a new challenge for retailers, wholesalers, suppliers and growers. (Herish and Shaw)

The main problems facing by fresh food supply chain are incorrect information - data, transparency, no standard level of consumer goods, and pallet level all these issues comes in fresh food supply chain and these start from field, then in warehouse, trucking, and in store. Business manager need an appropriate tools or system to increase the business sale, well manage inventory, distribution, procurements and product promotion. (American Lamb Board et al) A complete supply chain risk evaluation and mitigation action plan focused on preventive actions both internal operations of company and supply chain actors (Herish and Shaw).

Standardized product identification and correct information sharing through the supply chain can make dramatically improvement in warehousing, handling goods, pricing, distribution, safety of food, and product traceability. All these improvement can reduce supply chain cost and increase in sale volume of business. (American Lamb Board et al)

Bruzzone et al (2007) argues that the frozen goods refer to commonly a department with in store, and in this department the homogeneous flow occur over the year in the form of product sale that change seasonally like ice cream, on the other side frozen fish. Frozen department have some requirements like shelves with control temperature, so the inventory management is important for all such types of products because if additional goods arrive then it will be critical issues for management to manage these products outside the frozen area that is impossible. Additionally handle excess inventory create supply chain disruption (Lee and Whang, 2003).
If additional products come in response of improper demand estimation or due to changing in season even the old product is not sale out then management adjust these products by stacking in shelves without predefined place. This situation creates the disorders in store, less control on goods and pricing. In simple words it provide poor quality to customer, because customer need proper filling of products shelves and slot and it is more critical for frozen products. (Bruzzzone et al, 2007)

Deep and Dani (2009) describes that food supply chain facing more risks arising from disruption in supply of goods, lack in tracing and tracking and low check and balance force for supply chain risks management. Christopher and Peck (2004) explain that miscoordination of supply and demand arise risks, and disruption in normal activities. They divide the risks into five categories:

- **In Store**
  - Process
  - Control
- **Outside store but inside supply chain**
  - Demand
  - Supply
- **Outside the Store**
  - Environmental

*Figure – 3.3: Categorization of Risks  
Source: Christopher & Peck (2004)*

### 3.6. Risk Management

According to Tachankova (2002), risk is an inherent part of any business. Volatile market relations enhance the uncertainties of the environment where business operates. All the activities of the organizations are covered by risks so management of any business try to focus on coping these risks at all levels. So, managing risk has become a major part of business activities with the prime objective to assist all other management activities to achieve business goals and objectives efficiently and directly. North (1995, p. 2) defines risk management as “the process of identifying and implementing measures which can be applied to reduce risk to an acceptable level and documenting the final import decision.” Brindley (2004, p. 22) defines risk management as “the process whereby decisions are made to accept a known or assessed risks and/or the implementation of actions to reduce the consequences or probability of occurrence.” Deep and Dani (2009) discusses that companies should formulate their strategies proactively to mitigate and manage risks by
anticipating possible future risks. Wu and Olson (2008) argue that managerial attitude towards risk is very critical in qualitative risk management.

3.7. Supply Chain Risk Management

Brindley (2004) argues that supply chain management has been developed as a key research area in the last decade or so. This development has enabled researchers to get inspirations to find out new ways and methods to handle risks and vulnerabilities in the supply chain. According to Song et al (2009), there exists no generally agreed definition of supply chain risk management. But Norrman and Lindroth (2002, p. 7) defines of Supply Chain Risk Management (SCRM) as “SCRM is to, collaboratively with partners in a supply chain or your own, apply risk management process tools to deal with risks and uncertainties caused by, or impacting on, logistics related activities or resources in the supply chain.” Another definition is “the identification and management of risks within the supply chain and risks external to it through a coordinated approach amongst supply chain members in order to reduce supply chain vulnerability as a whole.” (Christopher et al., 2002, p. 38)

Paulsson (2007, p. 169) discusses the main objectives of supply chain risk management as:

- “to maintain the supply and continuous availability of a product;
- to increase the supply chain’s ability to cope with disruptions in the supply chain of products if necessary;
- to avoid possible domino effects throughout the chain; and
- to make the supply chain more resilient to disruptions”
3.8. Supply Chain Risk Management Process

Lin & Zhang (2008) has put up a basic supply chain risk management process and analyzing tool. This basic supply chain risk management process consists on risk identification, assessment, evaluation, planning and controlling. Lin & Zhang (2008); Brindley (2004) discusses that generally, risk identification, assessment and evaluation are also termed as 'risk analysis'. The purpose of risk planning is to setup goals for risk control and design risk mitigation plans. Risk control is the implementation of tailored risk mitigation tactics. In simple words, risk mitigation includes risk planning and its controlling.

![Figure 3.4: Supply Chain Risk Management Process](Source: Lin & Zhang (2008))

3.8.1. Risk Identification

According to Lin & Zhang (2008, p. 2), “risk identification aims to discover possible risk sources and potential risk events. Risk identification is the comprehensive approach which involves theoretical knowledge, empirical experience, information and appropriate tools. Risk checklist, Supply Chain Operations Reference Model (SCOR), event tree, cause-and-effect tree, and fault tree are all useful tools for risk identification.”

Tchankova (2002) discusses that in the risk analysis, ‘risk identification’ is the first step towards risk management. It provides good basis for development and implementation of new programs for controlling risk. To carry out effective risk identification, the investigation of organizational activities at every level and in every direction should be
done. Continuous risk identification is required to reveal new risks in case of internal and external changes in the environment.

Effectiveness of risk management process depends on accurate risk identification. Greene and Trieschmann (1984) explains that in case if managers do not be able to identify all possible risks and sources of risks which can harm the organization in time then it becomes extremely difficult to manage or to mitigate these un-identified risks later on. Dickson and Hastings (1989), in this case organization will not responsible for those risks that remained unidentified and will not plan for mitigation actions for them and the result may be unexpected. Incapability to identify the potential gaining risks that are remained unattended by the organization corresponds to non-identified risks. It is also considered loss if the organization does not find good positive possibility.

According to Tchankova (2002, p. 291), risk identification should to be taken in a broader perspective. The managers should be proactive in risk identification and they should not focus only on what can be insured or mitigated. Risk identification should begin with the following basic questions:

- “How can the organizational resources be threatened?

- What adverse effect can prevent the organization from achieving its goals?

- What favorable possibility can be revealed?”

This simple approach enables managers to implement the risk management process efficiently if risk identification process starts at the beginning. But Dickson and Hastings (1989) argues that it is much more difficult to realize complex risk identification than just to present it. Williams et al (1998) argues that “risk identification is a process that reveals and determines the possible organizational risks as well as conditions, arising risks. By risk identification the organization is able to study activities and places where its resources are exposed to risks.”

As per Tchankova (2002), risk identification can be described by the following basic elements:

- Sources of risks
- Hazard factors
- Perils
- Exposures to risk

The elements of the organizational environment which may bring positive or negative consequences for the organization are called sources of risks. For instance, mostly the market conditions don’t influence the organization’s decision to start the production of a new item. So, changing customer need, availability of raw material, competitors, market situations etc become the sources of risk for the organization. This risk varies or depends on quality of the product, time to market, customer behavior about product etc. Williams et al (1998) describes types of risks in the environment for the organization in the following risk classification:

- Physical environment
- Social environment
- Political environment
- Operations environment
- Economic environment
- Legal environment
- Cognitive environment

Wu and Olson (2008) describe that supply chain risks can encompasses both disruption and operational risks. Disruption risks trigger from natural disasters (hurricanes, floods, earthquake etc), man-made (wars or terrorist attacks) and from economic crises (striking, uncertainty in market situation, price fluctuations, currency reevaluations etc). On the other hand, operational risks include inherent uncertainties for supply chain elements such as cost, supply customer demand.

Hazard is a circumstance or condition which enhances the probability of gains or losses and their severity. For instance, management error regarding the market expansion of certain product is a hazard activity that determines the system risk.

Authors: Waqas, Yasir, Nauman, Hassan
Hance et al (1991) explains that “peril is something that is close to the risk and it has negative, non-profitable results. Peril can happen at any time and cause unknown, unpredictable loses. Peril is the cause of losses. This is, for example, an industrial accident, car crash, air-craft crash, fire, failure of the distribution network, failure of an exam, etc. A peculiarity of the peril is that it does not include a positive meaning, as the peril always causes losses.”

The objects facing possible gains or losses are known as ‘resources exposed to risk’. These resources are affected if the risk event actually takes place.

3.8.2. Risk Assessment

According to Lin & Zhang (2008, p. 2), “risk assessment follows to study the characters of every single risk and estimate its happening possibility, emerging time, and consequences”. Salvador et al (2006) explains ‘risk assessment’ as it quantifies the results of identified risks. For the assessment of the identified and analyzed risks, estimation about the impact of these risks on the performance of company and likelihood of occurrence of these risks is required.

There are number of methods for risk assessment. Artebrant et al (2003) discusses the following risk assessment methods:

*The What-If Method*

What-if method analyzes the result of possible deviation from a normal situation. The experience of employees with various risk areas are being asked through investigating questions. Although this method is quite simple but requires imagination. This method should be applicable to the total risk environment as sub analysis because in this method it is very easy to overlook important questions.

*The One-Day Analysis*

As the name of the method signifies that this is limited for one day since in this method managing director and co-workers for instance staff, heads of production, risk manager and economy must have to participate. Insurance company and municipal rescue service
representative are also invited to participate. The risks environment is analyzed and risks are prioritized by the participants. Prioritized risks are then examined by measuring current actions and insurance policies against those risks. This provides the foundation to risk manager to continue the work.

**The Jonsson Analysis**

Relative terms with money can be used to quantify the risks but not the money. Distribution, probability, and consequences of risks can be comprehensive reviewed by this analysis method. After analyzing the probability and consequences of risks, a scale is graded to inspect the level of risk. The sum of probability and consequences is termed as level of risk. For instance if there is a high probability and medium consequences (3+2=5) the risk level will be catastrophic means must be dealt immediately.

<table>
<thead>
<tr>
<th>Probability</th>
<th>Consequences</th>
<th>Level of risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Low Seldom occurring</td>
<td>1-2 Acceptable</td>
</tr>
<tr>
<td></td>
<td>Low cost, damage or loss</td>
<td>Can be allowed and should be dealt with</td>
</tr>
<tr>
<td>2</td>
<td>Medium Neither often nor seldom occurring</td>
<td>3-4 Unacceptable</td>
</tr>
<tr>
<td></td>
<td>Medium More cost, more damage or loss</td>
<td>Not allowed and shall be dealt with</td>
</tr>
<tr>
<td>3</td>
<td>High Often occurring</td>
<td>5-6 Catastrophic</td>
</tr>
<tr>
<td></td>
<td>Big Cost which can not be carried</td>
<td>Inexcusable, must be dealt with</td>
</tr>
</tbody>
</table>

*Figure – 3.5: Grading Table - Jonsson Analysis*

*Source: Artebrant et al (2003)*

**Delphi-Technique**

Experts and competent people from a consultancy firm are gathered to brainstorm and examined risks within the company. Risk conditions are then selected by the group. The tool used in this method is the human evaluations of important exposures, which may possibly effects the decisions of the host company regarding risk management.
Check Lists

In check list risk analysis method, a control tool is developed by asking questions regarding risks, vulnerabilities and damage exposure which measure the established security level. In the analysis, all the questions are asked by inquiry and the results of these questions are comparable. Disadvantage of this method includes that it does not provide the damage cost in numeric terms, also the question forms of this technique involves overlook of essential problems.

Expected Damage Cost Analysis

This method provides potential risk damage and vulnerability factors in numeric figures. Security measures are the direct choice of analysis results which optimizes the costs of these risks.

3.8.3. Risk Evaluation

Lin & Zhang (2008), explain that risk evaluation comprised of evaluating the risks in the whole supply chain with the objective to prioritize/rank the risks on the basis of risk level and chances of occurrence before and after risk mitigation planning tactics will be adopted. “Risk prioritization is a continuous process that is accomplished throughout the life-cycle of a system. Effective risk prioritization depends on planning; early identification and analyses of risks; continuous monitoring and reassessment; communication, documentation, and coordination.” This identification, planning, prioritization and ranking process provides the road map for the sample methodology for the ranking of supply chain risks. The main purpose of the risk prioritization is to rank to the risks which are identified during the identification process of the company for mitigation. (Internet - 3)

In order to compare the identified risks efficiently and effectively, and to provide with a perspective proactively, following factors should be considered for risks prioritization.

- The probability of the risk occurring,
- The consequence of the risk, and
- The cost and resources required to mitigate the risk
Cox (2008) discuss the risk matrix method to evaluate the risk and describes that a risk matrix is a table that has numerous categories of severity/impact/consequences on vertical axis and categories of probability/likelihood/frequency along horizontal axis. In addition, it also recommends urgency, priority, management actions and level of risk with each row-column pair, that is, with each cell. The below figure indicates an example of standard $5 \times 5$ risk matrix for risk assessment and rating/prioritization. The red, orange, yellow and green cells show critical, high, moderate, low risk levels respectively on the basis of likelihood ratings on the horizontal axis and impact on vertical axis ranging from very low to critical.


**Figure – 3.6: Risk Rating Matrix**


Cox (2008) discussed that risk matrix mainly focuses on to minimize the maximum loss from misclassified risks. Through Likely-hood and harshness, risks are ranked associated with hazard. This can be illustrated by where they fall on the risk matrix. Higher priority for treatment and mitigation is acquired for that hazards receiving higher risk. “Risk matrices have been widely praised and adopted as simple, effective approaches to risk management. They provide a clear framework for systematic review of individual risks and portfolios of risks; convenient documentation for the rationale of risk rankings and priority setting; relatively simple appearing inputs and outputs, often with attractively colored grids; opportunities for many stakeholders to participate in customizing category
definitions and action levels; and opportunities for consultants to train different parts of organizations on “risk culture” concepts at different levels of detail, from simply positioning different hazards within a predefined matrix to helping thought leaders try to define risk categories and express “risk appetite” preferences in the color coding of the cells” (Cox, 2008, pp. 498).

Risk matrices are used to prioritize the risks and have been recommended both in national and international standards as a guide for resource allocation. These matrices have been used in applied risk management consulting and practice, including business risk management, airport safety, homeland security, Highway construction project risk management, and in the assessment of potential risks to building ranging from terrorist attacks to hurricanes. Good (e.g., better-than-random) risk management decisions and effective allocations of limited management attention and resources are not supported necessarily through risk matrices. However, the risk matrices have been used too widespread to make cessation of use an attractive option. Quantitative risk assessment methods or data analysis requires no special expertise in constructing, using, and socializing risk matrices within an organization as addressed by many risk matrix practitioners and advocates (Cox, 2008).

This has been believed by many decision makers and consultants that risk matrices may be rough approximate tool for risk analysis but they are very beneficial tool for distinguishing qualitatively between least urgent and most urgent risks in many applications and are considered much better than nothing for instance purely random decision making. In general, disadvantage of this method includes that based on risk matrix there is no way to choose from two risks having same qualitative rating, meaning that there is a 50-50 chance of making the right choice, that is, 50% error probability. In particular, if some consequence with sufficiently large variances and are selected randomly, then there would be no guarantee that risks that receive higher risk ranking in a risk matrix are in fact greater than risks that receive lower rankings (Cox, 2008).
3.8.4. Risk Mitigation

Supply Chain Risk mitigation is getting increased concentration in present. The continually change towards reduction of supplier, consolidation of industries, and centralize distribution centre all make the significant risks in supply chain profile. Now a day supply chain risk management is biggest issue. Today's marketplace is classified in term of competition and as well as level of instability and uncertainty. Companies need efficiency in supply chain to deliver the superior value by over come the disruption risks and ensure continuous services to customer (Suresh and Braunscheidel, 2008).

According to Schmitt and Singh (2009), disruption risk in supply chain increasing as it is expending globally, hurricane Katrina brought into consideration supply chain risk analysis and formation of mitigation action plan to cover these risks. Due to complex and large supply Chain Company may face more risks regarding supply chain disruption. On the other hand if supply chain has more ability to adoption then it can act as advantage to mitigate the disruption risks. Small supply chain that have single plant May shutdown and on other side in large supply chain if company have investment for backup then it will be useful to cope this situation. Juttner et al (2003) argues that at operational level different approaches used to mitigate supply chain risks.

Miller (1992) describes number of strategic moves that can potentially mitigate the risks associated with the uncertainties and divides five general strategies for mitigate risk of companies.

a) Avoidance
b) Control
c) Cooperation
d) Imitation
e) Flexibility

But as per Juttner et al (2003), four out of these five can be modified for supply chain risk mitigation.
Avoidance ▪ Dropping specific products/geographical markets/supplier and/or customer organizations

Control ▪ Vertical integration
▪ Increased stockpiling and the use of buffer inventory
▪ Maintaining excess capacity in productions, storage, handling and/or transport
▪ Imposing contractual obligations on suppliers

Cooperation ▪ Joint efforts to improve supply chain visibility and understanding
▪ Joint efforts to share risk-related information
▪ Joint efforts to prepare supply chain continuity plans

Flexibility ▪ Postponement
▪ Multiple sourcing
▪ Localized sourcing

| Table – 3.2: Risk Mitigation Strategies in Supply Chain |

Avoidance

“Risk avoidance is used in risk management to describe an informed decision not to become involved in activities that lead to the possibility of the risk being realized.”

Risks avoidance is done when risks connected with operating in a particular product market place or Geographical area is measured to be undesirable (Miller, 1992). As per Juttner et al (2003), in supply chain perspective, the avoidance can be associated with products, suppliers, customer organization and geographical marketplace. By using the avoidance strategies the company can breach the contract with supplier, drop the specific products, or geographical market. Insurance, security from underwriter is consider as traditional form of risk avoidance, but these all focus on financial aspect of risk in the form of recovery if some thing negative happen. In supply chain risk management the insurance

Authors: Waqas, Yasir, Nauman, Hassan
is not only the single way to mitigate risk. Other foremost risks include loss of customer due to supply chain interruption.

Wernerfelt and Karnani (1987) discusses that if companies doing a business in a highly uncertain market, in this situation the company may use risk avoidance by exiting the market through divestment of assets that are used in the market. And on the other hand if company not yet performing business in the market; then in this condition the company should use risk avoidance by delaying the entrance in the market until the risks decrease at suitable level in the industry. Company can also avoid risks by using niche strategy by entering in low uncertain market.

Control

Cyert and March (1963) describe that to reduce the uncertainties the company can control environmental contingencies. Miller (1992) mentioned that manager should be proactive in controlling uncertainties rather than treat them passively. Examples of control strategies take account of activities regarding threatening the competitors, political situation, gaining market power, into more predictable. Mascarenhas (1982) explains that company can get control response to uncertainty by influencing customers through promotion and advertising. Vertical integration is effort to supply and demand uncertainty control (Allaire and Firsirtu, 1989). Acquisition and horizontal merging is tried to control competitive uncertainties (Pfeffer & Gerald, 1978).


i) Occupational safety control

This emphasized on small risks which are frequent in nature. Large number of work processes related risks included in it and the level of risk is controlled through passed studies of companies’ accidents.
ii) **Evolutionary safety control**

This focused on medium size but infrequent risks. The safety in this case control specific accidents creating processes. Evolutionary increased efforts toward improved safety are suppose to be the protection measures for these risks. In evolutionary safety control, risk management includes to remove the causes of particular accidents.

iii) **Analytical safety control**

Rare, large scale accidents encompasses in this type of risk category. Since the frequency of these risks is quite low that it is rather difficult to establish a protection design based on empirical material. The causes of these accidents comprised of the past face of technological innovation which provides the basis for industrial installation, also the only way to find these risks are the model processes.

*Cooperation*

Haywood and Peck (2003) argue that cooperation with in the company to minimize inventory management risks and demand forecasting would be extensively enhanced by prevalent collaboration. Miller (1992) describes that by comparing with control strategies, cooperative strategies engage multiparty agreements, rather than one-sided control, as purpose of getting uncertainty reduction.

The improvement in supply chain visibility and understanding to share information about risks drivers, and jointly business plan may achieved by cooperation with organizations. Cooperative risk mitigation strategies were useful by number of organizations and, it is mainly limited with key suppliers (Juttner et al, 2003).

*Flexibility*

Upton (1994) defines flexibility as “the ability to change or react with little penalty in time, effort, cost or performance.” In uncertain supply and demand markets, a more flexible supply chain can exercise its options faster than its competitors. Manuj & Mentzer (2008) explains that companies need to have flexible in all in all operations, source anything you need from wherever you can get a hold with best. Global supply chain flexibility is considered the most important because it acts as facilitator in coordination process and
help to overcome or manage supply chain uncertainties. Companies with higher flexibility characteris tic do better perform than those companies that have low flexibility (Fawcett et al, 1996). Manuj & Mentzer (2008), “for example, a global firm chose to assemble and sell air conditioners in India rather than manufacture them in India. They kit them in another country, and then ship the kits to India. The reason – different states in India have different tax advantages for business operations. So, one year, it might be most advantageous to assemble air conditioners in one state, and the next year it might be better to assemble in another state.”

Companies with more flexibility have positive impact on business operations and enhance performance comparatively with their competitors in the industry. Resultantly supply chain flexibility provides an intrinsic ability to react to rising situation that cannot be fully predictable in the planning cycle (Welch and Welch, 1996). As per Buckley and Casson (1998) companies with more flexibility have many option of risk management. Flexibility help a company for efficiently answer to change and allocation of resources.

3.9. Risk Mitigation Strategies

According to Machado and Azevedo (2009), in order to mitigate the risks in supply chains, a number of strategies are available in the literature. But according to the application scope at different level, companies have to aggregate them into different classes which are structural, operational and visibility base.

1. Structural

The structural mitigation strategies enclose the ones related with the decision making at the strategic level by an organization or a supply chain.

2. Operational

The operational mitigation strategies include the ones related with the operations management by an organization.
3. Visibility Base

The Visibility based class comprises the mitigation strategies that are directly related to the sharing and exchange of information within the organization and/or among SC entities.

4. Product Base

The product base class comprises the mitigation strategies directly related to the products.

3.9.1. Various Risk Mitigation Strategies for Different Supply Chain Risks

Lall (2006) describes that risk management strategies must be component of supply chain management and consist on process that reduces supply chain risk and also increase the efficiency of supply chain. For mitigation supply chain risks a firm may use tactical and strategic plans under supply management, product management, demand management, and information management approaches. Executive and manger of supply chain must have a sharp look and clear understanding of risks that, start from the supplier to consumer and then resources must be used for mitigation of risk. Christopher and Lee (2004) mentioned that with out risk exposure supply chain cannot be efficient.

Recently many authors have placed examples of companies that are facing risk from excess inventory in relation to discuss the supply chain management issues. Excess inventory in the firm have harmful effect on firms performance and supply chain. Due to supply chain mismatch the excess inventory occur. (Faisal et al, 2006) When supply of product is more than demand due to wrong forecasting then company faces the inventory excess risk and this is responsible for huge financial loss in term of increased labor cost, increased handling cost, increased space cost, and non-financial loss wasted time due to more transactions, consumer loss, spoiled products. (Internet – 5)

According to Mentzer (2001), collaborative relations improve the customer services; reduce inventory and delivery of products with reduced cycle time. Nyaga et al (2009, p. 101) argue that “firms engaged in collaborative relationship achieved improved visibility, higher service levels, increased flexibility, greater end customer satisfaction, and reduced cycle time. With collaborative relationships companies may get opportunities of better operational performance, reduced inventory, reduction in cost, and also superior logistics performance measures, e.g., cycle time, lead-time, fill rate (Whipple and Frankel, 2000)
Wilding and Humphries (2006) describe that companies are extending their collaboration relationship due to uncertain and complex market situation. Collaborative relationship within the different supply chain actors makes sure that response to a disturbance is more effective. Similarly, Muckstadt et al (2003) also discuss that the ordering process of fresh food items depends on forecasting, demand, consumer behavior and environmental situations that all are uncertain and complex.

Hsieh and Wu (2008) discuss that coordination may be at the vertical and horizontal level. Vertical coordination can help to avoid a disturbance from disrupting multiple SC stages. Horizontal coordination may facilitate organizations to forecast disorder. In fact, without horizontal coordination companies may face the risk of long lead time and finally supply chain disturbances. With better visibility between the Supply chain levels, companies may foresee a problem at a supplier or customer that may influence them (Stecke and Kumar, 2009) and can also improve the supply chain reaction to market (Ji and Zhu, 2008). For enhanced integration of information flow between the company and its suppliers, CPFR (Collaborative Planning, Forecasting and Replenishment) strategy is helpful that increases the visibility in supply chain entities. (Kleindorfer and Saad, 2005).

According to Childerhouse et al (2003), complicated supply chain with uncertainty increase the confusion risk within the supply chain and this is the result of over reactions, supposition, mistrust, redundant interference and unclear information between supply chain actors. Week confidence in order cycle time, services delivered, transportation reliability, capability of suppliers, demand forecast, order current status, quality of the products can impacted the supply chain confidence. Lack in supply chain confidence forced the manager for exposure of risk involved in supply chain. An example of this is the possible reaction from customer side. For example if sale man is not sure about the order cycle and order execution time then they will deal the customer with own plan. They can order products to entertain their key customer and put in ghost (Like their private safeguard stock) for secure supply and these all due upstream and downstream invisibility of information flow.

As per Christopher and Lee (2004), it is very difficult to make the optimal decision in any stage of supply chain if there is nervousness and confusion. Actors with confusion in supply
According to Hahn et al. (2000) for efficient supply chain coordination and effective communication between all actors are essential. Chopra and Sodhi (2004) argue Increase...
in demand information visibility reduces the risk in supply chain. Studies by Lee et al. (1997) describe that information sharing may considerably reduce the causes of the bullwhip effect. Further Lee and Whang (2000) suggested that information keep the tight coordination in a supply chain. Also, cooperation between the various supply chain elements may lead to a competitive advantage (Faisal et al, 2000). “For example, Wal-Mart, Proctor and Gamble, Lucent Technologies, and Sara Lee now collaborate readily with their supply chain partners in the areas of planning, forecasting and replenishment which help in reducing risks” (Handfield and Nichols, 1999).

These days, many companies dealing in food business are threatened by food contamination risks. “Food contamination refers to foods that are spoiled or tainted because they either contain microorganisms, such as bacteria or parasites, or toxic substances that make them unfit for consumption”. The food handler like the operating staff can be a major reason for the contamination of the food this is called cross contamination. Lastly the poor hygienic facility or poor hygienic environment in the processing area where the food is packed or process also added to another cause of food contamination. Food can be contaminated by the microorganisms’ such as virus or bacteria from various sources like from another food, equipment like utensils and people during the preparation and the storage of food and this is called cross contamination (Internet – 6)

According to Mayer (2008), there are four types of cross contamination:

a) **Food to food**

Food to food contamination caused from the bacteria from food to another food. These types of cross contamination occur when one food contains bacteria and the other food is contact with the infected food. Example of food to food cross contamination is: When bacteria raw meat is stored in the upper shelf of the refrigerator and the other meat is placed in the lower shelf and when the fresh food is mixed with the leftover food. (Mayer, 2008)

b) **Hand to Food**

Hand to food is the primary source of food contamination by the human’s. People are the one which is the cause of such type of hand to food cross contamination. Examples are: If
the hand is not washed properly by the operating staff which is responsible of handling fresh food. If the food is handled by the operating staff in fresh food department, after using bathrooms or using rest rooms. If the hand is washed with any cloth like apron etc which already have the bacteria inside, it will cause the food contaminated when the hands are in contact with the food. (Mayer, 2008)

c) Equipment/food contact surface to food

This type of contamination is caused through the equipments in kitchen, utensils, or when the food is in contact with the other food surface. Examples are: If the unclean equipment, such as the can opener, infected slicer or other equipment like utensils, to prepare the food. Cutting board is the big example, like when the various type of meat (chicken, beef, fish etc) used to cut on the same cutting board, it is the primary sources of food contamination through equipment or food contact surface to food (Mayer, 2008)

d) Chemicals to food

The last type of cross food contamination is the chemical to food. If the food is placed or stored near any type of chemical supplies, it causes contamination. For example, if the food is stored near the chemical like cleaning supplies which is very common in the storing of fresh food. Contamination also cause due to the using of cleaning chemical or material carelessly near the food. (Mayer, 2008)

According to Mayer (2008), different ways are available to control the hazards relating to food contamination. Personnel ways of protection against food contamination are that, it is important to maintain the good personnel hygiene all the time, because unwashed hand may cause food poising resulting in contamination. It is important to wash the hand thoroughly before handling the raw food specially the meat (fish, beef etc). For wiping the hands, a clean cloth must be use otherwise it may cause cross contamination to plates etc. By practicing safe procedures, risk of food contamination can be reduced:

- Refrigerators must be separate for raw and cooked food (food that is ready to eat). In case if there is no place to store, raw food like meat must be stored at the bottom of the cooked food storage place like refrigerator

- Raw meat must be placed separate from the fruits and vegetable
- Raw meat should be placed in a tray or a bowl, if defrosted so that it may catch the drips from the defrost food items like meat

- Raw meat should be placed in the freezer with proper packing, like it should be wrapped to avoid the leakage

- The food which is in the process of cooling must be kept in separate freezer from the raw food

- An important thing is the cleaning of the sink. It should be adequately cleaned, and assures that it is properly disinfected. There should be separate sinks for washing hands other than using for food purpose for the operating staff handling fresh food

- Equipment should be separate, for different categories of food items, like for meat separate hygienic and disinfected tray’s or flask should be used because usually meat items have more chance of contaminated whereas for fruits some other equipment other then the meat equipments

- Separate thermometers which should be sanitized and cleaned be used for different food items (Mayer, 2008)

Loose practice of FIFO (First In, First Out) is another major risk; FIFO is particularly significant for perishable stock. FIFO means that the stock is arranged and identified by receiving date with the aim to make sure that stock which is received first should be sold/removed first (Internet – 7). As per Brown (2003), FIFO rotation method is used by placing the incoming supplies in the back, dating packages in order to ensure the freshness of products. Similarly, Dopson and Hayes (2010) argue that prior to the sale of most recently received stock; already on hand stock should be displayed/sold first. This implies that the store in-charge should be very active and take extra care to put the new stock behind and move the existing stock up. But this has been observed that the store in-charge normally has the tendency not to carry out this practice on regular basis. “For instance, the store room clerks who must put away six cases of tomato sauce, the cases weigh about 40 pounds. The FIFO method dedicate that these six case be placed under the five cases already stacked in the store room, will the clerk place the six newly delivered cases underneath the five older cases? In many instance, the answer is no. unless management
strictly enforce the FIFO rule, employees may be tempted to take the easy way out.” (Dopson and Hayes, 2010, p. 102).

FIFO is basically a storage technique which is more appropriate for fresh food (perishable and non-perishable items). Product loss due to excessive spoilage, deterioration in quality and shrinkage may occur if the company fails to implement the FIFO system. If a company has to manage the effective food business and to avoid these factors, then the proper implementation of FIFO system is critical. To ensure this, manager requires the store in-charge to put up a tag or mark on each received item along with delivery date. This mark/tag works as a visual aid for the in-charge which product received when and which product to be used first. This tagging system is especially significant in items which are more perishable like fresh meat or sea food. (Dopson and Hayes, 2010). Generally, stock rotation follows FIFO rule. This may result in certain issues if a company does not follow the following FIFO principles in shelves, freezer and fridges.

- “Date stamp every time if it does not already have one
- Move old stock to front and new stock to back
- Periodically check that stock is being used. If it is not then you need to take action. This could mean, pitting on a special promotion to sell it off cheaply, or use in staff meal”. (Burgess, 2001, p. 157)
**Thesis Model**

**RQ-1**
Identification of significant supply chain risks in fresh food section at Makro-Habib

**RQ-2**
Mitigation plan for significant supply chain risks of fresh food at Makro-Habib

**Literature Review**
- Supply chain
- Food supply chain
- Risk
- Supply chain risk
- Food supply chain risk
- Risk management
- Supply chain risk management
- Supply chain risk management process

**Methodology**
- Research Strategy
- Case Study
- Scientific Perspective
- Positivistic
- Scientific Approach
- Deductive
- Research Method
- Qualitative
- Data Sources
- Primary & Secondary

**Analysis**

**Conclusion**

*Figure – 3.7: Thesis Model*
*Source: Own*

Authors: Waqas, Yasir, Nauman, Hassan
CHAPTER – 4: EMPIRICAL DATA

This chapter includes and presents the data that has been received from Makro-Habib by two questionnaires and several interviews of the fresh food section head. Firstly, an introduction about the supply chain department is given which also include products range in fresh food. Secondly, the process of fresh food supply chain management of Makro-Habib is described. After that the current supply chain risk management process of Makro-Habib is discussed. In the last portion of this chapter, current supply chain risks in fresh food section are identified.

4.1. Introduction to Makro-Habib Supply Chain Department

Supply chain department in Makro-Habib has the most critical role to play because whole business model of Makro-Habib depends on effective supply chain. Supply chain department consists of two sections; first one is commercial section and the other one is operations section. The roles of commercial section include planning, ordering and coordination with suppliers and they are placed in head office while the role of operations section is to operate on ground and deals with customers. Manager fresh food and his team are responsible for all the operations-related activities regarding fresh foods within the store. (Interview: Fresh Food Section Head)

*Makro-Habib Supply Chain Goal:*

“To handle thousands of orders, shipments and deliveries efficiently and to make sure that goods arrive at the right place at the right time”
**Product Range**

A wide portfolio of product and an excellent price-performance ratio are the key features of Makro-Habib. Its business model in itself results in savings which are passed on to the end customer directly. All types of products are available to professional/commercial customers under one roof with wholesale price that gives these customers the room for healthy profit margins. This makes Makro-Habib a perfect business partner for commercial customers who rely on it as a supplier to obtain competitive advantage.

Makro-Habib categorizes the products into three groups:
A) Non-Food  

In non-food, Makro-Habib offers products which meet safety standards and up-to-date in terms of design and technology. Non-food comprises of sub-departments like electronic, office & stationary, household & kitchenware, apparel, sports wear, shoes, bed linen, electric equipments, toys & luggage and accessories etc.

B) Dry Food  

In dry food section, Makro-Habib its customers with products like basic commodities, confectionaries, drinks & beverages, dry grocery, home & personal care etc.

C) Fresh Food  

There are approximately 1900 product/articles in fresh food section. Freshness is the first priority of Makro-Habib in the fresh food range and this is ensured by the efficient quality control and supply chain management. The fresh food section consists of fruits & vegetables, dairy & frozen, meet & poultry, fish & sea food and bakery items.

For the first time in Pakistan, Makro-Habib provides a platform for fruit & vegetables which are equipped with modern accessories for product processing. This ensures clean and packed vegetables under hygienic and temperature-controlled environment (cold chain) which are as per international standards of Hazard Analysis of Critical Control Points (HACCP).

A cold chain is known as temperature-controlled supply chain. The accurate temperature controls are crucial to keep fresh food items in their original form till their shelf life. That is why, utmost importance is given to the cold chain to make sure that fresh food products for instance fish, meat, fruits, dairy items and vegetables are produced, handled and transported to Makro-Habib store by the cold chain and at the receiving point, the internal temperatures of the products are verified. So, for this purpose, all fresh food supplying vehicles are equipped with temperature loggers which automatically keep the record of temperatures of vehicles at regular time intervals throughout the journey from supplier to
the store. Inside the Makro-Habib store, the cold storages and selling areas are well-equipped to keep the temperatures at the desired level for each fresh product.

Throughout the shelf life of fresh product, special care is taken in storage, handling and maintaining the freshness of these products. Freshness of these products is monitored daily to ensure that no product is left on the shelf which does not accomplish the freshness and quality standard requirements. Products like fish, meat, fruits and vegetables which fall under ultra fresh product category require special attention because of their sensitivity and delicacy. These products are sourced from few suppliers who comply and committed to quality and hygiene standards. (Interview: Fresh Food Section Head)

4.2. Makro-Habib Fresh Food Supply Chain Process

Makro-Habib has very simple supply chain process which starts from supplier side and their operations to ordering and all the activities involved from ordering to final receiving of goods to placing the goods on the shelves. (Interview: Fresh Food Section Head)

![Makro-Habib Supply Chain Process Diagram](image)

*Figure – 4.2: Makro-Habib Supply Chain Process*

*Source: Interview of Section Head (Fresh Food)*

Authors: Waqas, Yasir, Nauman, Hassan
Basically, Makro-Habib has two types of ordering within fresh food section. First is ‘permanent ordering’ which includes ordering for fruits and vegetables, butchery, and bakery items and this type of ordering are made manually on daily basis and for professional customers like catering services, schools, colleges, factories etc. The manager assesses the daily requirement for these products and then communicates this requirement to commercial team in the head office. Second one is ‘OPL (order proposal list)’ which is system generated stock ordering for dairy & frozen products and it is not made on daily basis rather it is based on sales of these products. In both types of ordering, company commercial team has to communicate with the respective suppliers on daily basis for delivery of these fresh products in time and of desired quality. Supplier is responsible for all type of transportation outside the store, loading and unloading and also it is supplier responsibility to ensure the quality of these products during transportation until these products are delivered. Operational staff also takes part in unloading the fresh products at store. When these fresh products are delivered to Makro-Habib, then Makro-Habib is responsible for ensuring product quality and freshness within the store. Goods Receiving (GR) department is responsible for receiving the goods and ensuring the freshness, quality and quantity of these products. After GR, the concerned section heads are responsible for in-store transportation, storage and display of these products on their respective locations/shelves. (Interview: Fresh Food Section Head)

4.3. Fresh Food Supply Chain Risk Management Process

To mitigate the risks in fresh food section, manager of fresh food section is wholly empowered for evaluating and mitigating the identified risks. The risk mitigation process which is followed by Makro-Habib right now is based on individuals; means that the concerned manager is fully responsible for risk analysis and mitigation. It is up to the ability and capability of the manager that how he foresees risks and what plans he suggests for overcoming these risks.

Section heads and other team members are responsible for identification of risks within their operational areas; when risks are identified then these risks are communicated to the manager. After that the manager tries to evaluate these risks by prioritizing/ranking these
risks based upon likelihood of occurrence and impact on business by using risk matrix method. Risk matrix is used because it classifies the risks qualitatively as critical, high, moderate, low and very low risks. This is done because company cannot have the time and resources to address all minor risks as well rather company expects operational staff to resolve these minor issues on their own and then communicate it to manager/section head. After identification and prioritization, the whole teams of fresh food supply chain sits together and discusses the reasons and potential consequences of these identified risks. After that, it's totally the manager's responsibility to provide the remedial action against those significant identified risks keeping every member of his team into confidence. In cases where risks are of extreme nature, then commercial team is also involved to take their guidance and suggestions. These remedial plans are more or less based on the individual experience of the manager as scientific or research approach is still not used extensively in Makro-Habib.

4.4. Supply Chain Risks in Fresh Food Section

According to the interview and questionnaire-1 (annexure-1) of Mr. Zeeshan Hamid (Section Head – Fresh Food), we, the authors are informed about various supply chain risks which Makro-Habib is facing in its operations within the store. These risks are involved in various locations/activities in their routine operations; some of them are of routine nature and may occur occasionally and have not really high impact on business. But some of them are of serious nature and can impact business severely if they occur at any point in time. The risks which are identified during the interview are listed below:

- Wrong ordering
- Untrained staff/lack of technical training
- No quality control in receiving
- Display limitations
- Under/Over receiving
- Quality Assurance
- No control over storage
- Short expiry product management

Authors: Waqas, Yasir, Nauman, Hassan
- Mixing of Expired/Spoiled/Quality Deteriorated with Fresh Items
- Buyer orders without store consensus
- Internal purchase procedure – loose control
- Contamination of products
- No control over bakery production/expiry/wastage (Internal Production Management)
- FIFO (loose practice)

During the interview of section head, he told that due to these risks company is bearing a number of losses in the form of financial and moral. Some of them have high impact that affects the whole supply chain process. For instance, mixing an expired and spoiled product with fresh items and no quality control on receiving items and quality assurance risk create the customer and moral loss in form of low customer satisfaction, customer switch off, distrust, unreliability of product quality. Also, on the other hand wrong ordering, buyer order without store concusses, no control over storage, contamination of products are the causes of huge financial loss in form of material handling cost, ordering cost, spoilage products cost, energy cost for storage of product in the company that affects the company performance in the competitive market. Like this untrained staff is the cause of financial and moral loss because they can’t treat the customer well, and unskilled staff is big threat of material handling.
Figure – 4.3: Thesis Model
Source: Own
CHAPTER – 5: ANALYSIS

This chapter presents the analytical vision of the theory and empirical data to respond to our research questions. First part deals with the identification of most significant risks in fresh food section of Makro-Habib by using risk rating matrix technique. After that, risk mitigation is analyzed and in the last part of this chapter, risk mitigation strategies are proposed against the most significant supply chain risks in fresh food section.

5.1. Most Significant Fresh Food Supply Chain Risks

According to Tachankova (2002), risk is an inherent part of any business. Artebrant et al (2003) discusses that an organization can face various types of risks which can be inside the organization and outside the organization. Risks inside the organization can be related human resources, IT, supply chain, financial etc. According to Deleris and Ehrun (2007), risks within supply chain can be categorized as operational, social, natural/hazards, legal or political risks. Supply chain department of Makro-Habib has the most important role to play but they are also facing various risks within and outside the company. Inside the company, Makro-Habib facing various operational risks within fresh food like storage, lack of coordination within supply chain team members and with other supply chain actors, quality assurance, loose practice in FIFO etc. Deep and Dani (2007) support that all the stakeholders expect companies to adopt secure supply chain process within fresh food supply chain to avoid various risks. Also, they explain that incorrect or lack of information, no standard level of consumer goods, no standard warehousing and storage facilities, poor inventory management and data transparency are the factors which create the risks within fresh food supply chain.

In Makro-Habib, risk identification is considered very important and section heads and other team members of fresh food are responsible for risk identification of risks within their operational areas under the guidance of manager and when risks are identified then risks are communicated to the manager. Tchankova (2002) discusses that for risk management efficient risk identification is very critical. As per Lin and Zhang (2008), risk identification aims to find out the possible risks sources and potential risks events by using theoretical knowledge, empirical experience. Tchankova (2002) claims that risk identification should to be taken in a broader perspective and the manager should be
proactive in risk identification by focusing on sources of risks, hazard factors, perils and exposures to risks and various methods can be used for that. Checklist method is currently being used in Makro-Habib to assess the risks within fresh food section. In checklist method, Makro-Habib has developed a questionnaire related to various areas like good receiving, storage, inventory management etc to check out risk.

After risk assessment, manager evaluates the identified/assessed risk on the basis of his ability and experience. Artebrant et al (2003) argues that checklists method does not provide the consequences of risk in numeric form. So, we think that 'Expected Damage Cost Analysis Method' and 'Delphi Technique' methods proposed by Artebrant et al (2003) should be adapted by Makro-Habib to assess the consequences of risks in numeric terms and also to have an expert opinion of consultants/experts as well.

After assessment, manager is responsible for evaluating/prioritizing the risk on the basis of their impact/significance and likelihood of occurrence by using risk matrix method qualitatively. Cox (2008) also discuss this thing in a way that many decision makers and consultants believe that risk matrices are very appropriate tool for risk significance qualitatively on the basis of least urgent and most urgent risks in many application. Lin & Zhang (2008), explain that risk evaluation comprised of evaluating the risks in the whole supply chain with the objective to prioritize/rank the risks on the basis of risk level and chances of occurrence.

Now, the risks in fresh food supply chain identified above in empirical portion are prioritized by using risk rating method below which is based on the response of fresh food section head against questionnaire-2 (annexure-2).
Table – 5.1: Risk Rating Matrix (All Identified Risks)
Source: Own

Legends:

1. Wrong Ordering
2. Untrained Staff/Lack of Technical Training
3. No Quality Control in Receiving
4. Display Limitations
5. Under/Over Receiving
6. Quality Assurance
7. No Control over Storage
8. Short Expiry Product Management
9. Mixing of Expire/Spoiled/Quality Deteriorated with Fresh Items
10. Buyer Orders without Store Consensus
11. Internal Purchase Procedure (Loose Control)
12. Contamination of Products
13. No Control over Bakery Productions/Expiry/Wastage (Internal Production Management)
14. FIFO (Loose Practise)

Risks number 2, 3, 5, 6, 7, 9 and 13 are of moderate risks because they have moderate/major impact and their likelihood of occurrence is of possible/likely nature. Risk significance of risks number 4, 8, 10 and 11 are of low/very low because their impact is of minor/insignificant and their chances of occurrence are unlikely in nature. Risks number 1, 12 and 14 are of high and critical significance in nature because their impact is catastrophic/major and their likelihood of occurrence is of likely/almost certain. The significance of all these risks is based on the fresh food section head's knowledge, experience, observation and perception.

Authors: Waqas, Yasir, Nauman, Hassan
At a glance, the most significant fresh food supply chain risks in Makro-Habib in terms of their impact and likelihood of occurrence are shown in the table below:

<table>
<thead>
<tr>
<th>Supply Chain Risks in Fresh Food</th>
<th>Impact (Rating)</th>
<th>Likelihood (Rating)</th>
<th>Risk Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrong Ordering</td>
<td>Catastrophic</td>
<td>Likely</td>
<td>Critical</td>
</tr>
<tr>
<td>FIFO (Loose Practice)</td>
<td>Catastrophic</td>
<td>Almost Certain</td>
<td>Critical</td>
</tr>
<tr>
<td>Contamination of Products</td>
<td>Major</td>
<td>Likely</td>
<td>High</td>
</tr>
<tr>
<td>Untrained Staff/Lack of Technical Training</td>
<td>Moderate</td>
<td>Possible</td>
<td>Moderate</td>
</tr>
<tr>
<td>No Quality Control in Receiving</td>
<td>Major</td>
<td>Possible</td>
<td>Moderate</td>
</tr>
<tr>
<td>Under/Over Receiving</td>
<td>Moderate</td>
<td>Possible</td>
<td>Moderate</td>
</tr>
<tr>
<td>Quality Assurance</td>
<td>Major</td>
<td>Possible</td>
<td>Moderate</td>
</tr>
<tr>
<td>No Control over Storage</td>
<td>Major</td>
<td>Possible</td>
<td>Moderate</td>
</tr>
<tr>
<td>Mixing of Expired/Spoiled/Quality Deteriorated with Fresh Items</td>
<td>Moderate</td>
<td>Likely</td>
<td>Moderate</td>
</tr>
<tr>
<td>No Control over Bakery Production/Expiry/Wastage (Internal Production Management)</td>
<td>Moderate</td>
<td>Possible</td>
<td>Moderate</td>
</tr>
<tr>
<td>Display Limitations</td>
<td>Minor</td>
<td>Unlikely</td>
<td>Low</td>
</tr>
<tr>
<td>Short Expiry Product Management</td>
<td>Minor</td>
<td>Unlikely</td>
<td>Low</td>
</tr>
<tr>
<td>Buyer Orders without Store Consensus</td>
<td>Minor</td>
<td>Unlikely</td>
<td>Low</td>
</tr>
<tr>
<td>Internal Purchase Procedure (Loose Control)</td>
<td>Insignificant</td>
<td>Unlikely</td>
<td>Very Low</td>
</tr>
</tbody>
</table>

*Table – 5.2: Most Significant Fresh Food Supply Chain Risks*

*Source: Own*
5.2. Risk Mitigation

There is no proper and comprehensive risk mitigation process in fresh food section of Makro-Habib rather it is more or less totally based on the ability and experience of the manager. Bruzzone et al (2007) argues that there should be a complete supply chain risk evaluation and mitigation process emphasized on preventive actions on both internal operations of company and all supply chain actors. Also, Juttner et al (2003) claim that companies should mitigate risks within supply chain by using any of the appropriate strategy like avoidance, control cooperation or flexibility against each significant risk.

Below we will propose the mitigation action plan for the above-mentioned most significant risks which are wrong ordering, FIFO and contamination of products:

5.3. Action Plans of the Most Significant Fresh Food Supply Chain Risks

5.3.1. Wrong Ordering

*Risk Elaboration*

According to the interview of fresh food section head, wrong ordering means over and less order quantity of product and also the wrong article (product) ordered from buyer to supplier. Computer-generated OPL (order proposal list) is prepared for dry food, noon food and dairy & frozen items on the basis of daily sales. But OPL is not being prepared for fruit, vegetables, fish and meat because of the perish-ability of these products and customer's preference for the freshest food. So, the order of these products dependents upon the manager forecasting and also the outside environmental factors like weather, terrorism, special days, strikes, etc. High lead order processing time due to difference of office closing time of commercial and operational staff and different work shift of fresh food section staff (morning and evening) is also a cause of information invisibility. Childerhouse (2003) describes that the unclear and lack of information increases the confusion risk caused by complexity and uncertainty within the supply chain. So, if the manager is not been able to identify the risks at the early stage then it becomes very difficult to manage that risk later on. Wrong ordering is triggered by the fluctuation in the customer demand that become the reason of mismatch in the actual demand and company's forecast. Resultantly, increase in
customer demand becomes the cause of running down the safety stock and reduction in customer demand becomes the cause of holding cost for the company.

**Purpose of Wrong Ordering Mitigation Strategies**

The purpose is to ensure the availability of the right product with right quantity at right place and right time.

**Comparison of Impact Factors**

<table>
<thead>
<tr>
<th>Impact Factors</th>
<th>Literature</th>
<th>Empirical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased labor cost</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Increased product handling cost</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Increased space cost</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>More transactions = wasted time</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Customer loss</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Lack of food freshness</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Spoiled products (fruits and vegetables)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Good will loss</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

*Table – 5.3: Comparison of Impact Factors – Wrong Ordering*

*Source: Own*

**Mitigation Strategies**

After deep review and analysis of the literature and empirical data, we comprise the strategies into three classes which are structural, operational and visibility base as suggested by Machado and Azevedo (2009). In all three classes, we suggest following different mitigation strategies to Makro-Habib to overcome the wrong ordering risk in their fresh food section.
Efficient supply chain coordination and effective communication between all supply chain actors are essential (Hahn et al, 2000). Companies share the supply and demand information with their suppliers for making the joint forecasting, collaborative inventory management and correct ordering. For logistic efficiency and advance warehouse management, the collaborative distribution is necessary. Demand forecasting, high market competition and perish-ability of fresh food products enhances the need of collaborative relationship between the company and suppliers. Tactical form of collaboration increases the supply chain efficiency and reduces the lead time (Internet - 8).

Makro-Habib should use the collaborative strategy that can increase the accuracy in demand forecasting, warehousing management and reduction in lead order processing time. In Makro-Habib, the promoters of the product deal with the customers directly which are appointed by the suppliers. According to Mentzer (2001), collaborative relations improve the customer services; reduce inventory and delivery of products with reduced cycle time. Makro-Habib should build the collaborative relationship with the

Authors: Waqas, Yasir, Nauman, Hassan
supplier/promoters to analyze the customer trends, demand and behavior related to products because promoters of the product that deal with consumer can analyze the above mentioned factors efficiently and can share these information with them which can be very help full for the mitigation of wrong ordering risk.

Nyaga et al (2009, p. 101) argue that “firms engaged in collaborative relationship achieved improved visibility, higher service levels, increased flexibility, greater end customer satisfaction, and reduced cycle time.” With collaborative relationships companies may get opportunities of better operational performance, reduced inventory, reduction in cost, and also superior logistics performance measures, e.g., cycle time, lead-time, fill rate (Whipple and Frankel, 2000). By using the collaborative relationship Makro-Habib can reduce the factors that are the basis of wrong ordering like invisibility of information, long cycle time, inaccurate forecasting and can also enhance the customer satisfaction with fresh and quality product on right time.

Wilding and Humphries (2006) describe that companies are extending their collaboration relationship due to uncertain and complex market situation. Collaborative relationship within the different supply chain actors makes sure that response to a disturbance is more effective. (Muckstadt et al, 2003). The ordering process of fresh food items depends on forecasting, demand, consumer behavior and environmental situations that all are uncertain and complex, so Makro-Habib should have to collaborate relationship with supplier, that can strength the fresh food manager for accurate and reliable forecasting in the presence of correct information flow that can reduce the wrong ordering risk.

Reduction in cycle time is major strategy to mitigate the supply chain risk. This strategy may beneficial to overcome the harmful effects of disorder in the supply chain. (Christopher and Lee, 2004). Makro-Habib have complex ordering process for fresh food items and due to mismatch in job closing time of operational and commercial staff, order processing time is long that create the confusion in demand estimation for perishable products. By reducing order processing cycle time, Makro-Habib can control the factors that are causes of wrong order and inefficiency of supply chain. Developed coordination through out the Supply chain entities is another stagey to reduce the factor that may affect supply chain actors. Hsieh and Wu (2008) discussed that
coordination may be at the vertical and horizontal level. Vertical coordination can help to avoid a disturbance from disrupting multiple SC stages. Horizontal coordination may facilitate organizations to forecast disorder. In fact, with out horizontal coordination companies may face the risk of long lead time and finally supply chain disturbances. Coordination between fresh food supply chain actors should be in Makro-Habib for the efficiency of supply chain, resultantly Makro-Habib can get the on-ground information that can be helpful for accurate decision making about ordering, inventory management and customer dealing.

Machedo and Azevedo (2009, p. 14) argue that “procurement emergency is another strategy to mitigate supply disturbance associated, for example, with a shortage of products or components. This strategy is coupled with sourcing and intends to find quickly in the market a substitute product.” Procurement policy is necessary in Makro-Habib to reduce the effects of wrong ordering, that company bear less loss in form of customer and financial loss by arranging the products through alternative sources. Advanced Electronic Data Interchange (EDI), Collaborative Forecasting and Replenishment, Sharing information and Vendor Management Inventory (VMI) are strategies to mitigate the supply chain risk on base of invisibility. The main root causes of wrong ordering in Makro-Habib fresh food section is no proper electronic information sharing system. So, this creates the ambiguity in assessing the required processes within the supply chain. EDI is the system by which Makro-Habib can overcome the factors that lead the manager to wrong forecasting and after that buyer to place wrong order to the supplier.

Chopra and Sodhi (2004) discussed that increase in demand information visibility reduces the risk in supply chain. Studies by Lee et al. (1997) describe that information sharing may considerably reduce the causes of the bullwhip effect. With better visibility between the Supply chain levels, companies may foresee a problem at a supplier or customer that may influence them (Stecke and Kumar, 2009) and can also improve the supply chain reaction to market (Ji and Zhu, 2008). In Makro-Habib, information sharing is the key factors that are involve in whole supply chain, this factors is very week in fresh food supply chain, that lead the whole fresh food supply chain on risk. Sharing information regarding customer from promoter to manager, section heads, senior store officer and then to commercial staff in head office for correct order placing is must but due to lack of coordination with
promoters, no proper information sharing system is available that leads towards manual reporting which is also one of the major cause of wrong ordering. So, information visibility is extremely critical for the correct order of fresh food and this visibility can be achieved by adopting proper information sharing system with the promoters/suppliers. For enhanced integration of information flow between the company and its suppliers, CPFR (Collaborative Planning, Forecasting and Replenishment) strategy is helpful that increases the visibility in supply chain entities. (Kleindorfer and Saad, 2005). “The organizations need to be more open in sharing information related to disturbances with supply chain partners and to accept risk jointly instead of individually. Enhance visibility in a supply chain can reduce the vulnerability to disturbances that can affect any supply chain entity, and to reduce the bullwhip effect.” Machedo and Azevedo (2009, p. 15).

Below is the pictorial representation of the causes including long lead order processing time, week information sharing against the wrong ordering risk together with the mitigation strategies to mitigate this risk.
5.3.2. Contamination of Products

Risk Elaboration

As per the fresh food section head’s interview, food contamination refers to spoiled and infected food. From the point of receiving to the end customer Makro-Habib needs to ensure the food quality. Company have to focus more on fresh produce as compared to dry and non-food items because of the hazard of perishability and short expiry period.
associated with these products. In goods receiving department it is quite impossible to inspect the quality of each and every fresh food items as the quality inspection is based on random sampling. When the food is received by the goods receiving department, then it was taken to the storage place because fresh food is perishable so should be stored right after the receiving. As a consequence, a number of activities from goods receiving department to the storage area are involved requiring the intensive care of fresh food in terms of temperature, space and handling, especially in case of fresh food in Makro-Habib. This also implies to the movement of goods from storage to shelf. The shelving of the products includes the display, where customer can easily access. Makro-Habib is facing, there are some operational issues from the in stores movement of fresh food, their storage, handling and shelving, which cause which cause the contamination problem.

**Purpose**

To ensure the safe and healthy quality food to customer

**Comparison of Impact Factors**

<table>
<thead>
<tr>
<th>Factors</th>
<th>Literature</th>
<th>Empirical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of product recall</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Documentation and recovery cost</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Customer loss</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Good will on risk</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Trade restriction</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Sale reduction</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Increased product price</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

*Table – 5.4: Comparison of Impact Factors – Contamination of Products*

*Source: Own*

The analysis shows that Makro-Habib is bearing huge financial and non-financial losses as mentioned above, so there is a need to control this risk at the highest priority.
Mitigation Strategies

By using the literature suggested by Machado and Azevedo (2009), we classify the mitigation strategies to counter the risk of contamination of products into three classes which are structural base, operational base and visibility base.

![Figure – 5.3: Contamination of Products Risk Mitigation Strategies](Source: Own)

According to Mayer (2008), there are different ways to control the hazards relating to food contamination. Personnel ways of protection against food contamination are that, it is important to maintain the good personnel hygiene all the time, because unwashed hand may cause food poising resulting in contamination. It is important to wash the hand thoroughly before handling the raw food specially the meat (fish, beef etc). For wiping the hands, a clean cloth must be use otherwise it may cause cross contamination to plates etc.

By using the above mentioned strategies Makro-Habib can reduce the risk of food contamination, during the product handling a bear hand in loading , unloading, shifting in shelves are the main cause of cross food contamination, recently company not focusing on this procedure but company have to need focus in it in future. In Pakistan the behavior of the peoples are to check the product with own hand, and frequently touching the products
with bear hand is big risk for contamination. Makro-Habib should arrange the gloves for customer to wear it first then touch the products.

Product may be temperature abused, exposed to unsanitary conditions, physically damaged and various other undesirable factors (Food & Housing Division Workbook). As a consequence this can result in increased risk of chemical, microbiological or physical hazard. Fresh food items are very perishable and have needed to keep in proper temperature, so during the load shedding the Makro-Habib need to control the temperature carefully. And by using the temperature check list it will be easy to control the temperature.

Mayer (2008) argues that the safety of the food will be compromised if the product is not stored in the warehouse or transported at the correct temperature. In order to maintain the food integrity in terms of quality and safety, the personnel who handle the product including loaders, truckers and warehouse forklift drivers should ensure the proper stored temperature during transit. After receiving the product its responsibility for the Makro-Habib employees to manage these products carefully, manager of the concern department ensured that no employees touch the product without gloves and handle it carefully. Also, at the receiving end employees should ensure the proper identification, segregation of damaged, rejected, expired and on hold products. Otherwise this may suffer the proper rotation, segregation of product and can adversely affect the product quality and safety. Good receiving department make it sure that the product that are receiving by the supplier is up to the quality and quantity, also check the expiration date of product carefully.

On the safety side, this may include the mix-up of tested and non-tested food items at the receiving end that may put the people at the risk of food borne illness or worse. Handling personnel should also ensure that finished products are segregated from raw products in shipping vehicles and storage because in this case cross-contamination risk is too high. In Makro-Habib by using the proper handling product strategy (raw food and ready to eat food keep separate) the cross contamination risk can be control. And also like this chemical consists food should be spate by the ready to eat food.

Gapud (2006) discusses that for highest levels of food safety in supply chain operation requires establishing training program for all employees in good sanitation, personal

Authors: Waqas, Yasir, Nauman, Hassan
hygiene and in food handling procedures and practices. Makro-Habib can reduce the contamination risk by using the employee’s training strategy. This strategy can be consisting on demonstration and slide presentation. In fresh food section the handling the product is important job and trained employee can manage it carefully. Like storing of products, implementation of FIFO and temperature control check list.

Personnel in warehouse should practice strict hygiene policies. For instance, warehouse employees should wear clean footwear and clothes; limit the wearing of jewelry at work place and use hairnets. Consequently, this may reduce the potential hazard at the receiving end and help keep the storage environment clean. It is also important, even in warehouse that employees should practices the proper hand washing techniques. Dirty hands may allow the transfer of bacteria, chemical residue and diseases. Also this may result in cross contamination risk to the actual product due to soils onto food packages, container or boxes. Likewise employees from coming to work should be discouraged if they are ill (Gapud, 2006). In Makro-Habib for awareness the above mention strategies companies needed to hang the printed material near the working places like store, fridge, cutting counter, sink area etc. and also give the written material to the employee and make it sure the employees are followed these rules and regulation properly. In store freezer, and fridge the operational staff implement the FIFO strategy and at the end promoter recommended the every customer for wearing the gloves before touching the products.

Below is the pictorial representation of the causes including improper product handling and storage, untrained staff against the contamination of product risk along with the mitigation strategies to mitigate this risk.
5.3.3. FIFO (Loose Practice)

**Risk Elaboration**

According to the interview of fresh food section head, loose practice of FIFO means that implementation of FIFO policy is not carried out fully in stock rotation e.g. the products that received first are not sold first. The risks of loose FIFO practice is increased in the storage area including display shelves, freezers and fridges after fresh food items are received from goods receiving department.

**Purpose**

The purpose is to ensure implementation of FIFO policy.
**Comparison of Impact Factors**

<table>
<thead>
<tr>
<th>Factors</th>
<th>Literature</th>
<th>Empirical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excessive product</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Shrinkage of products</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Deterioration of quality</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Disposal cost of product</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Reduction in profit margin</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Loss due to spoilage</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

*Table 5.5: Comparison of Impact Factors – FIFO (Loose Practice)*

*Source: Own*

**Mitigation Strategies**

By using the literature suggested by Machado and Azevedo (2009), we classify the mitigation strategies to cope the risk of FIFO (loose practice) into three classes which are structural base, operational base and visibility base.

*Figure 5.5: FIFO (Loose Practice) Risk Mitigation Strategies*

*Source: Own*
FIFO (First In, First Out) is particularly significant for perishable stock. FIFO means that the stock is arranged and identified by receiving date with the aim to make sure that stock which is received first should be sold/removed first. According to Brown (2003), FIFO rotation method is used by placing the incoming supplies in the back, dating packages in order to ensure the freshness of products. Similarly, Dopson and Hayes (2010) argue that prior to the sale of most recently received stock; already on hand stock should be displayed/sold first. Makro-Habib is using FIFO method for stock rotation but failed to fully implement it. The main reason is that the mixing of the old and new products at the time of receiving and shelving. Fresh food section dealing a large number of articles, so after mixing the old and new products, it is very difficult to manage it afterwards. So, by using the strategy of effective collaboration with promoters can reduce the loose FIFO practice. Because promoters are the employees of suppliers and they have no concern with the Makro-Habib profit and loss, so they always try to sell the freshest product that received at the last. By using the collaboration strategy, the promoter feel the responsibility to manage the product in this way that new product behind or under the old product. This implies that the store in-charge should be very active and take extra care to put the new stock behind and move the existing stock up. But this has been observed that the store in-charge normally has the tendency not to carry out this practice on regular basis. By giving the training to the store’s employees, Makro-Habib can reduce the loose practice of FIFO in store. Proper training enables the employees to handles the products carefully by using the fully implementation of FIFO policy. In addition to this, regular monitoring of FIFO policy implementation in stores may ensure the desired outcomes. (Dopson and Hayes, 2010)

FIFO is basically a storage technique which is more appropriate for fresh food (perishable and non-perishable items). Product loss due to excessive spoilage, deterioration in quality and shrinkage may occur if the company fails to implement the FIFO system. If a company has to manage the effective food business and to avoid these factors, then the proper implementation of FIFO system is critical. To ensure this, manager requires the store in-charge to put up a tag or mark on each received item along with delivery date. This mark/tag works as a visual aid for the in-charge which product received when and which product to be used first. This tagging system is especially significant in items which are more perishable like fresh meat or sea food. Makro-Habib is facing a financial loss in term
of spoilage, deterioration in quality, and disposes off the products. So, there is a dire need of managing the products carefully to protect the company from financial loss, this requires the product tagging. Product tagging ensure the fully implementation of FIFO policy in product rotation, storage, due to easy visibility of product delivery date and expiry dates. (Dopson and Hayes, 2010)

Burgess (2001) explains that generally, stock rotation follows FIFO rule. This may result in certain issues if a company does not follow the FIFO principles in shelves, freezer and fridges.

- “Date stamp every time if it does not already have one
- Move old stock to front and new stock to back
- Periodically check that stock is being used. If it is not then you need to take action.

  This could mean, pitting on a special promotion to sell it off cheaply, or use in staff meal” (Burgess, 2001, p. 157)

Also, by monitoring all the processes ranging from receiving to the storage and shelving area can increased possibility to removes the loose practice of FIFO risks in Makro-Habib. Monitoring of all the process ensure that employees of good receiving department tagging the products carefully, also in store and shelving new product are placing behind or under the new product. So, applying the monitoring strategy at each step can reduce the chance of FIFO risk.

Below is the pictorial representation of the causes including loose practice, untrained staff against the FIFO (loose practice) risk along with the mitigation strategies to mitigate this risk.
- Proper product receiving list
- Tagging
- Monitoring
- Proper handling
- Employees training
- Frequent monitoring
- Proper handling
- Employees training
- Proper space allocation
- Proper handling
- Collaborative relationship with promoters
- Frequent monitoring

**Figure – 5.6: FIFO (Loose Practice) Mitigation Strategy Model**

*Source: Own*
Figure – 5.7: Thesis Model
Source: Own
CHAPTER – 6: CONCLUSION

Undoubtedly, in current era, the risks that exist in company’s complex supply chain networks including upstream, downstream or in its operational areas are critical. It is very important to understand the whole supply chain system, actors involves it and the potential consequences of these risks in order to mitigate these risks. There are always challenges in analyzing the risks within the supply chain network but the manager and his team should be up-to-dated and be proactive to first identify risks and then to mitigate these risks from the company’s perspective. If a company is not proactive in risks mitigation against those risks that exist in the entire supply chain network then the business continuity may suffer dramatically.

*Research Question # 1: What are the most significant supply chain risks in fresh food items at Makro-Habib?*

In order to manage supply chain risks, there is a dire need to identify the risks proactively. Makro-Habib is facing various operational risks in its fresh food supply chain ranging from good receiving department to shelving of products in terms of material handling, inventory management and storage. Whole fresh food supply chain team is responsible for risk identification in their respective operational areas within the store. Based on fresh food section head’s interview, numbers of on ground risks are identified which are wrong ordering, no quality control in receiving, under/over receiving, no control over storage, mixing of expired/spoiled/quality deteriorated with Fresh items, internal purchase procedure (loose control), no control over bakery productions/expiry/wastage (internal production management), untrained staff/ lack of technical training, display limitations, quality assurance, short expiry product management, buyer orders without store consensus, contamination of products and FIFO (loose practise).

Risk rating matrix method is used to prioritize/rank the identified risks based on the impact on the business and likelihood of occurrence of these risks. Out of the above-mentioned identified risks, ‘wrong ordering’, *contamination of products’ and ‘FIFO (loose practice)’ are the most significant risks in fresh food supply chain and their signification is based on fresh food section head experience, knowledge, perception and on ground situation.
Research Question # 2: How can significant supply chain risks in fresh food items of Makro-Habib be mitigated through proposed action plan?

The supply chain risk analysis and mitigation strategies discussed in this thesis provide Makro-Habib with a highly elaborative and strong tool to manage the most significant fresh food supply chain risks effectively and with ease. The proposed mitigation strategies imparts a certain degree of intelligence for decision making at strategic, operational and visibility based level against each of the most significant fresh food supply chain risks.

First most significant risk is ‘wrong ordering’, to mitigate this risk at the strategic level: collaborative relationship with suppliers and capacity flexibility of storage, at operational level: coordination among supply and demand, coordination among supply chain entities/actors, supply chain cycle time reduction, order processing lead time reduction, procurement emergency policy and at visibility based level: electronic data interchange (EDI), collaborative planning forecasting and replenishment (CPFR) and information sharing should be adopted by Makro-Habib to overcome the wrong ordering risk.

Second most significant risk is ‘contamination of products’, Makro-Habib should follow standard operating model (SOP), training and development of employees which include demonstration and presentations at strategic level, proper handling, storage, shelving and personal hygiene and utensils cleaning at operative level and frequent monitoring, instruction manual, checklists of temperature control and allergic awareness strategies at visibility based level to counter contamination risk in fresh food supply chain.

Various mitigation strategies to cop third most significant fresh food supply chain risk i.e., FIFO (loose practice) are effective collaboration with promoters, training and development of employees at strategic level and at the operational level it includes proper material handling, tagging of products and proper allocation of storage space. Also at visibility level, frequent monitoring and proper product receiving list strategies should be employed to mitigate the FIFO (loose practice) risk in Makro-Habib fresh food supply chain.
CHAPTER – 7: SCOPE AND FUTURE RESEARCH

The purpose of our extensive research was how to manage supply chain risks in fresh food section. The fresh food industry faces different challenges in the form of risk that disrupts the whole supply chain within and outside the company. In order to avoid or minimize such types of risks in the fresh food supply chain we have given the action plans against the most significant risks of fresh food supply chain within the store. The study results can be applied to Makro-Habib Pakistan Limited and can also be used as a role model for the other companies like Metro, hyper star having the same business model as Makro-Habib’s. This study may also provide the guidelines for the fresh food related industries as how to avoid and deals with the supply chain risks associated with fresh food.

This study may provide the basis for the future research as it is a case study on Makro-Habib so it can be used for comparative study in the wholesales food industry in Pakistan by conducting a survey. In addition to that, the current research study will further helps to finds the possible ways and proactive tools to mitigate the risks within the company and the food industry as a whole. Another dimension regarding future work may involve the risks associated with dry food and non-food items within the store. The future study may be also held on tracking and traceability in upstream supply chain from farmer until delivery to company in order to have flawless supply chain. According to Weng el at (2009, p. 464), “developed a traceability optimization model to minimize the recall size by planning batch dispersion in supply chain operation”. It is a fact that if the food safety problems arise from the raw material such as during transportation, it definitely affects the finished good in the company as the raw material/supplies may be contaminated or infected. Another problem is the batch mixing in raw material from the supplier which can be named as batch dispersion problem. So all this problem arises in the upstream supply chain in which supplier are directly responsible especially in case of fresh food supply chain. The risks associated with the upstream supply chain should be eliminated so that it will not affect the finished goods inside the company.
Authors: Waqas, Yasir, Nauman, Hassan

Figure – 6.1: Thesis Model
Source: Own
REFERENCES


Authors: Waqas, Yasir, Nauman, Hassan


Authors: Waqas, Yasir, Nauman, Hassan


Authors: Waqas, Yasir, Nauman, Hassan


Morse, J. M. (1999). “Myth # 93: Reliability and Validity are not Relevant to Qualitative Inquiry”, Qualitative Health Research, 9, 717


Authors: Waqas, Yasir, Nauman, Hassan


Authors: Waqas, Yasir, Nauman, Hassan


Authors: Waqas, Yasir, Nauman, Hassan


Other References


Hersh, M. & Shaw, H. “Food Safety Strategies: How to Protect Your Company and Your Consumers”


“Wholesale Food Warehouse Risk Control Plan Workbook”, County of San Diego, Department of Environment Health, Food & Housing Division

Internet Reference


**Interview Schedule and Personnel**

<table>
<thead>
<tr>
<th>Interview Date</th>
<th>Interviewed Person</th>
<th>Data Collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 23, 2010</td>
<td>Mr. Zeeshan Hamid</td>
<td>Topic discussion/clarification</td>
</tr>
<tr>
<td></td>
<td>Mr. Adnan Bhatti</td>
<td></td>
</tr>
<tr>
<td>April 25, 2010</td>
<td>Mr. Zeeshan Hamid</td>
<td>Empirical data/questionnaire – 1(annexure 1)</td>
</tr>
<tr>
<td></td>
<td>Mr. Adnan Bhatti</td>
<td></td>
</tr>
<tr>
<td>April 28, 2010</td>
<td>Mr. Zeeshan Hamid</td>
<td>Risk signification/ranking/questionnaire – 2</td>
</tr>
<tr>
<td></td>
<td>Mr. Adnan Bhatti</td>
<td>(annexure – 2)</td>
</tr>
<tr>
<td>April 30, 2010</td>
<td>Mr. Zeeshan Hamid</td>
<td>Risk Elaboration – Wrong Ordering</td>
</tr>
<tr>
<td></td>
<td>Mr. Adnan Bhatti</td>
<td></td>
</tr>
<tr>
<td>May 04, 2010</td>
<td>Mr. Zeeshan Hamid</td>
<td>Risk Elaboration – Contamination of Products</td>
</tr>
<tr>
<td></td>
<td>Mr. Adnan Bhatti</td>
<td></td>
</tr>
<tr>
<td>May 14, 2010</td>
<td>Mr. Zeeshan Hamid</td>
<td>Risk Elaboration – FIFO (loose practice)</td>
</tr>
<tr>
<td></td>
<td>Mr. Adnan Bhatti</td>
<td></td>
</tr>
</tbody>
</table>

Mr. Zeeshan Hamid  
Section Head – Fresh Food (Morning Shift)  
Makro-Habib Pakistan Limited  
Email: ffmdt@makropakistan.com

Mr. Adnan Bhatti  
Section Head – Fresh Food (Evening Shift)  
Makro-Habib Pakistan Limited
APPENDICES

Annexure – 1 (Questionnaire 1):

Questionnaire 1: Empirical Data – Makro Habib Pakistan Limited

Q1. Description/introduction of Makro-Habib supply chain department (hierarchy)
Q2. How many employees are working in supply chain department and how many of them are in fresh food section?
Q3. Who is the in charge of fresh food section (designation, email address)?
Q4. Who is the assistant of in charge of fresh food section (designation, email address)?
Q5. How many products/article in fresh food section (product line)?
Q6. How many suppliers for fresh food section?

Q7. What is the supply chain process of fresh food section of Makro-Habib (how you give order, who is responsible for transportation, who is responsible for unloading and storage etc)?
Q8. What are the supply chain risks in fresh food sections currently and where they are most likely to occur?
Q9. How many logistics links in the entire supply chain of fresh food (from supplier to good receiving to final storage/shelving) and which logistics facilities are used in these links?
Q10. How Makro-Habib overcome/mitigate these risks (process)?

Identification

- How you identify your risks
- What tools are used to identify risks
- Who is responsible for risk identification

Rank/Prioritize

- How you rank your risks
- What tools are used to identify risks
- Who is responsible for risk identification

We will really appreciate if you could provide us any of already printed material/research done/pictures etc on Makro-Habib.

Note: Please feel free if you require any clarification about any of the question above.

Group Members

Waqas Mehmood, Yasir Liaqat, Nauman Iftikhar, Raza Syed Hassan
Students of Supply Chain Management
Linnaeus University, Vaxjo, Sweden

Authors: Waqas, Yasir, Nauman, Hassan
## Annexure – 2 (Questionnaire 2):

**Questionnaire II For Thesis: Managing Supply Chain Risks in Fresh Food Supply Chain - Makro-Habib Pakistan Limited**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Risks</th>
<th>Impact</th>
<th>Likelihood of Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Wrong ordering</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>2</td>
<td>Insufficient staff/lack of technical training</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>3</td>
<td>No quality control in receiving</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>4</td>
<td>Display limitations</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>5</td>
<td>Stolen/misplaced goods</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>6</td>
<td>Quality Assurance</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>7</td>
<td>No control over storage</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>8</td>
<td>Short expiry product management</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>9</td>
<td>Mixing of Expired/Spilled Quality</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>10</td>
<td>Buyer orders without store consensus</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>11</td>
<td>Internal purchase procedures - labor control</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>12</td>
<td>Contamination of products</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>13</td>
<td>No control over bakery production/expiry/wastage (Internal Procurement)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>14</td>
<td>ISSR (green practice)</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

**Group Members:**

Waqas Mohyuddin, Yasir Usman, Nauman Ali (Makro-Habib Pakistan Limited)

Students of Supply Chain Management

Lahore University

Visby, Sweden
Annexure – 3 (A3) (Risk Rating Matrices):

### 1. Risk Rating Matrix – Wrong Ordering

<table>
<thead>
<tr>
<th>Impact</th>
<th>Rare</th>
<th>Unlikely</th>
<th>Possible</th>
<th>Likely</th>
<th>Almost Certain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catastrophic</td>
<td></td>
<td></td>
<td></td>
<td>Critical</td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insignificant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table – A3:1 Risk Rating Matrix (Wrong Ordering)*  
*Source: Own*

### 2. Risk Rating Matrix – Untrained Staff/Lack of Technical Training

<table>
<thead>
<tr>
<th>Impact</th>
<th>Rare</th>
<th>Unlikely</th>
<th>Possible</th>
<th>Likely</th>
<th>Almost Certain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catastrophic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insignificant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table – A3:2 Risk Rating Matrix (Untrained Staff/Lack of Technical Training)*  
*Source: Own*
### 3. Risk Rating Matrix – No Quality Control in Receiving

<table>
<thead>
<tr>
<th>Impact</th>
<th>Rare</th>
<th>Unlikely</th>
<th>Possible</th>
<th>Likely</th>
<th>Almost Certain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catastrophic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insignificant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table – A3:3 Risk Rating Matrix (No Quality Control in Receiving)
Source: Own

### 4. Risk Rating Matrix – Display Limitations

<table>
<thead>
<tr>
<th>Impact</th>
<th>Rare</th>
<th>Unlikely</th>
<th>Possible</th>
<th>Likely</th>
<th>Almost Certain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catastrophic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insignificant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table – A3:4 Risk Rating Matrix (Display Limitations)
Source: Own
### 5. Risk Rating Matrix – Under/Over Receiving

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Impact</th>
<th>Rare</th>
<th>Unlikely</th>
<th>Possible</th>
<th>Likely</th>
<th>Almost Certain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Catastrophic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Major</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Minor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Insignificant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table – A3:5 Risk Rating Matrix (Under/Over Receiving)**

*Source: Own*

### 6. Risk Rating Matrix – Quality Assurance

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Impact</th>
<th>Rare</th>
<th>Unlikely</th>
<th>Possible</th>
<th>Likely</th>
<th>Almost Certain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Catastrophic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Major</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Minor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Insignificant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table – A3:6 Risk Rating Matrix (Quality Assurance)**

*Source: Own*
7. Risk Rating Matrix – No Control over Storage

<table>
<thead>
<tr>
<th>Impact</th>
<th>Rare</th>
<th>Unlikely</th>
<th>Possible</th>
<th>Likely</th>
<th>Almost Certain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catastrophic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insignificant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table – A3:7 Risk Rating Matrix (No Control over Storage)
Source: Own


<table>
<thead>
<tr>
<th>Impact</th>
<th>Rare</th>
<th>Unlikely</th>
<th>Possible</th>
<th>Likely</th>
<th>Almost Certain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catastrophic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insignificant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table – A3:8 Risk Rating Matrix (Short Expiry Product Management)
Source: Own

Authors: Waqas, Yasir, Nauman, Hassan
### 9. Risk Rating Matrix – Mixing of Expired/Spoiled/Quality Deteriorated with Fresh Items

<table>
<thead>
<tr>
<th>Impact</th>
<th>Rare</th>
<th>Unlikely</th>
<th>Possible</th>
<th>Likely</th>
<th>Almost Certain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catastrophic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insignificant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Source: Own*

### 10. Risk Rating Matrix – Buyer Orders without Store Consensus

<table>
<thead>
<tr>
<th>Impact</th>
<th>Rare</th>
<th>Unlikely</th>
<th>Possible</th>
<th>Likely</th>
<th>Almost Certain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catastrophic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insignificant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Source: Own*

---

**Authors:** Waqas, Yasir, Nauman, Hassan
### Table – A3:11 Risk Rating Matrix (Internal Purchase Procedure-Loose Control)
*Source: Own*

<table>
<thead>
<tr>
<th>Impact</th>
<th>Rare</th>
<th>Unlikely</th>
<th>Possible</th>
<th>Likely</th>
<th>Almost Certain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catastrophic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insignificant</td>
<td>very low</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table – A3:12 Risk Rating Matrix (Contamination of Products)
*Source: Own*

<table>
<thead>
<tr>
<th>Impact</th>
<th>Rare</th>
<th>Unlikely</th>
<th>Possible</th>
<th>Likely</th>
<th>Almost Certain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catastrophic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>High</td>
</tr>
<tr>
<td>Minor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insignificant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 13. Risk Rating Matrix – No Control over Bakery Production/Expiry/Wastage (Internal Production Management)

<table>
<thead>
<tr>
<th>Impact</th>
<th>Rare</th>
<th>Unlikely</th>
<th>Possible</th>
<th>Likely</th>
<th>Almost Certain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catastrophic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insignificant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table – A3:13 Risk Rating Matrix (No Control over Bakery Production/Expiry/Wastage - Internal Production Management)*
*Source: Own*

### 14. Risk Rating Matrix – FIFO (Loose Practice)

<table>
<thead>
<tr>
<th>Impact</th>
<th>Rare</th>
<th>Unlikely</th>
<th>Possible</th>
<th>Likely</th>
<th>Almost Certain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catastrophic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insignificant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table – A3:14 Risk Rating Matrix (FIFO-Loose Practice)*
*Source: Own*