Factors affecting to Supplier selection for fabric sourcing in large scale apparel companies in Sri Lanka

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ABSTRACT

This research study was carried out to identify the factors affecting to fabric sourcing for large-scale apparel industry in Sri Lanka. The conceptual framework was structured based on past literature reviews and 4 supplier selection criteria and 29 sub-criteria were identified. 15 companies were identified as large-scale apparel manufactures. Primary data was collected through questionnaire survey for 15 companies. Questionnaire was distributed among 250 respondents in the selected sample. Total numbers of 195 questionnaires were returned back. Ten questionnaires were rejected since those questionnaires had huge amount of missing data. Further, a web-based survey was conducted using the same questionnaire. Through web-based questionnaire 18 responses were collected.

According to the descriptive analysis all the companies maintain pool of supplies and consider supplier selection as a critical activity in the business process. All 29 sub criteria were categorized in to 4 main groups through the factor analysis. After that hypothesis testing was conducted using chi square test to check the hypothesis on the current fabric supplier satisfaction and grouped factors. All the P values were under 0.05 and that means all the grouped factors are significant. As a result of that we can conclude grouped factors were depend on the fabric supplier satisfaction.

Lack of studies regarding to the supplier selection criteria and models in Sri Lankan context is the main limitation of this research study. So, all the sub factors were identified through international literatures. Sub factors were identified specifically to the Sri Lankan context to select the best fabric supplier form a pool of fabric suppliers. The identified factors will help to procurement professional to select the best fabric supplier in large scale-apparel industry in Sri Lanka.

Keywords: *Factor analysis, Hypothesis testing, large-scale apparel industry, supplier selection, supplier selection criteria.*

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This dissertation written to represents the essence of the achievements during the four years of study in bachelor of science (hons.) in logistics and transportation in CINEC Maritime Campus. This paper is concluding part of the degree in BSc. in logistics and transportation. This research gives a knowledgeable and practical experience for the theoretical subjects that we have been studying during the academic period of time with connected to supply chain managements.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF EQUATIONS

LIST OF ABBREVIATIONS

SC - Supply Chain

SCM - Supply Chain Management

QFD - Quality Function Deployment

AHP - Analytic hierarchical process

ANP - Analytic Network Process

CIPS - Chartered Institute of procurement and Supply

JIS - Just In Sequence

JIT - Just In Time

CHAPTER 01: INTRODUCTION

1.1 Introduction to the Chapter

Chapter 01 targeted on to achieved the background study to get an idea about supply chain management, procurement, factors that affect when selecting a supplier under the procurement. Research problem should be identified to conduct the research. Because otherwise final objective of the research will not be achieved. So, identification of the research problem is a key aspect of an academic research. To achieve the research objective what kind of questions should be asked are discussed under this chapter.

1.2 Background of the study

1.2.1 Introduction

The supply-chain management (SCM) has become very critical to every organization. To manage risk, dynamism and complexities of global sourcing SCM processes need to be in proper structure. A totally integrated supply chain is required for the company to get gain the maximum benefits (Asli Koprulu, 2007).

The objectives of the supply chain and the performance measurements need to be understood in order to build the most effective supply chain. Due to dynamic changes in global supply chain, supply chain management (SCM) is getting affected by many challenges with regarding to decision making processes. To face with above challenges, decision makers are looking for proper decision-making processes (Talluri, 2002).

Traditionally there are separate responsible parties to handle and coordinate the different functions of supply chain. Collaborative relationships with suppliers across multiple tires are also a important factor in SCM. The primary objective of SCM is to link and administer the sousing flow and control of materials using a total system aspect across numerous function and numerous tires of suppliers (Monczka, 1998).

The philosophy of SCM highlights that boundaries of SCM cover not only logistics, but also all other function carried out within a firm and within a Supply Chain to build customer value and satisfaction.

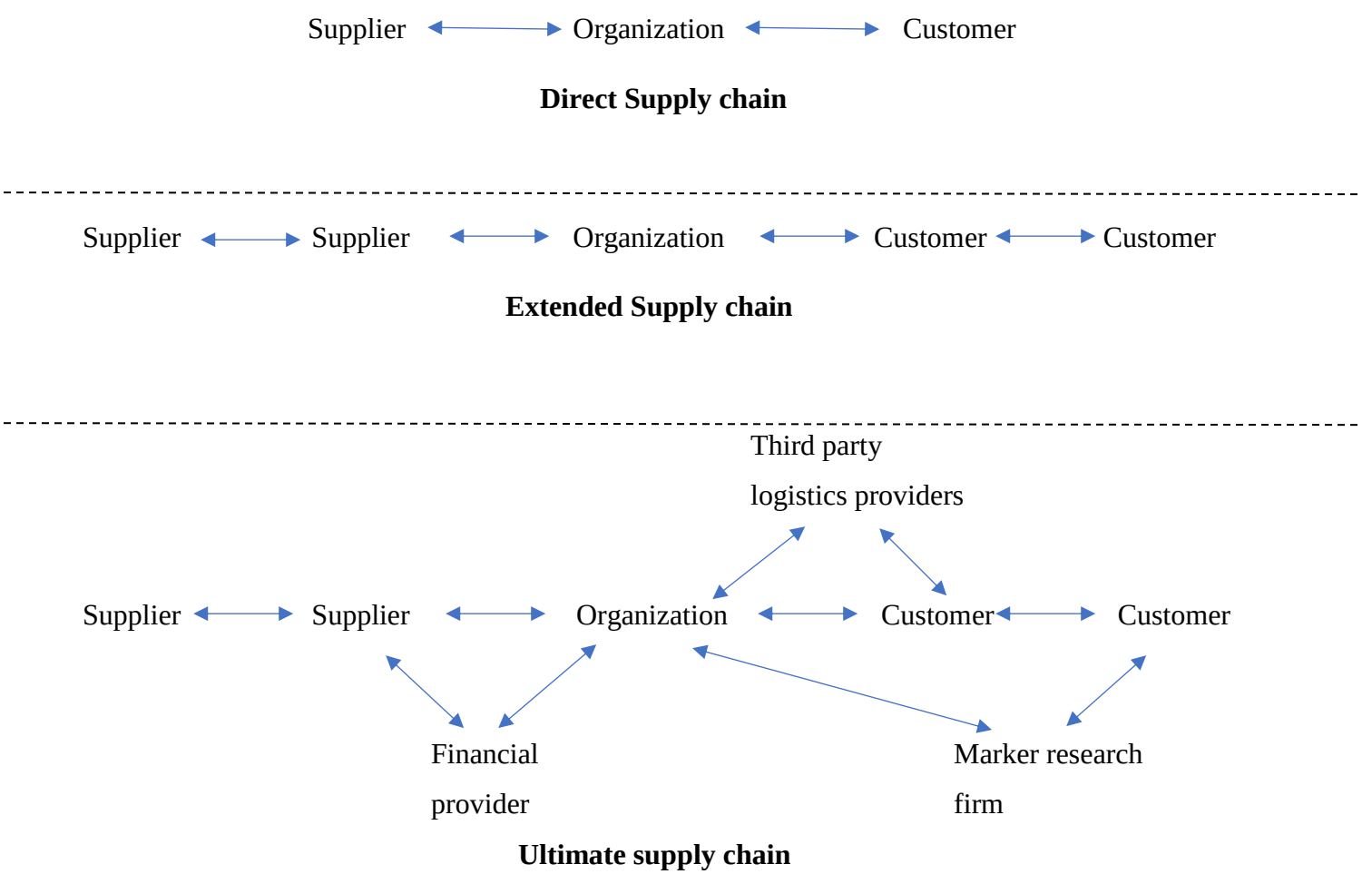

Figure 1.1-Types of Channel Relationships

Dealing with own functional silos within a company helps to implement SCM in a successful way. Thus, all the function within the supply chain need to be re-arranged as key process. The key processes in the supply chain includes demand management, Procurement, customer relationship management, order fulfilment, manufacturing flow management, product development and commercialization on and customer service management (Lambert, 1998).

As Figure 1.2 shows, SCM aims four major goals:

- waste reduction
- time compression
- flexible response
- unit cost reduction.

These goals have been articulated in several contexts associated with SCM, emphasizing the importance of both intra- and inter-firm coordination (Brewer, 2000).

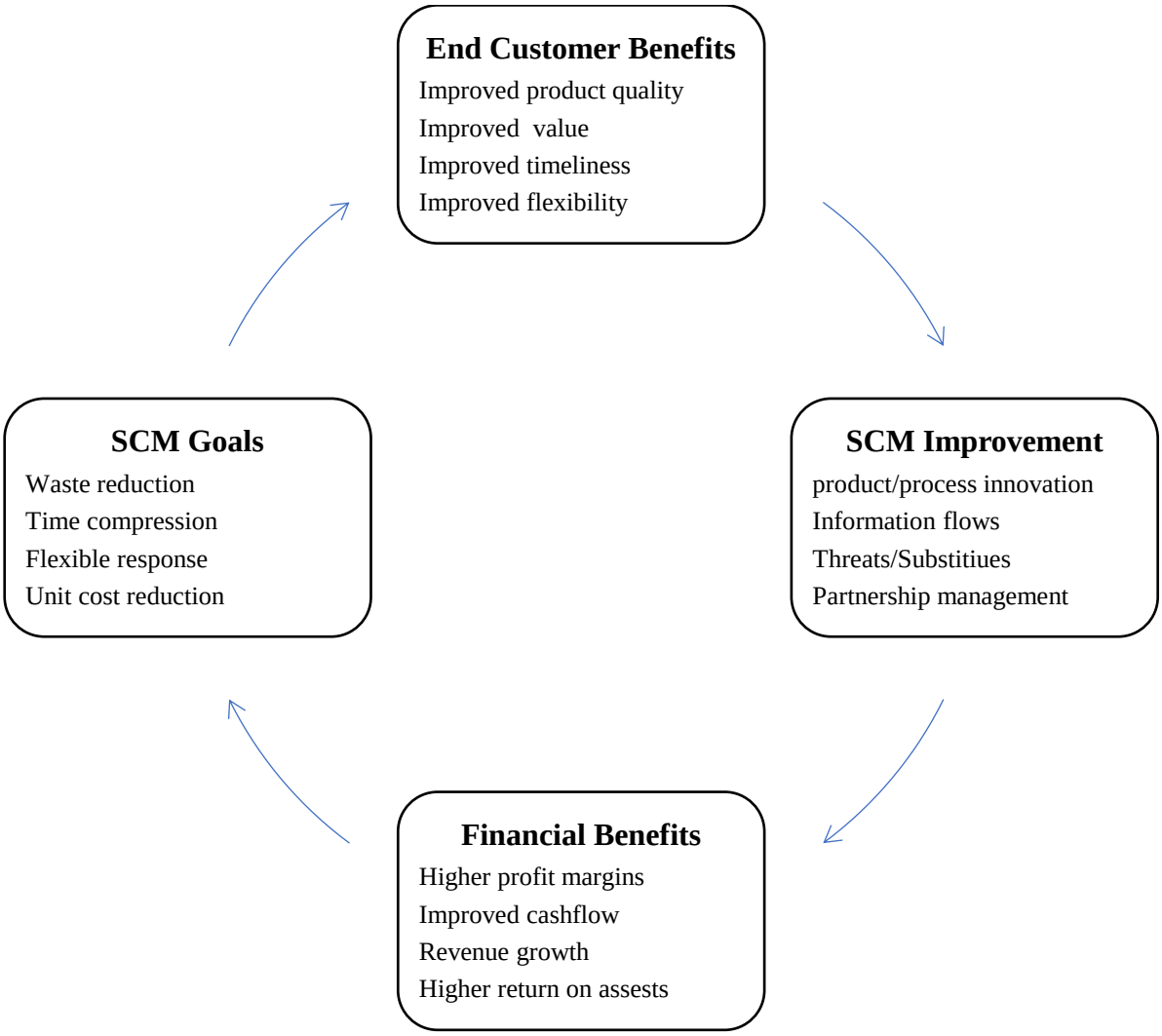

Figure 1.2-Supply Chain Management Framework

Source: (Brewer, 2000)

Purchasing plays an important role in SCM. Selection of appropriate supplier will be a key success factor for purchasing function. One of the most important aspects of purchasing is supplier selection (Tidwell, 2012). The importance of supplier selection increased with the widely implementation of JIT among manufacturing industry since 1980s (H.K. Sim, 2010).

Literature findings estimated that 85% of North American and European multinational companies practice outsourcing (G. Tyndall, 1998). Today, many companies want to gain competitive advantage through reliable and efficient supply networks based on suppliers' relations since using that companies can increase profit and promote customer value while minimizing the total supply chain cost. Supplier selection has become more and more important in many processes in supply chain for any kind of business in the world. Cost of raw materials, components and sub-assemblies are the main cost components for the many products in many manufacturing industries. It accounts about 60% of the total costs (Ali, 2008). So, the purchase department always try to make an effort to reduce the purchasing cost by choosing the appropriate suppliers (Pandian, 2013).

In the current situation of the trade, selecting the appropriate supplier is not only depend on the price list. It is far more than that. There are huge number of criteria to be considered to match with the objectives of the business such as minimizing the total supply chain cost while maximizing the profit. In an increasingly competitive environment, firms are trying to pay more attention to selecting the appropriate suppliers for procurement of raw materials and component parts for their products (Amol, 2015).

In current context supplier selection is one of the critical problems in many industries due to high complexity. For decision making context in purchasing, there would be contradictory vendor evaluation criteria. And also, supplier selection is recognized as multi criteria decision making problem (Temesgen, 2014). Hence, supplier selection process has both qualitative and quantitative criteria, due to that this process becomes a multiple criteria decision-making problem (Punniyamoorty, 2012). Industry experts are looking for the developments in this process since using this many cost components such as inventory cost product cost can be reduced (Özkan, 2011).

1.2.2 Apparel industry in Sri Lanka

In current dynamic world, Sri Lanka has become a hub of apparel manufacturing. The reason for selecting apparel industry as the research industry is there is a competitive supplier base within the industry. And also, with the dynamic environment, it is essential to select most suitable supplier with the situational change. Sri Lanka's apparel industry has grown to be nation's one of the leading contributors to the export revenue (Ranaweera, 2014). The industry has enjoyed epic growth levels over the past four decades and is today Sri Lanka's primary foreign exchange earner accounting to 40% of the total exports and 52% of industrial products exports (EDB, 2018). Sri Lankan apparel industry is well known for providing fast, high quality and ethical fashion products. In order to supply good quality products, it is important to choose right supplier at the right time for the right product.

1.3 Problem Statement

There are lots of suppliers in every industry who can give same product and service to the customers in very effective way. But it is very difficult to select best supplier among those pool of suppliers, maintaining the cost, service quality and product quality. Most of the organizations in Sri Lanka don't have a proper mechanism to select the most suitable supplier among best suppliers.

In this changing business environment supplier selection has become a multi-criteria decision problem which involves qualitative and quantitative criteria. In Sri Lanka, many organizations evaluate and identify best supplier using their expertise knowledge and past experience. The main reason for this is Sri Lanka don't have proper research and developments procedures for these mechanisms.

Therefore, it is very important to carry out research study regarding to the supplier selection in the aspect of Sri Lanka. This research is targeted on determine the factors that affect to the supplier selection for large scale apparel industry in Sri Lanka.

1.4 Objective of the Research

The main objective of this research is to identify the factors that affect to the supplier selection for fabric in large scale apparel industry. When selecting a supplier there are lot of criteria and sub criteria and it depend on organization to organization.

Further, the following secondary objectives are formulated,

- To study the overall fabric supplier satisfaction of the apparel industry in Sri Lanka.

1.5 Research Questions

To achieve the objective of the research below research questions are asked,

Question 1:

What are the major factors influencing the supplier selection process for fabric in apparel industry in Sri Lanka?

Question 2:

What is the current overall fabric supplier satisfaction level in apparel industry in Sri Lanka?

1.6 Significance of the Research

After conducting this research, the main objective of the identifying of major factors will be determined by handling multiple criteria that will enable considering a number of both qualitative and quantitative factors when assessing the supplier. Then the identified factors can be used to develop a supplier selection model, which will enable the apparel industry to mitigate the selection of incompetent supplier. Apart from that this research will helpful for future researchers since there are no any research articles on this topic to refer in Sri Lanka.

1.7 Outline of the Paper

Chapter 01 is consisting of background of the study, problem statement, objective of the study, research questions, significant of the study and outline of the paper.

Chapter 02 which is literature review, explains supply chain management, procurement, supplier, types of suppliers, supplier selection, supplier selection criteria, supplier selection methods based on paste literature.

Chapter 03 research methodology consists of research methodology, sample design, data collection, conceptualization, dimensions and items of the questionnaire, data analysis and model development.

Chapter 04 consists of analysis of demographic factors and model development.

Chapter 05 consists conclusion, recommendation, limitation of the study and further research.

1.8 Chapter Summary

From the chapter 01 researcher describes about background of the study, problem statement, objective of the study, research questions, significant of the study and a summary outline of the whole research. Objective of the study is to determine prominent supplier evaluation criteria to select best supplier from a supplier pool for apparel industry (large scale) in Sri Lanka.

CHAPTER 02: LITERATURE REVIEW

2.1 Introduction to the chapter

This chapter targeted on previous research findings and landmark researches on supply chain management, procurement, supplier selection, supplier selection criteria and basic supplier selection models. For Supply Chain Management, there are numerous types of definitions can be found. Those definitions help to understand the supply chain management in broader level and different areas of supply chain management. The role of procurement in supply chain management and importance of procurement in supply chain management identified in many literatures. Apart from that, the role of supplier selection, supplier selection criteria used select supplier and different types of supplier's selection model under procurement function was identified according to the past literature. The importance of the apparel industry to the Sri Lankan economy was studied in this chapter based on the past literatures.

2.2 Supply Chain Management

Concept of SCM was developed in early 1980s by team of consultants (Oliver & Webber, 1982). Over the years many definitions have been created by scholars to deal with SCM. This concept was developed in many areas in all around the world. After few years this concept expanded to the business management area. After it came to the business management, main focus was to increase the efficiency in cost management system in 1990s (Christopher & Lee, 2004). Five main groups were identified in SCM according to the content of SCM, which are supply chain, inter-organizational integration, objectives and evolution towards integrated supply chain.

Basically, Supply chain is a complex network with consists of several areas. As an example, it consists of processes like inventory control, purchasing, order processing, manufacturing, and distribution etc. Above processes help to deliver final product or service to the customer in an efficient and effective way. With these processes all of the customers, manufacturers and suppliers, starting from the creation of raw material or component parts by suppliers, and ending with consumption of the product by customers are interconnected (Shin-Chan & Danny, 2013).

In another way supply chain can be defined as a network of autonomous or semiautonomous business entities collectively responsible for procurement, manufacturing and distribution activities associated with one or more families of related products (jayashankar & swaminathan, 1998). A supply chain comprises of all the parties involved directly or indirectly in order to fulfill customer requirement. In here not only the suppliers and manufactures but also transporters, distributors, wholesalers, retailers and

the customer are included as the entities in supply chain (Chopra & Mendil, 2013). It consists three flows of goods, information and funds.

“One of the most significant paradigm alterations of modern business management is that individual businesses no longer compete as solely-autonomous entities, but rather as supply chain. Business management has entered the era of internetwork competition” (Cooper, Lambert, & Janus, 1997).

Supply chain process flows mainly can be divided in to 3 processes; flow of material, flow of information and flow of financial. The movement of physical products from supplier to customer known as flow of material. The payment process such as payment of bills, letters of credit, credit terms, bankruptcy payment schedules and suppliers known as flow of financial. Order detail, order delivery detail and inventory status are illustrations the information flow. This data is used to have the supply chain efficient and help make decisions (Tang, Nurmaya, & Musa, 2010).

Through effective and efficient SCM organization can achieve operational effectiveness and efficiency (Womack & Jones, 2005). SCM is one of the dominant drivers in the changing modern business world. Different research articles and studies have found various reasons to existence of SCM in different viewpoints like SCM is developed due to competition and network organization operations (Cooper, Lambert, & Janus, 1997).

Supply Chain is a network of multiple business and SCM as the way of capturing the interaction of intra-company and intercompany management and incorporation (Cooper, Lambert, & Janus, 1997).

2.2.1 Procurement

Purchasing is one of the most important processes which common to all organizations. It involves the acquisition of goods, services and materials from another organization in an ethical and legal manner. Initially, the acquisition was a tactical factor for the organization, focused on transactions and low prices. However, over time, the role of the buyer and the purchasing department has changed considerably and the role has become strategic for the competitiveness of the organization.

Table 2.1-History of Purchasing

Period	Status
Late 1890s	Used in railroad and it's difficult to find in other departments.
Early 1900s	Named as clerical work.
World War I and II	Acted as a main role in every department due to obtaining of services, suppliers and raw materials within this war period.
1950s and 1960s	Continue to gain body and handle more sophisticated and well-trained professionals. Still consider placing staff in a position supported by staff.
Late 1960s–early 1970s	The introduction of integrated material systems has made materials a part of strategic planning and has increased the importance of the sector.
1970s	Oil embargo and shortages of basic raw materials turned the focus of the business world to purchasing.
1980s	Fittingly, focusing on inventory control and supplier quality, quantity, time and reliability make buying a cornerstone of competitive advantage
Early 1990s	Value proposition of purchasing continued to increase; cost-savings became the buzzword.
Late 1990s	Purchasing evolved into strategic sourcing, contracts were more long term, and supplier relationship building and supplier relationship management started.
2000s	Purchasing change, the focus of their nearsightedness to a broader term. Some development projects widely used: cost analysis, low cost procurement in the

	country, evolution of procurement technology (ERP, e-procurement), evolution of outsourcing (P2P), total cost of ownership, data extraction and benchmarking, and lean acquisition.

Source: (Nawat, 2018)

Purchasing has been defined in many ways by many scholars. Generally purchasing is defined as doing "the five rights": getting the right quality, in the right quantity, at the right time, for the right price, from the right source (Monczka, Handfield, Giunipero, & Patterson, 2011). Most organizations include purchasing as a major supply chain activity.

Figure 2.1-Macro Process of Supply Chain

Source: (Chopra & Mendil, 2013)

Macro supply chain process was categorized in to three phases; Supplier Relationship Management, Internal Supply Management and Customer Relationship Management. Procurement is played significant role under the Supply Relationship Management and supplier selection is the most concerning area in the procurement process (Tidwell & Sutterfield, 2012).

Procurement process can be defined as in many ways. Different scholars defined this process according to their knowledge.

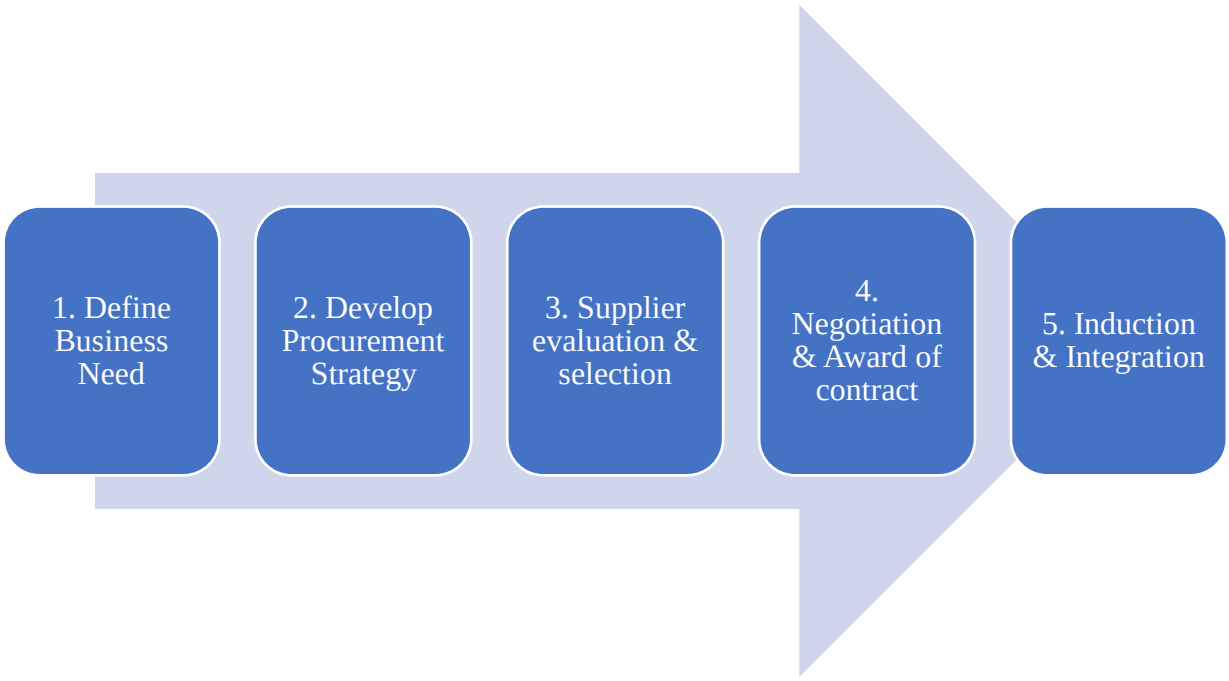

Figure 2.2 -Procurement Process

Source: (blog: purchasinginsight, 2018)

2.3 Supplier

In generally supplier is a term that used for a person, company, or organization that sells or supplies something such as goods or equipment to customers. Some authors defined supplier as vendor, service provider or contractor. Supplier plays an important role in anywhere. In supply chain there is a huge role for supplier. In a supply chain, material flow is initiated by the suppliers providing the raw materials according to the purchase orders (Sheremetov & Rocha-Mier, 2008). Therefore, selection of the suitable supplier is a critical task for a company, and that process will take huge money and time (Avila, et al., 2012).

2.3.1 Types of suppliers

Manufacturers and Vendors – This is the type which makes finished products. These products are already ready for purchase. Main parties like distributers, whole sellers, resellers and retailers purchase products from manufacturers and vendors. Main reason behind that is these people can get the best price from the manufacturers and vendors. Out of the all the supplier types manufacturers and vendors can offer the cheapest price to the market since these people are the direct sellers of the particular finish product.

Wholesalers and Distributors –These suppliers buy bulk of products from manufacturers or vendors. Basically, they are acting like brokers in this supply chain. They already try to reduce the price using bulk buying strategy. Their process is buying as much as from vendors or manufacturers and store them. After that they resale the products keeping some amount as their profit.

Affiliate Merchants – This is a supplier who tries to gain traffic to their website or sales of their product through banners, links and ads. This type placed above strategies throughout their website and try to attract more customers. Merchants will normally pay affiliates a commission for every visit to the website or every sales conversion.

Franchisors – a franchisers are a kind of a supplier who give their trademark or name to different parties for start a business. This trade mark or name act like a license. This help to attract different customer at no time

Importers and exporters – These suppliers purchase products from different countries. After purchasing them they export them to home country. On the other hand, these types of suppliers can act as importers as well. Reason behind that is they can get good price in different countries. So, some of suppliers travel to those expert countries and try to buy bulk products to get a cheap price.

Independent crafts people – These suppliers are normally manufacturing and they have special kind of products which produce small scale. So, these suppliers will send these products direct to the final customer since these types of suppliers are not available everywhere. Apart from that value of these types of products are bit high.

Drop shippers – These suppliers will produce product which goes directly to the end customers. The difference between independent craft people is these drop shippers don't make special products. This method is very cost effective since this eliminates the lot of unnecessary cost components like advertising etc.

(Content: The reseller network, 2018)

2.3.2 Supplier selection

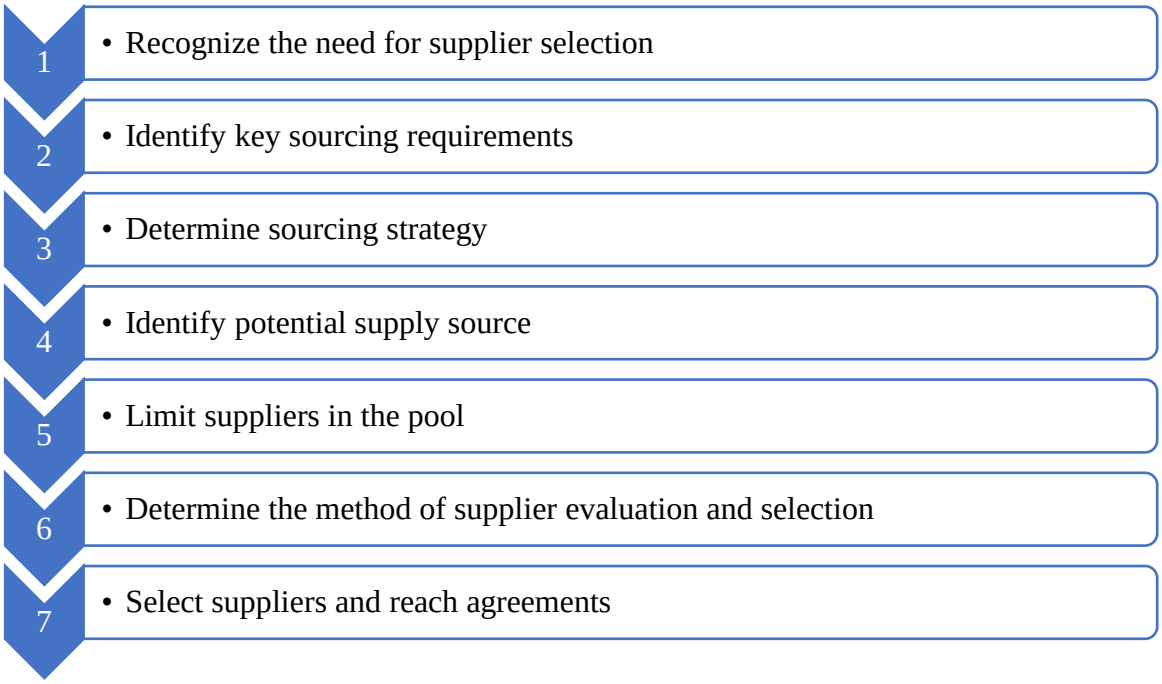

Figure 2.3-Supplier selection process

Source: (Monczka, Handfield, Giunipero, & Patterson, Purchasing & Supply Chain Management, 2011)

The supplier selection process consists of seven steps: recognizing supplier selection needs, identifying key procurement requirements, determining acquisition strategies, identifying potential sources of supply, limiting suppliers in the selection group and determine the methods of evaluation and selection of the provider. Finally, to select the provider and reach an agreement.it must be confirmed that the supplier in question meets certain entry requirements, such as financial strength, adequate commercial strategy, solid support management, proven manufacturing capabilities and design capabilities.

2.3.3 Supplier selection criteria

In every industry supplier plays an important role so that selection of a supplier is a critical task for every industry and this process bit complicated due to many reasons. Basically, supplier selection criteria can be divided in to 2 main categories. They are qualitative and quantitative. These qualitative and quantitative factors will change due to different factors and time. So that this changing environment convert this process to bit complicated.

Since 90s researchers have talked about factors that affecting to supplier selection. quality, on time delivery, cost, lead time and flexibility have been identified as prominent criteria for supplier selection

(Verma & Pullman, 1998). quality, service performance, buyer-supplier partnership, risk, trade restrictions, cultural & communication (Min, 1994). price and on time delivery (Weber & Ellram, 1993).

Clean Technology availability, use of environmentally friendly material were identified by (Anon, 2018) and Pollution reduction capabilities, return handling capabilities were captured by (Humphreys, Wong, & Chan, 2003).

service level, quality and supplier capability were identified by (Hwang, Moon, Chung, & Goan, 2005). Quality, price, on time delivery, responsiveness, buyer supplier partnership, technology and facility were the factors that identified by (Shyur & Hshih, 2006). Quality, price, on time delivery and service performance were the main criteria that identified by (Li, Yamaguchi, & Nagai, 2007). Quality, price, on time delivery, service performance and flexibility were some of factors which were captured by (Mendooza, Santiago, & Ravindran, 2008) and quality, price, on time delivery and collaboration have been considered when developing supplier selection model (Ali & Zeynep, 2008).

quality, service performance, budget/financial position, organization, environment, technology, life cycle cost, green image and pollution control (Lee, Kang, Hsu, & Hung, 2009), quality, price, service performance, purchasing cost/cost, lead time, responsiveness, flexibility, product (Ordoobadi, 2009), quality, price, on time delivery and buyer-supplier partnership (Fatih, Serkan, Mustafa, & Diyar, 2009), are the criteria which were identified by 2009 researchers.

quality, price, on time delivery, service performance, responsiveness, technical capacity, R&D capability (Joshi, Singh, & Kumar, 2012), quality, service performance, purchasing cost/cost, environment, technical capacity, manufacturing challenges and HRM (Prathiban, Zubar, & Garge, 2012), quality, responsiveness, green initiatives, sustainability, innovation and incumbency (Tidwell & Sutterfield, 2012), quality, on time delivery, budget/financial position, purchasing cost/cost, buyer-supplier partnership, organization, environment, technical capacity, management, facility and safety (Punniyamoorty, 2012), quality, on time delivery, budget/financial position. responsiveness, technical capacity, management, facility and discipline (Bhattacharya, Geraghty, & Young, 2010), quality, price, on time delivery, service performance, trust (Lin, Chen, & Ting, 2011), price, service performance, organization and production capability (Ozkan, Basligil, & Sahin, 2011),

quality, price, on time delivery, technology, transportation cost, production system were the criteria that identified by (Golmohammadi & Mellat-Parast, 2012). quality, price, on time delivery and green initiatives were the main criteria that captured by (Lin R. H., 2012). quality, on time delivery, purchasing

cost/cost, production capability and synergies have been identified as supplier selection criteria for their research proceeding were the main factors that the identified by (Avila, et al., 2012).

quality, price, service performance, lead time, buyer-supplier partnership and organization were identified by (Shen & Yu, 2013). quality, budget/financial position, purchasing cost/cost, customer service, cooperation & partnership, reliability were the main factors which identified by (Shin-Chan & Danny, 2013), quality ,price ,budget/financial position, lead time, reputation and after sales were captured by (Temesgen, 2014), budget/ financial position, lead time, demand and supplier capacity were identified by (Amol, 2015). quality, price, on time delivery, budget/financial position, technology, production capability, e-transaction capability were captured by (Kar, 2015) and quality, service performance, purchasing cost/cost, organization and collaboration are the current criteria that are used to develop supplier selection model used by (Nazim, Yahya, & Malim, 2015)

Table 2.2- Criteria of Supplier Selection

Criteria	**Number of Articles**	**%**
Net Price	61	80
Delivery	44	58
Quality	40	53
Production facilities and capacities	23	30
Geographic location	16	21
Technical Capability	15	20
Management and Organization	10	13
Reputation and position in industry	8	11
Financial position	7	9
Performance history	7	9
Repair service	7	9
Attitude	6	8
Packaging ability	3	4
Operational controls	3	4
Training aids	2	3
Bidding procedural compliance	2	3
Labor relations record	2	3
Communication system	2	3

Reciprocal arrangements	2	3
Impression	2	3
Desire for business	1	1
Amount of past business	1	1
Warranties and claims	0	0

Source: (Weber, Current , & Benton, Vendor selection criteria and methods, 1991)

2.4 Apparel Industry

Sri Lankan apparel industry growth started in late 70. After the development of economy in 1977 this industry growth rapidly. At current status there are more than 350 apparel manufactures in Sri Lanka. These manufactures can be mainly divided in to 2 groups, they are Large-scale and Small and Medium scale apparel manufactures. This classification is based on their average annual income. Organizations which procure more than $150million income per year are classified as "Large scale manufactures" and others as "Small and Medium scale manufactures". Apparel industry of Sri Lanka produce more than 300000 direct occupations and around 600000 indirect occupations (EDB, 2016).

The Sri Lankan clothing industry that exports world-famous brands Victoria's Secret, Gap, Liz Claiborne, Next, Jones New York, Nike, Tommy Hilfiger, Pink, Triumph, Ann Taylor, Speedo, Abercrombie & Fitch, Land's End, Marks & Spencer and intimacy with a huge mix of portfolio products. The portfolio of clothing export products includes sportswear, lingerie, casual wear, bridal wear, workwear, bathing suits and children's clothing, etc. which are made in Sri Lanka

More than 90% of apparel trade accomplished by 15 large scale manufactures from more than over 300 of apparel manufactures in Sri Lanka according to the categorization (EDB, 2016)

Apparel manufacturing companies are very important to Economy of the Sri Lanka since apparel industry is the leading foreign exchange earner accountable for 43% of exports from 52% of Industrial exports in Sri Lanka. Therefore, it's vital for carry out study on those key companies to mitigate the problems that they are currently facing for future development and compete within international market.

2.5 Chapter Summary

In this chapter different research papers reviewed. As a result of that different techniques, methods practices used in global context were identified. All of different techniques, tools and findings were summarized in this chapter Most important supplier selection criteria in different foreign settings were identified under the chapter.

According to the literature review, it is clear that the topic has been attractive in the global context but still a requirement for a proper analysis of the Sri Lankan context is missing. Therefore, it is important to do a proper research on developing supplier selection model for apparel industry, Sri Lanka.

CHAPTER 03: METHODOLOGY

3.1 Introduction to the chapter

In the methodology chapter researcher has presented the methodological aspects of the study. This chapter includes Research Design, Conceptual Framework, Identification of Variables, Questionnaire Design, Measurements, Population and Sample Design, Justification of Sampling Approach, Data Collection Methods and Statistical Methods of Data Analysis.

3.2 Research Design

This type of research design falls into the category of the causal research. The main objective of a causal research is to determine the extent and nature of cause-and-effect relationship between variables. The main objective of this research is to identify the **Factors affecting to Supplier selection for fabric sourcing in large scale apparel companies in Sri Lanka**. After the conducting this research the research objective must be achieved. Therefore, two research questions are needed be answer.

Question 01: What are the major factors influencing the supplier selection process for fabric in apparel industry in Sri Lanka?

Question 02: What is the current overall fabric supplier satisfaction level in apparel industry in Sri Lanka?

Apart from the main objective, hypothesis testing for dependent variable and independent variables have been conducted. Overall satisfaction of current fabric suppliers considered as dependent variable and factors which are affecting to selecting a fabric supplier considered as the independent variables.

3.3 Conceptual framework

The framework of this research is constructed mainly based on the literature that has been reviewed in chapter 02. Figure 3.1 shows the conceptual frame work which holds together the concept, relationship and context of the research. Below conceptual framework based on top 4 main factors which have found on this research paper. Each and every main criterion has its own sub factors

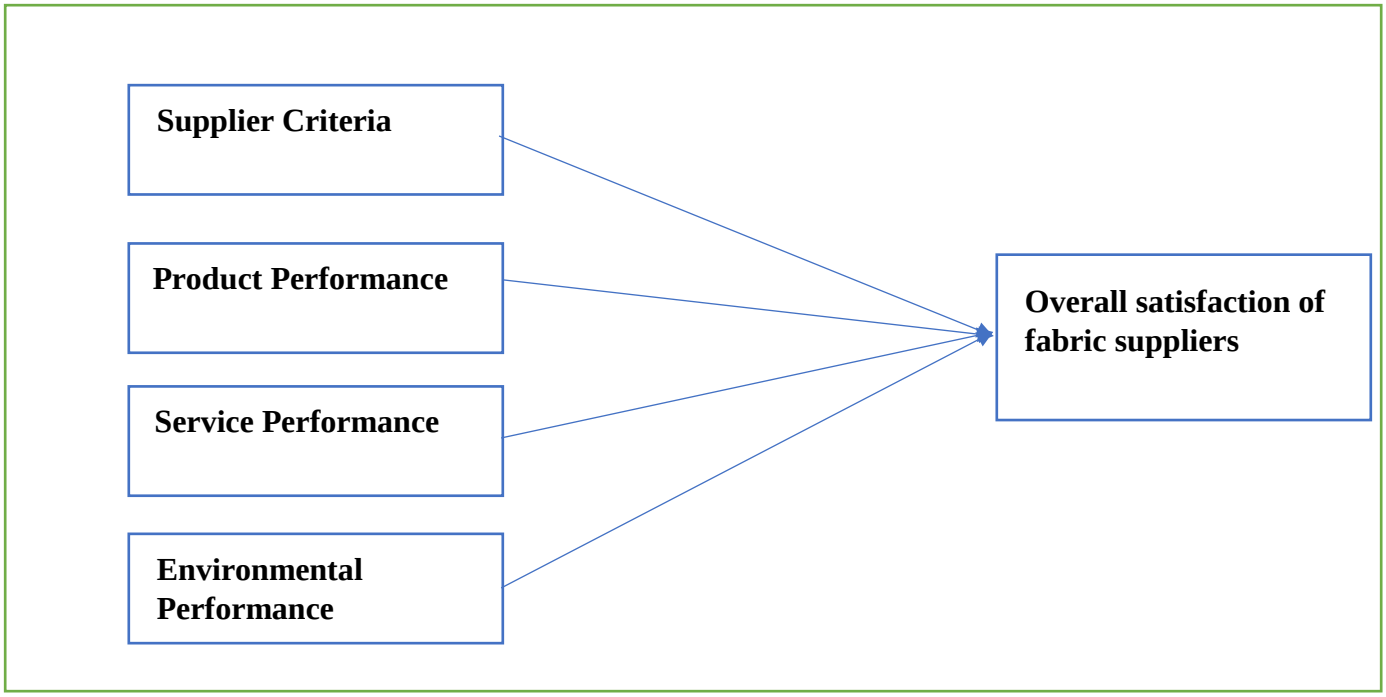

Figure 3.1-Conceptual Framework of the Study

3.4 Identification of variables

The main objective of this research is to identify the factors affecting to **Supplier selection for fabric sourcing in large scale apparel companies in Sri Lanka**. According to that topic author identified particular dependent and independent variables.

3.4.1 Dependent variable

Overall Satisfaction of existing fabric suppliers in large scale apparel industry in Sri Lanka is identified as the dependent variable. Satisfaction is measured as an objective in this research and also the impact on the dependent variable i.e. Overall satisfaction with the changes in independent variables will also be analyzed.

3.4.2 Independent variables

Factors have been identified through the intensive literature review. Net price is one of the most crucial factors when selecting a supplier in any industry. Further description is available in the Chapter 02- Literature Review. A brief description for each factor is shown in the below,

Supplier Criteria: Under supplier criteria there are 11 sub factors, which can be named as Performance history, Degree of collaboration with supplier, Financial position, Communication system, Geographical location, Management approach, Inventory capability, Industry knowledge. These factors measure the strength of the supplier in industry.

Service performance: Under service performance there can be seen 6 sub factors which are Delivery lead time, On time delivery, Responsiveness to customer needs, Warranty claims, Willingness to continuously improve the product and process, Transportation cost. These factors can be used to measure the service level of the suppliers.

Product performance: In product performance there can be seen 8 sub factors which are Presence of certification, Product price, Product quality, Product quantity, Product availability, Reliability, Customization according to requirement and Technical abilities. Using these factors product strength and accurate of the product can be measured.

Environmental criteria: Under environmental criteria there are Environmental friendliness, Pollution reduction capabilities, Clean technology availability and Trade regulations. Using these factors environmental awareness of the supplier can be measured.

3.4.3 Independent Variables: Demographics

Demographics refer to quantifiable statistical attributes of a given population. In this research they are of the sample of respondents from which the data were collected. Following demographic factors are used in this study

I. Respondents Position and Experience within the Organization
II. Respondents procurement department overview
III. Current supplier relationship type
IV. Supplier identification method

3.5 Questionnaire Design

In order to collect the primary data required for the study, a survey questionnaire was constructed. There are six factors have been identified as the factors affecting to supplier selection in large scale apparel industry. 29 items were constructed among these 8 factors. Properly structured questions were included in the questionnaire asking the respondents to select an answer from a set of responses. Questionnaire was developed in English language and simple wording was used so that each respondent would be able to answer.

Questionnaire consists of three segments which are as follows and the questionnaire is presented in Appendix

Section 01

Section 01 of the questionnaire is related to the respondent's demographic data. This segment was observed these factors for instance respondents‟ position within the Organization, respondents‟ industry category, Current supplier relationship type, Supplier identification method.

Section 02

This part of the questionnaire consists of the questions regarding the factors that affect when selection a fabric supplier in large scale apparel industry. Questionnaires were constructed among these four factors. Each factor has been further divided into 29 latent variables since single question might lead to the weird answers. Thus, multi-dimensional questions were constructed to get the reasonable response to the questions overall.

Section 03

Third and final segment relates to the overall satisfaction of existing fabric suppliers. This segment also provides a small idea about methods of supplier evaluation methods and adaptation of these methods with respect to the large-scale apparel industry in Sri Lanka.

3.6 Measurement

Different types of scaling methods were applied in measuring different questions in the questionnaire. Nominal scaling method was used in the screener question where a set of two responses were given to the respondent to choose from, namely 'Yes' and 'No'. Similarly, questions on demographic data were given a particular set of responses according to the question. Some questions in Segment 01 were used nominal scaling method while others were used interval scaling method. Respondents were asked to select the most appropriate response for them in respect of each enquiry.

Table 3.1-Nominal Scaling Method Used Questions

Question	Responses
Identification of supplier in first place	Search the internet Search among current suppliers Third party consultants Word-of-mouth propaganda Other
Supplier evaluation method	Analytic Hierarchy Process ANP TOPIS Total cost Other

For the last question in the first segment of the questionnaire which are related to perception of long-term relationship, Respondents were asked to select the multiple answers according to their preferences.

Table 3.2-Interval Scaling Method Used Question

Question	Response
Average annual procurement cost	0%-20% 20%-40% 40%-60% 60%-80% 80%-100%

Scaling method used in Segment 02 of the questionnaire was Five-Point-Likert-Type-Scale. Liket scale is bipolar scaling method used for decide on either positive or negative feedback. Neutral is marked when the answer is undecided. Most preferred answers will be assigned five while least preferred answer will be one.

Respondents were asked to specify their level of agreement with the statements given in Segment 02 by ticking the most applicable cage designed according to the Likert-Type-Scale which is as follows;

1- Strongly Disagree

2- Somewhat Disagree

3- Neutral

4- Somewhat Agree

5- Strongly Agree

Same scaling method was used in designing the measurement for the sole question in Segment 03 which was relating to the overall satisfaction of existing fabric suppliers in Sri Lanka. Respondents were asked to rate their satisfaction regarding the overall quality of service provided by their fabric suppliers throughout the experience by ticking the most applicable response from the responses given which are as follows;

1- Strongly Dissatisfied

2- Somewhat Dissatisfied

3- Neutral

4- Somewhat Satisfied

5- Strongly Satisfied

3.7 Sample Design

3.7.1 Target Population

Sri Lanka apparel manufacturing industry consists of 300 to 350 apparel manufacturing companies. These companies are divided into two main categories based on the annual income. If the company earn more than 150 million US dollars per year, company recognized as a large-scale apparel manufacturer and if the company earn less than 150 US dollars per year, company categorized as a small & medium scale company. 15 companies were identified as large-scale manufactures and account for 80% of apparel exports in come of Sri Lanka (EDB, 2016). So, when compared to the other industries apparel industry give huge contribution to the Sri Lankan economy. Employees who are dealing with fabric suppliers in above 15 companies were considered as population of this study. This categorization was done by EDB dividing total apparel export manufactures based on annual average income.

3.7.2 Sample

To increase the accuracy of the data, researcher has targeted all 15 large scale apparel companies in Sri Lanka. Questionnaire was distributed to all the employees who are dealing with fabric suppliers in 15 large scale apparel companies in Sri Lanka.

3.8 Data Collection

3.8.1 Primary Data

The research is based on primary data collected through the structured questionnaire which was distributed among 250 respondents in the selected sample. Total numbers of 195 questionnaires were returned back. Ten questionnaires were rejected since those questionnaires had huge amount of missing data. Further, in order to reach out to more respondents while attempting to breach the geographical restriction, a web-based survey was conducted using the same questionnaire. Through web-based questionnaire 18 responses were collected.

3.8.2 Secondary Data

Secondary data were used immensely for the conceptualization of the study. Secondary data was collected from various sources such as scholarly articles, journals, reports and web pages based on fabric supplier selection factors to get a broader idea on the theoretical framework of this particular research.

Apart of that, secondary data were also helpful in areas such as determining the sample size, construction of questionnaire, scaling questions and also in analyzing data.

3.8.3 Reliability and Validity

Prior to make decisions based on the data, the pilot survey was conducted to check the validity of the data collected. To check and measure the reliability commonly used the value of Cronbach's alpha. Cronbach's alpha is an index of the reliability and is generally used as a measure of reliability of a set of questions in a survey instrument. Alpha co-efficient ranges in value from 0-1 and it may be used to describe the reliability of the factors. Higher score of value indicates the higher reliability. The level of alpha indicates an acceptable level of reliability has usually been 0.6 or higher.

Table 3.3-Cronbach's Alpha Value Table

Cronbach's Alpha	Internal consistency
$\alpha \geq 0.9$	Excellent (High-Stakes testing)
$0.7 \leq \alpha < 0.9$	Good (Low-Stakes testing)
$0.6 \leq \alpha < 0.7$	Acceptable
$0.5 \leq \alpha < 0.6$	Poor
$\alpha < 0.5$	Unacceptable

Source: (George & Mallery, 2003)

Cronbach's alpha can be written as a function of number of test items and the average inter co-relation among the items. Cronbach's alpha can be interpreted as below.

$$\alpha = \frac{N * \bar{C}}{\bar{V} + (N-1) * \bar{C}}$$

Equation 1-Cronbach's alpha

N = Number of items

C-bar is average inter-item covariance among the item

V-bar is equal to average variance.

3.9 Statistical Methods of Data Analysis

Data gathered using the questionnaire survey were fed into SPSS 25.0 (a statistical software tool) in order to generate a comprehensive analysis of the study which is discussed in the next chapter. Following statistical data analysis methods were used in analyzing the data set obtained.

3.9.1 Descriptive Analysis

Descriptive statics is the analytical tool that helps summarize and show the data in a meaningful way. Descriptive statistic is more important since raw data visualization would be very hard and critical. Statistics such as frequency distributions, measures of central tendency, measure of spread are used in this analysis. Measures of central tendency (mean, median. mode) and measures of spread (range, absolute deviation, variance, standard deviation.). Univariate analysis is commonly used in the descriptive stage of the research. For data presenting tables and graphs were used.

3.9.2 Factor Analysis

This is a statistical tool which is used to find factors among observed variables. Typically, when the number of variables is high, factor analysis is performed to reduce the number of variables in the factor group. Variables with similar characteristics are grouped under one factor. Factor analysis can produce a small number of factors from a large number of variables, explaining the variance observed in the largest number of variables. Multi-dimensional variables have been analyzed in this factor analysis. There are few basic steps.

• Step 1: Selecting and Measuring a set of variables in a given domain

• Step 2: Factor Extraction

• Step 3: Factor Rotation to increase interpretability

• Step 4: Compute values for each factor and measure the reliability for each factor

There are two types of factor analysis are available which are exploratory factor analysis and confirmatory factor analysis. In this study exploratory factor analysis has been carried out. Exploratory factor analysis is a statistical method used to uncover the underlying structure of comparatively large set of variables. Exploratory factor analysis is a method within the factor analysis whose deceiving goal is to identify the underlying relationships between measured variables (Norris, Megan, Lecavalier, & Luc, 2009). It commonly used by studies when developing a scale and serves to recognize set of latent constructs underlying the battery of measured variables (Faiber, Leandre, Wegener, Duane, & MarCallum, 1999).

Factor analysis can provide many advantages. The reduction in the number of variables and the identification of the relevant variables of the group can be given as an example of the advantages in the factorial analysis. The basic step of factor analysis is to generate a correlation matrix for all the variables and, secondly, to extract the factors from the correlation matrix according to the relative efficiency of the

variables. Third, factor rotation is done to maximize the relationship between the variables. Finally, calculate the value of each factor.

Descriptive statistics, Bartlett's & Kaiser-Meyer-Olkin (KMO) test, Communalities, Total Variance, and Rotated Component Matrix is computed and analyzed using SPSS 25.0 software. The Bartlett's test compares the observed correlation matrix to the identity matrix. In other words, it checks if there is a particular redundancy between the variables that can be able to summarize with a small number of factors. If the variables are perfectly correlated, only one factor is sufficient.

The Bartlett's test checks if the observed correlation matrix R= (rij) (p x p) deviates significantly from the identity matrix.

Ho: Correlation matrix is an identity matrix.

H1: Correlation matrix is not an identity matrix.

The Bartlett's test statistic indicates to what extent deviate from the reference situation

|R| = 1. It uses the following formula.

$$\boldsymbol{X^2} = -\left(n - 1 - \frac{2p + 5}{6}\right) \times \ln |R|$$

Equation 2-Bartlett's test statistic

The KMO index compares the values of correlations between variables. The overall KMO index is computed as follows.

$$\frac{\sum_{\boldsymbol{i}} \sum_{\boldsymbol{j}\neq} \left(\boldsymbol{r^2}\right)}{\sum_{\boldsymbol{i}} \sum_{\boldsymbol{j}\neq} \left(\boldsymbol{r^2}\right) + \sum_{\boldsymbol{j}\neq} \left(\boldsymbol{r^2}\right)}$$

Equation 3-KMO index

KMO value measured the sampling adequacy. Normally KMO should be greater than 0.5 is to accept the factor analysis. Higher KMO values are good because higher correlations between pairs of variables. 0.5 is barely accepted value. Value between 0.7-0.8 is in acceptable level. Value of above 0.9 is superb.

Proportion of variance affected for common factors of a variable can be identified through Communalities. Communality scores range from 0 to 1. Value one means common factors can explain all the variables. Value zero means common factors can't explain any variance.

Total variance explained in the initial solution table. Eigenvalue is the total variance described by each factor. Eigenvalues that is less than one does not have enough total variance explained to represent a unique factor. Eigen values that are less than one is excluded from the analysis.

3.9.3 Chi-square Test of Independence

Chi-square test is conducted in order to determine whether there is a significant association between two categorical variables in a given population. Data collected from the questionnaire survey in this study are of data yielded in categorical manner which implies that Chi-square test of independence is viable test for this particular survey.

The first step of Chi-square test procedure is to state the hypotheses. In order test the hypothesis, first, an alternative hypothesis and a null hypothesis must be constructed.

Ha: alternative hypothesis state dependent; dependency exists between two variables

Hb: null hypothesis state independent; dependency does not exist between two variables

Once hypotheses are constructed, the next step involves testing of hypotheses using Chi-square test for independence using sample data available. This particular test concludes whether there is a significant relationship between the two variables in the particular hypothesis or not. It is important to state a significance level for this test beforehand which according to most researchers, is usually 0.5. Same significance level has been used in this study when conducting the Chi-square test. Chi-square random variable (X2) is defined by the equation below.

$$\boldsymbol{X^2} = \sum \left(\frac{(\boldsymbol{O\gamma\varepsilon - E\gamma\varepsilon})^{\boldsymbol{2}}}{\boldsymbol{E\gamma\varepsilon}}\right)$$

Equation 4-Chi-square random variable

X2 = Chi-square random variable

Or,c = the observed frequency count at level r of Variable A and level c of Variable B

Er,c = the expected frequency count at level r of Variable A and level c of Variable B

Significant variables can be identified by analyzing the results of Chi-square test of independence. These significant variables can be used to further analysis.

3.10 Chapter summary

Under the research methodology the has discussed about the methods that have used to achieve research objectives. In the sample design explained about the population of the research study and under data collection methods that have used to collect data have been described. Furthermore, how to identify the significant supplier evaluation criteria, what is factor analysis, how to perform the factor analysis and how to conduct a hypothesis testing using chi square test were analyzed in this chapter

CHAPTER 04: DATA ANALYSIS

4.1 Introduction to the Chapter

In this chapter describes results of the data analysis. Data collected through the questionnaire survey were fed into SPSS 25.0 (a statistical software tool) in order to generate a comprehensive analysis of the study which is discussed in this chapter. This chapter mainly consists with descriptive statistics and inferential statistics. Under inferential statistics factor analysis, reliability analysis and hypothesis testing has been done. Descriptive statistics used to represent analyzed data in a meaningful way and Factor analysis is used to find factors among observed variables. There are number of variables consist in the study. Therefore, the most appropriate method to reduce number of variables is Factor analysis. Since factor analysis can be used to reduce number of variables by grouping variables with similar characteristics together. Reduced factors used for further analysis.

4.2 Descriptive Statistics

In this research descriptive statistics has been used to describe, show and summarize raw data in a meaningful way, which might emerge patterns from the raw data. Descriptive statistics are very crucial since presenting raw data are hard to visualize. In this study the author used different type of methods to summarize data such as tabulated description (tables), graphical description (graphs and charts), and statistical commentary (discussion of the results). Typically, there are two types of statistics are used to describe data. They are measures of central tendency (mean, median, and mode) and measures of spread (range, absolute deviation, variance and standard deviation).

4.2.1 Demographic Profile of the Respondent

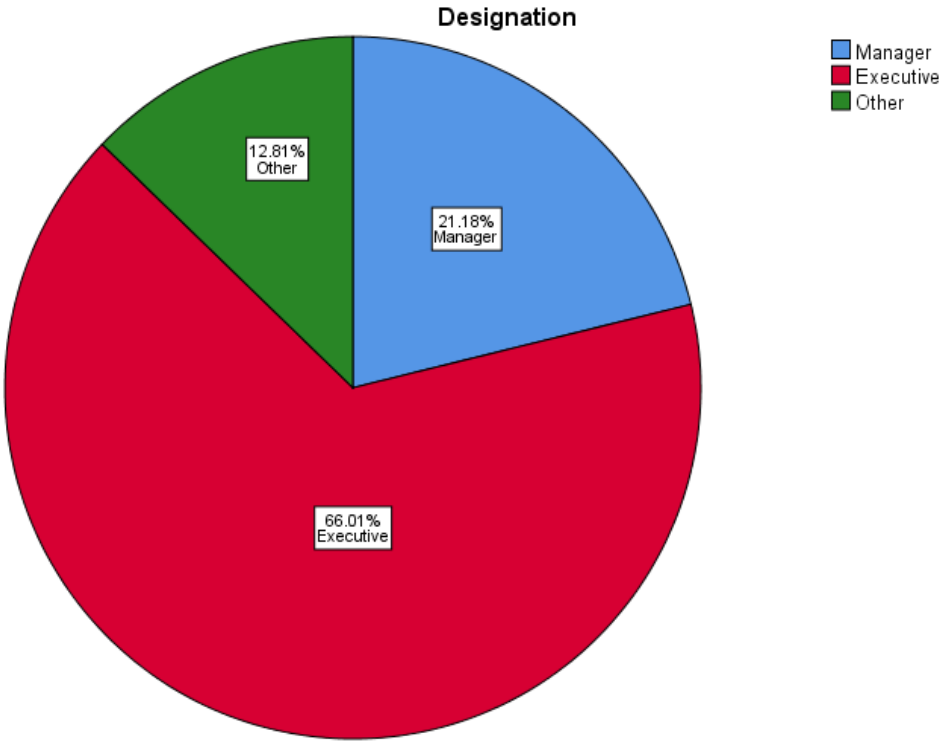

Figure 4.1-Profile of Respondents' Position within the Organization

According to figure 4.1 majority of the respondents in this study are executives which counts 134. It illustrates 66% of the total respondents. There are 43 managers and 26 other employees who give responses respectively. Managers represent 21.2% while other employees represent 12.8% accordingly.

Table 4.1-Profile of Respondents' Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below 1 year	53	26.1	26.1	26.1
	Between 1 and 2 years	81	39.9	39.9	66.0
	Between 2 and 3 years	35	17.2	17.2	83.3
	More than 3 years	34	16.7	16.7	100.0
	Total	203	100.0	100.0	

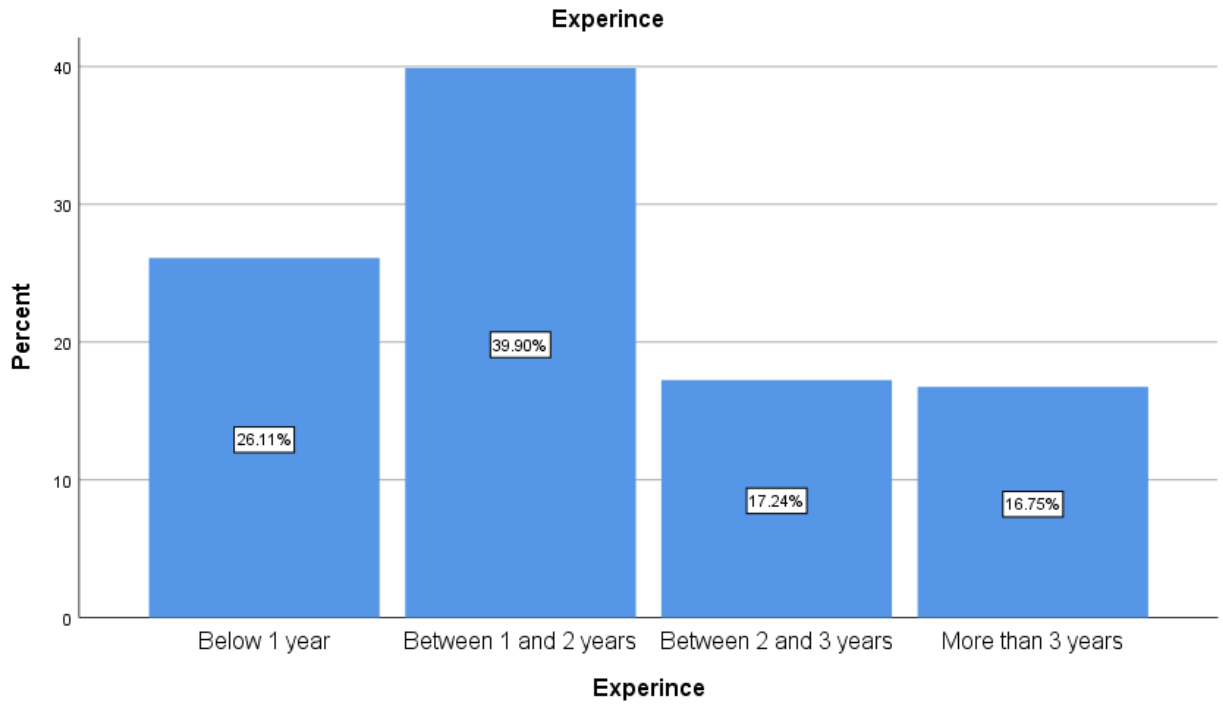

Figure 4.2-Profile of Respondents' Experience

According to Table 4.1 majorities are in between 1 to 2-year experience category. It indicates 39.9% from total sample. Second highest numbers of respondents are from below 1-year category and it denotes

26.1%. Main reason behind that is most of the respondents are junior or senior executives. So, they don't have much experience in this area. Third largest respondents are from between 2 and 3-year category which consists of 17.2% from total population. Lowest respondents are from more than 3-year group which gives 16.7% out of all.

Table 4.2-Profile of Average annual procurement cost

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0%-20%	6	3.0	3.0	3.0
	21%-40%	17	8.4	8.4	11.3
	41%-60%	174	85.7	85.7	97.0
	81%-100%	6	3.0	3.0	100.0
	Total	203	100.0	100.0	

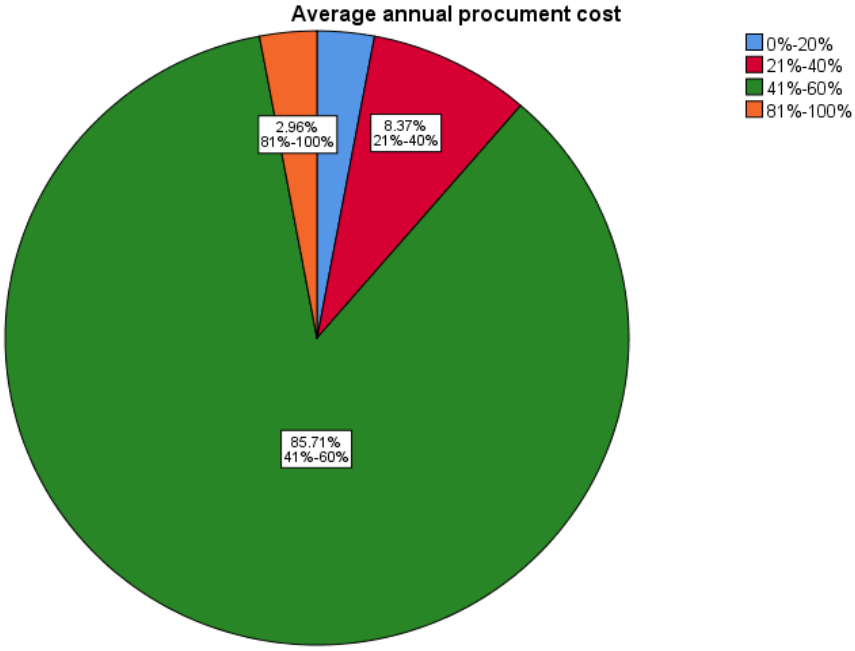

Figure 4.3-Profile of Average annual procurement cost

According to the table 4.5 73.3% of company's procurement cost lies between 40%-60% of annual cost which is very significant to select best supplier in order to reduce the cost.

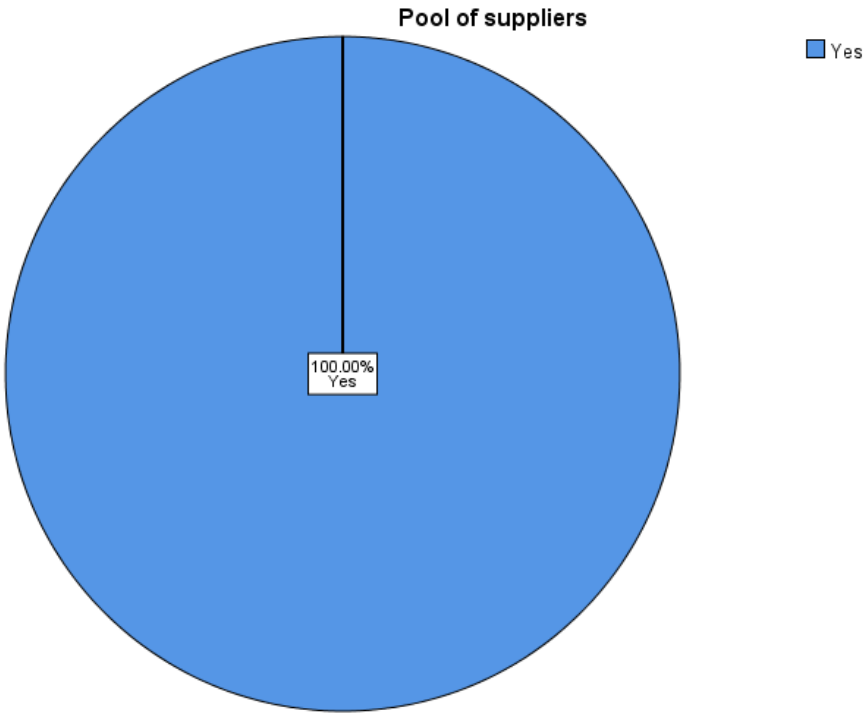

Figure 4.4-Profile of supplier pooling

According to figure 4.4 all of the large-scale apparel companies have pool of suppliers. Reason behind that is these companies are the giants in this industry so to keep that momentum they need lot of suppliers.

Table 4.3-Profile of significant of the supplier selection process

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	197	97.0	97.0	97.0
	No	6	3.0	3.0	100.0
	Total	203	100.0	100.0	

In Table 4.3 importance and the significant of supplier selection significant was analyzed. According to the table 4.3, 97% of the responders were answered as Yes. That indicates supplier selection process is very crucial activity in large-scale apparel industry.

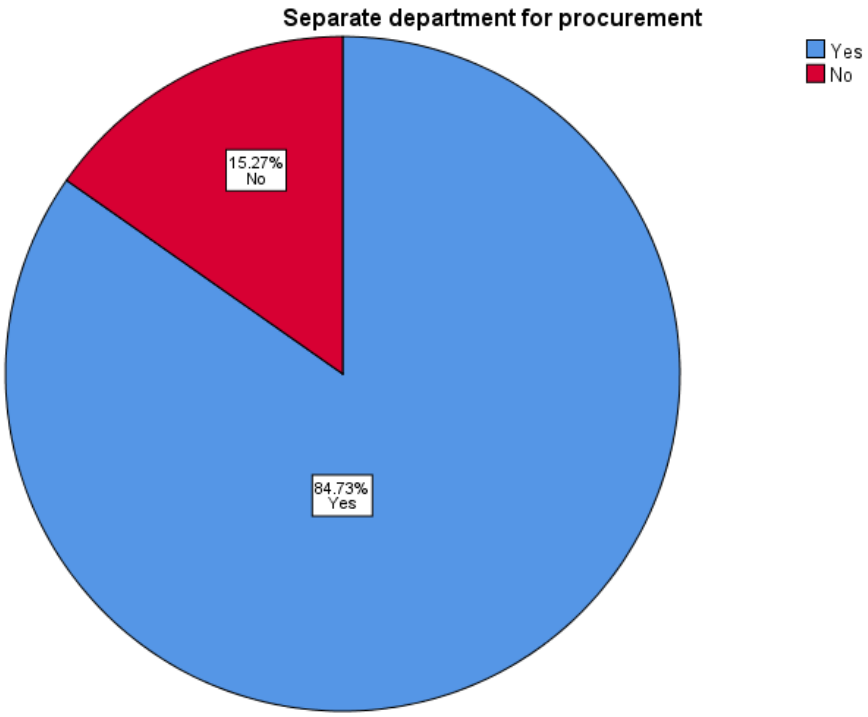

Figure 4.5-Profile of availability of separate department for procurement

According to the table 4.3, 73.3% of companies have separate department which is responsible of procurement and in other 15.27% have different department for procurement.

Table 4.4-Profile of fabric suppliers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-10	49	24.1	24.1	24.1
	11-20	49	24.1	24.1	48.3
	21-50	55	27.1	27.1	75.4
	More than 50	50	24.6	24.6	100.0
	Total	203	100.0	100.0	

According to table 4.4 out of all companies' majorities have 21-50 fabric suppliers which is 27.1% and 24.6% have more than 50 fabric suppliers.

Table 4.5-Profile of supplier identification methods

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Search the internet	43	21.2	21.2	21.2
	Third party consultants	40	19.7	19.7	40.9
	Word-of-mouth propaganda	34	16.7	16.7	57.6
	Search among current suppliers	48	23.6	23.6	81.3
	Other	38	18.7	18.7	100.0
	Total	203	100.0	100.0	

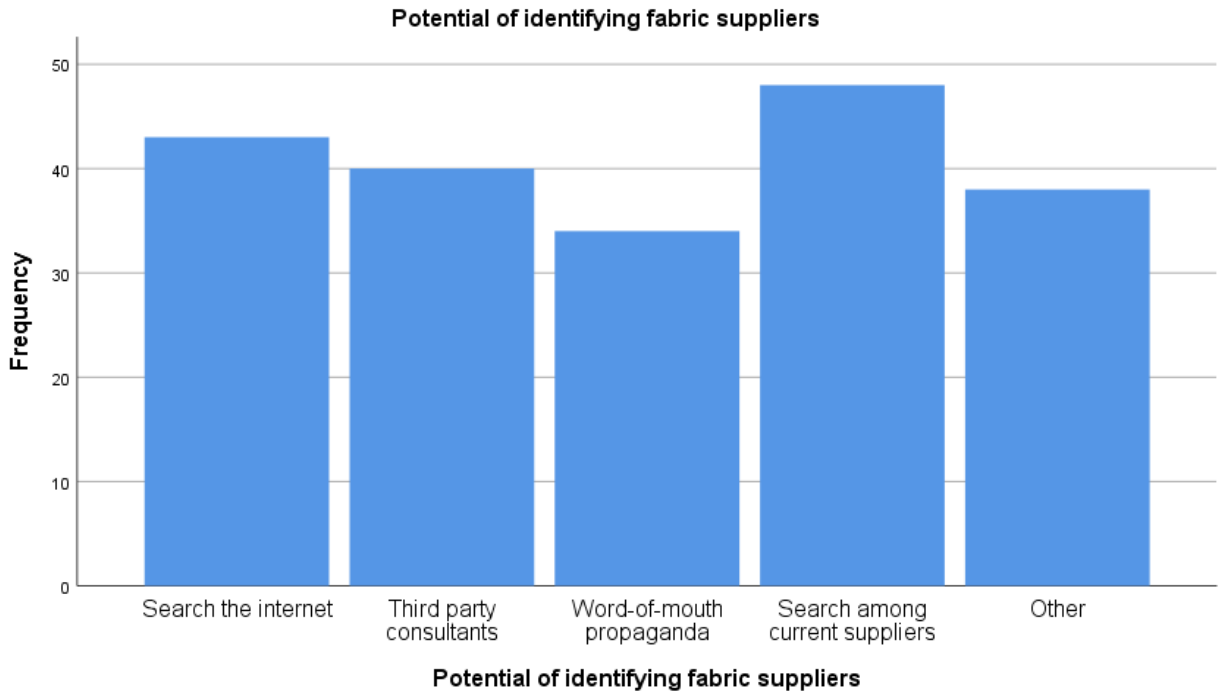

Figure 4.6-Profile of supplier identification methods

Before doing the study it's important to get a solid idea about the methods that has been used for supplier identification in large-scale apparel industry in Sri Lanka. So According to the responds 23.6% of companies select supplier based on searching among current suppliers. 16.7% of companies identified their supplier based on word of mouth and that is the lowest respond rate among all methods.

4.3 Factor Analysis

Factor analysis is a statistical tool is used to find factors among observed variables. Usually factor analysis is carried out when availability of number of variables. By factor analysis, variables which have similar characteristics are grouped into one factor. In this study factor analysis is used to determine factors affecting to supplier selection for fabric in large scale apparel industry.

Table 4.6-Descriptive Statistics

	N	Mean	Std. Deviation
Presence of certification or other documentation	203	3.67	.799
Product price	203	3.94	.683
Trade regulations	203	3.65	.902
Reliability	203	3.19	.927
Product quality	203	3.16	.911
Product quantity	203	3.72	.822
Product availability	203	3.81	.817
Performance history	203	3.35	.919
Communication system	203	3.30	.955
Degree of collaboration with supplier	203	3.56	.906
Financial position	203	3.69	.870
Geographical location	203	3.57	.861
Customization according to requirement	203	3.63	.742
Environmental Friendliness	203	3.80	.796

Pollution reduction capabilities	203	3.73	.803
Clean technology availability	203	4.04	.804
Technical abilities	203	3.30	.965
Delivery Lead time	203	3.55	.746
On time delivery	203	3.82	.743
Transportation costs	203	3.89	.789
Reputation	203	3.76	.921
Similar management approach	203	3.71	.890
Inventory Capability	203	3.63	.836
Industry knowledge	203	4.00	.873
Responsiveness to customer needs	203	3.99	.823
Willingness to continuously improve the product and process	203	3.37	1.028
Quality of relationship with supplier	203	3.64	.962
Warranties and claim policies	203	3.36	1.012
Supplier quality system	203	3.90	.829

Table of descriptive statistics is the first output of the factor analysis which helps to investigate the all variables. Typically mean value, standard deviation (S.D.), and number of respondents (N) are tested in this study. According to the table 4.6 product price, industry knowledge, responsiveness, supplier quality system and clean technology availability can be considered as most vital factors.

Table 4.7-KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.939**
Bartlett's Test of Sphericity	Approx. Chi-Square	4227.707
	df	406
	Sig.	**.000**

Kasier – Mayer- Olken (KMO) measures is lie between 0 and 1. For KMO statistics, value should be greater than 0.6 and to be in the range of acceptance. Bartlett's test measures the null hypothesis. If significance value less than 0.05, factor analysis can be continued. As KMO test statistic is greater than 0.6, it can be concluded that sample is adequate. According to the table 4.8 value of Kaiser-Meyer-Olkin is 0.939. The KMO value of this sample exceeds the recommended value of 0.5. Therefore, factor analysis can proceed further.

Following hypothesis has been checked during Bartlett's test,

Ho: Correlation matrix is an identity matrix.

H1: Correlation matrix is not an identity matrix.

According to the Table 4.7 p-value of the Bartlett's test is 0.000, null hypothesis is not accepted. It can be concluded that, correlation matrix is not an identity among variables used in factor analysis matrix which further supports the strength of the relationship

Table 4.8-Communalities

	Extraction
Presence of certification or other documentation	.564
Product price	.524
Trade regulations	.574
Product quality	.684
Product quantity	.622
Performance history	.591

Product availability	.533
Reliability	.669
Degree of collaboration with supplier	.691
Financial position	.680
Communication system	.688
Customization according to requirement	.439
Environmental Friendliness	.658
Pollution reduction capabilities	.591
Geographical location	.560
Technical abilities	.562
Delivery Lead time	.617
On time delivery	.503
Similar management approach	**.813**
Inventory Capability	.661
Industry knowledge	.637
Responsiveness to customer needs	**.725**
Reputation	**.804**
Willingness to continuously improve the product and process	.696
Quality of relationship with supplier	**.785**
Warranties and claim policies	.649
Transportation costs	.584
Clean technology availability	.573
Supplier quality system	.627
Extraction Method: Principal Component Analysis.	

Communalities table shows level of variance that has been accounted to extracted factors through variables. In other words, how much of variance level of each and the variable can be explained by the retain factors after extraction. Over the 80 per cent of the variance in accounted for both variables of reputation and similar management approach. Furthermore, 78.5% and 72.5% of the variance accounted for both variables of Quality of relationship with supplier and Responsiveness to customer needs.

Table 4.9-Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	14.242	49.111	49.111	14.242	**49.111**	49.111	6.301	21.726	21.726
2	1.644	5.670	54.781	1.644	**5.670**	54.781	4.279	14.756	36.483
3	1.319	4.550	59.331	1.319	**4.550**	59.331	4.205	14.500	50.983
4	1.099	3.789	63.120	1.099	**3.789**	**63.120**	3.520	12.137	63.120
5	.956	3.295	66.415						
6	.822	2.833	69.248						
7	.789	2.720	71.968						
8	.715	2.465	74.433						
9	.665	2.292	76.725						
10	.655	2.257	78.983						
11	.622	2.146	81.128						
12	.536	1.847	82.975						
13	.514	1.774	84.749						
14	.484	1.667	86.417						
15	.447	1.541	87.958						
16	.389	1.340	89.298						
17	.367	1.267	90.565						
18	.347	1.197	91.762						

19	.312	1.076	92.838						
20	.286	.985	93.822						
21	.281	.971	94.793						
22	.276	.953	95.746						
23	.246	.850	96.596						
24	.238	.822	97.418						
25	.219	.756	98.173						
26	.170	.586	98.759						
27	.159	.548	99.307						
28	.135	.464	99.771						
29	.066	.229	100.000						
Extraction Method: Principal Component Analysis.									

The table 4.9 showed the eigenvalues related to each linear component. First two main tables show the before and after extraction of the factors, and last 3 columns show the factor rotation values. Before extraction, SPSS has identified 29 components (factors) within the data set. Variance of each linear component is explained by the eigenvalues which are associated with each factor. SPSS output also shows the eigenvalue in terms of the percentage variance explained. The factors which are met the criterion is showed by extraction sum of squared part. SPSS exact all factors with eigenvalue greater than one. According to the table 4.10, there are four factors with eigenvalue greater than one. Total variability of each factor can be found on the percentage of variance of variance column of the extraction sums of squared loading part. Factor 1 explains almost half of the total variance (49.11%). This figure shows that the first few factors explained relatively large amount of variance while other subsequent factors explain only small amount of variance. Factor 2 explains 5.67%, factor 3 explains 4.55% and factor 4 explains 3.78% of total variance. Altogether these four factors explain the 63.12% of total variance.

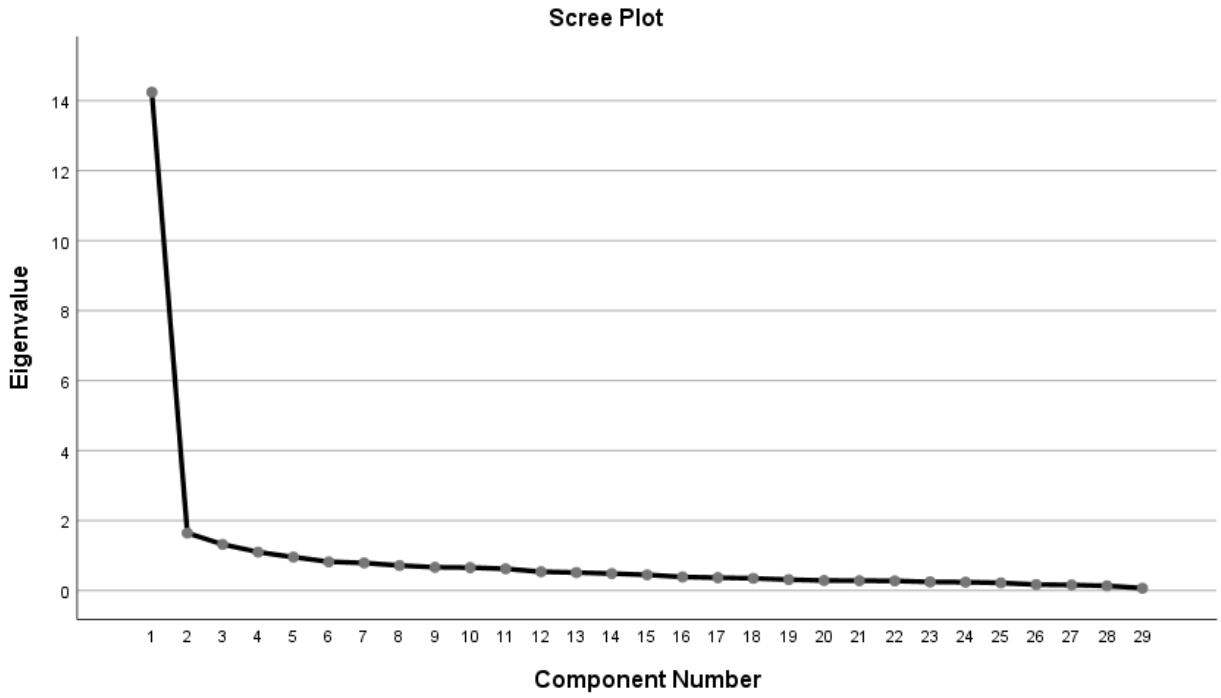

Figure 4.7-Scree Plot

In figure 4.7 it can be seen a sharp turn after 4th Eigen value. So it can be conclude 4 factors are enough to capture the total variance. It further confirmed under the Extraction Sums of Squared Loadings. According to that only four factors have been retained for further analysis.

Table 4.10-Component Matrix

	Component			
	1	2	3	4
Presence of certification or other documentation	.595	.215		-.404
Product price	.716	.101		
Trade regulations	.700	.119	-.110	.240
Product quality	.573	.542	-.124	-.216
Product quantity	.596	.455	.109	.219
Performance history	.707	.107	-.276	

Product availability	.626	.337	.108	.125
Reliability	.650	.400	-.292	
Degree of collaboration with supplier	.760		-.315	-.102
Financial position	.778	-.148	-.185	-.136
Communication system	.731		-.344	-.174
Customization according to requirement	.637	.158		
Environmental Friendliness	.649			.485
Pollution reduction capabilities	.627		.203	.386
Geographical location	.704		-.134	-.213
Technical abilities	.701	.248		
Delivery Lead time	.766	.125	.113	
On time delivery	.614		.316	-.145
Similar management approach	.811	-.335	-.170	-.118
Inventory Capability	.791	-.143		
Industry knowledge	.646	-.394		.255
Responsiveness to customer needs	.714	-.190	.418	
Reputation	.796	-.356	-.191	
Willingness to continuously improve the product and process	.647		.457	-.263
Quality of relationship with supplier	.818	-.319		
Warranties and claim policies	.691		.389	-.104
Transportation costs	.698	-.197	.242	
Clean technology availability	.723			.216
Supplier quality system	.762	-.194		

Extraction Method: Principal Component Analysis.
a. 4 components extracted.

Factor loading of 4- factor model is shown in table 4.10. Results of factor loadings in factor one is all most the same magnitude. It is difficult to identify factor loadings for each component. Thus, factors are rotated to obtain meaningful factors. Factor rotation has been done according to Varimax method. Varimax Rotation is considered for further analysis.

Table 4.11-Rotated Component Matrix

	Component			
	1	2	3	4
Presence of certification or other documentation	.291	.398	**.562**	
Product price	.399	.323	**.425**	.284
Trade regulations	.384	.154	.373	**.513**
Product quality	.127	.181	**.789**	.110
Product quantity		.246	**.536**	.523
Performance history	**.503**		.465	.339
Product availability	.115	.305	**.486**	.437
Reliability	.308		**.681**	.332
Degree of collaboration with supplier	**.678**	.153	.417	.186
Financial position	**.678**	.287	.331	.169
Communication system	**.689**	.141	.427	.106
Customization according to requirement	.260	.309	**.380**	.364
Environmental Friendliness	.350	.119	.165	**.703**
Pollution reduction capabilities	.176	.325	.186	**.648**

Geographical location	**.537**	.303	.413	
Technical abilities	.308	.319	**.550**	.251
Delivery Lead time	.335	**.433**	.407	.390
On time delivery	.279	**.606**	.176	.165
Similar management approach	**.797**	.333	.189	.176
Inventory Capability	**.528**	.499	.242	.273
Industry knowledge	**.597**	.267		.449
Responsiveness to customer needs	.346	**.725**		.271
Reputation	**.806**	.300	.161	.194
Willingness to continuously improve the product and process	.193	**.763**	.257	.104
Quality of relationship with supplier	**.729**	.329	.127	.359
Warranties and claim policies	.185	**.668**	.313	.266
Transportation costs	.423	**.560**	.103	.285
Clean technology availability	.450	.280	.222	**.493**
Supplier quality system	**.565**	.368	.166	.380
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.[a]				
a. Rotation converged in 12 iterations.				

The purpose of factor rotation is to reduce number of factors on which the variable under investigation have high loading. Factor rotation not makes any significant changes. However, interpretation of the analysis may easier. Factors are rotated to obtain meaningful factors. Varimax Rotation method is used in this study. According to the rotated factor loadings, 29 variables can be categorized for extracted four factors as shown in the table 4.11.

According to table 4.11 performance history, Degree of collaboration with supplier, Financial position, Communication system, Geographical location, Similar management approach, Inventory Capability, Industry knowledge, Reputation, Quality of relationship with supplier and Supplier quality system have higher loadings compared to others within the component one. Therefore, factor1 is generated using the following variables.

Factor 1 can be defined as,

Factor 1 = f {Degree of collaboration with supplier, Financial position, Communication system, Geographical location, Similar management approach, Inventory Capability, Industry knowledge, Reputation, Quality of relationship with supplier and Supplier quality system}

To make further interpretation easier, factor one can be named as **Supplier Criteria**.

Delivery Lead time, On time delivery, Responsiveness to customer needs, Willingness to continuously improve the product and process, Transportation costs, Warranties and claim policies have higher loadings compared to other within the component two.

Therefore factor 2 can be define as,

Factor 2 = f {Delivery Lead time, on time delivery, Responsiveness to customer needs, Willingness to continuously improve the product and process, Transportation costs, Warranties and claim policies have higher loadings compared to other within the component two.}.

Factor 2 can be named as **Service Performance**.

Presence of certification or other documentation, Product price, Product quality, Product quantity, Product availability, Reliability, Customization according to requirement and Technical abilities have higher loadings in the component three.

Therefore, factor three can be defined as,

Factor 3 = f {Presence of certification or other documentation, Product price, Product quality, Product quantity, Product availability, Reliability, Customization according to requirement and Technical abilities have higher loadings in the component three.}

Factor 3 can be named as **Product Performance**.

Environmental Friendliness, Pollution reduction capabilities, Trade regulations, and Clean technology availability have higher number of loading in component four. Therefore, factor four can be defined as,

Factor 4 = f {Environmental Friendliness, Pollution reduction capabilities, Trade regulations, and Clean technology}

Factor 4 can be named as **Environmental Criteria**.

Table 4.12-Component Score Coefficient Matrix

	Component			
	1	2	3	4
Presence of certification or other documentation	-.004	.129	**.231**	-.289
Product price	.009	.012	**.087**	-.002
Trade regulations	.001	-.124	.037	**.213**
Product quality	-.094	-.031	**.364**	-.125
Reliability	-.007	-.199	**.262**	.059
Product quantity	-.206	-.013	**.155**	.241
Product availability	-.150	.024	**.125**	.157
Performance history	**.091**	-.171	.114	.055
Communication system	**.211**	-.127	.110	-.157
Degree of collaboration with supplier	**.189**	-.131	.089	-.095
Financial position	**.175**	-.035	.030	-.116
Geographical location	**.113**	.008	.102	-.164
Customization according to requirement	-.059	.023	**.065**	.094
Environmental Friendliness	-.018	-.148	-.101	**.407**
Pollution reduction capabilities	-.131	.022	-.084	**.356**

Clean technology availability	.026	-.039	-.062	**.191**
Technical abilities	-.039	.019	**.171**	-.033
Delivery Lead time	-.060	**.075**	.051	.072
On time delivery	-.051	**.262**	-.044	-.073
Transportation costs	.009	**.192**	-.117	.012
Reputation	**.245**	-.038	-.083	-.091
Similar management approach	**.235**	-.016	-.067	-.115
Inventory Capability	**.055**	.118	-.046	-.033
Industry knowledge	**.140**	-.031	-.237	.192
Responsiveness to customer needs	-.055	**.314**	-.137	-.010
Willingness to continuously improve the product and process	-.121	**.378**	.002	-.147
Quality of relationship with supplier	**.178**	-.030	-.126	.048
Warranties and claim policies	-.141	**.285**	.013	-.018
Supplier quality system	**.087**	.019	-.095	.080
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Component Scores.				

Component score coefficients are shown by the table 4.12 According to above table it can be derived factors as follow,

Factor 1 (Supplier Criteria) = 0.211 Communication system + 0.189 Degree of collaboration with supplier + 0.175 Financial position + 0.113 Geographical location + 0.245 Reputation + 0.235 Similar management approach + 0.178 Quality of relationship with supplier + 0.087 Supplier quality system + 0.140 Industry knowledge + 0.055 Inventory Capability + 0.091 Performance history

Factor 2 (Service Performance) = 0.075 Delivery Lead time + 0.262 On time delivery + 0.192 Transportation costs + 0.314 Responsiveness to customer needs + 0.378 Willingness to continuously improve the product and process + 0.285 Warranties and claim policies

Factor 3 (Product Performance) = 0.231 Presence of certification or other documentation + 0.087 Product price + 0.364 Product quality + 0.262 Reliability + 0.171 Technical abilities + 0.155 Product quantity + 0.125 Product availability + 0.065 Customization according to requirement

Factor 4 (Environmental Criteria) = 0.213 Trade regulations + 0.407 Environmental Friendliness + 0.356 Pollution reduction capabilities + 0.191 Clean technology availability

4.4 Reliability Analysis

Cronbach's Alpha is used in statistics to measure the internal consistency/ reliability which is most commonly used to determine the reliability of the scale in a multiple Likert-Scale questionnaire. Higher value of Alpha coefficient is considered as questionnaire being more reliable to collect the primary data associated to the survey. Conventionally, it is established that Cronbach's alpha coefficient requires 0.60 or higher to be reliable.

Table 4.13-Reliability in Full Dataset

Reliability Statistics	
Cronbach's Alpha	N of Items
.935	48

According to the table 4.15 the value of Cronbach's Alpha is 0.935. That illustrates higher Cronbach's Alpha value. Therefore, the reliability of the variables is in superb level since data set can be accepted.

Afterwards reliability analysis has been carried out to check the reliability of extracted four factors.

Table 4.14-Reliability Test for Factor 01(Supplier criteria)

Reliability Statistics	
Cronbach's Alpha	N of Items
.941	11

According to the reliability test statistics, Cronbach's Alpha value is 0.941 meanwhile, Factor 1 (Supplier Criteria) can be considered as a reliable factor.

Table 4.15-Reliability Test for Factor 02 (Service performance)

Reliability Statistics	
Cronbach's Alpha	N of Items
.869	6

According to the table 4.15 it clearly reveals that Cronbach's alpha value is 0.869. That means factor 2 (Service performance) can be considered as reliable a factor.

Table 4.16-Reliability Test for Factor 03 (Product Performance)

Reliability Statistics	
Cronbach's Alpha	N of Items
.868	8

According to the table 4.16 it clearly reveals that Cronbach's alpha value is 0.868. That means factor 3 (Product performance) can be considered as reliable a factor.

Table 4.17-Reliability Test for Factor 04 (Environmental criteria)

Reliability Statistics	
Cronbach's Alpha	N of Items
.788	4

According to the table 4.17 it shows that Cronbach's Alpha value of factor 4 is 0.788. That means factor 4 (Environmental criteria) can be considered as a reliable factor.

Table 4.18-Reliability Test for All Four Extracted Factors

Reliability Statistics	
Cronbach's Alpha	N of Items
.962	29

According to the table 4.18 it clearly reveals that Cronbach's Alpha value of all four extracted factors is 0.962. That means these 29 variables have higher reliability. Therefore, these four factors can be used to the further analysis.

4.5 Hypothesis Test

Hypothesis test has been carried out by using Chi-Square test. It is used to test the independence between two variables. (2-Tailed) or P-Value indicates if there is a statistically significant correlation between two variables. P-values for the research variables have been tested using SPSS software and the results obtained are presented below.

First hypothesis test has been done for extracted four factors with overall suppler satisfaction.

Hypothesis Test for Factor 1(Supplier criteria)

H0= Overall existing fabric supplier satisfaction is independent from factor1 (Supplier criteria)

H1 = Overall existing fabric supplier satisfaction is dependent from factor1 (Supplier criteria)

Table 4.19-Chi-Square Test for Factor 01(Supplier Criteria)

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	356.389[a]	99	**.000**
Likelihood Ratio	288.651	99	.000
Linear-by-Linear Association	129.451	1	.000
N of Valid Cases	203		

According to the above result, it clearly highlighted that 2-tailed or significant value is 0.000, since it cannot accept H0 (0.05>0.000). That means overall supplier satisfaction is dependent from factor 1(Supplier criteria).

Hypothesis Test for Factor 2 (Service performance)

H0 = Overall existing fabric supplier satisfaction is independent from factor2 (Service performance)

H1 = Overall existing fabric supplier satisfaction is dependent from factor 2 (Service performance)

Table 4.20-Chi-Square Test for Factor 02 (Service performance)

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	318.300[a]	57	**.000**
Likelihood Ratio	209.649	57	.000
Linear-by-Linear Association	114.400	1	.000
N of Valid Cases	203		

According to the table 4.20 it clearly shows that 2-tailed or significant value is 0.000, since it cannot accept H0 (0.05>0.000). That means overall supplier satisfaction is dependent from factor 2 (Service performance).

Hypothesis Test for Factor 3 (Product performance)

H0 = Overall existing fabric supplier satisfaction is independent from factor 3 (Product performance)

H1 = Overall existing fabric supplier satisfaction is dependent from factor 3 (Product performance)

Table 4.21-Chi-Square Test for Factor 03 (Product performance)

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	244.520[a]	72	**.000**
Likelihood Ratio	197.481	72	.000
Linear-by-Linear Association	95.089	1	.000
N of Valid Cases	203		

According to the table 4.21 it clearly shows that 2 tailed or significant value is 0.000, since it cannot accept H0 (0.05>0.000). That means overall supplier satisfaction is dependent from factor 3 (Product performance).

Hypothesis Test for Factor 04 (Environmental criteria)

H0 = Overall existing fabric supplier satisfaction is independent from factor 4 ((Environmental criteria).

H1 = Overall existing fabric supplier satisfaction is dependent from factor 4 ((Environmental criteria).

Table 4.22-Chi-Square Test for Factor 4 (Environmental criteria)

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	194.283[a]	36	**.000**
Likelihood Ratio	158.149	36	.000
Linear-by-Linear Association	94.452	1	.000
N of Valid Cases	203		

According to the table 4.22 it clearly shows that 2 tailed or significant value is 0.000, since it cannot accept H0 (0.05>0.000). That means overall supplier satisfaction is dependent from factor 4 (Environmental criteria).

By reviewing the above results, researcher can be identified that all the extracted factors are highly significant over, overall supplier satisfaction under 5% significant levels.

4.6 Chapter summary

This chapter can be summarized, fist the demographic factors were analyzed and identified importance of the conduction research study and the took a solid idea about population considered in the study. After that factor analysis was conducted to reduce the large number of factors to low. After reducing the factors hypothesis testing was conducted to test the independence between dependent variable and independent variables.

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The objective of this chapter is to cover the areas of discussion of research findings, recommendations, contributions and implications of the research findings, limitations of the research, and capability of further research.

5.2 Discussion on Research Findings

At the beginning of the analysis chapter demographic data was analyzed using descriptive statistics. From the results of descriptive statistics, researcher could be able to find some of the characteristics in sample population. According to the results, majority of the respondents were executives in this research. In Sri Lanka majority of procurement staff was in between 1 to 2-year experience range. Most of the company's procurement cost lied between 41%-60% range when compared to the total cost, this implies that procurement is a crucial and very important activity for growth of the company. Furthermore, every company has pool of suppliers, they maintain this kind of pool in order to minimize the risk of the company.

In the last part of the questionnaire, supplier evaluation methods have been asked to get a knowledge about supplier evaluation methods.

Table 5.1- Supplier evaluation methods

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	147	72.4	72.4	72.4
	No	56	27.6	27.6	100.0
	Total	203	100.0	100.0	

According to Table 5.1, out of the 15 companies 72.4% has supplier evaluation methods. Using supplier evaluation methods companies can gain lot of advantages such as they can track performance of the suppliers, easily manage and identify the suitable suppliers. Apart from that they can take more visibility on their suppliers.

Table 5.2-Supplier evaluation methods

		Responses		Percent of Cases
		N	Percent	
Supplier Evaluation Methods[a]	AHP	78	26.0%	53.1%
	ANP	106	35.3%	72.1%
	TOPIS	33	11.0%	22.4%
	Total Cost	44	14.7%	29.9%
	Other	39	13.0%	26.5%
Total		300	100.0%	204.1%
a. Dichotomy group tabulated at value 1.				

This question was a multiple response question which can be selected more than 1 answer. Out of the 300 responses most of the companies used AHP and ANP methods for supplier evaluation which denotes 26% and 35.3%. TOPIS method not used very much which gives lowest percentage as 11%.

Two main objectives were addressed throughout this empirical research. The first objective of this research is to determine the factors affecting to the supplier selection for fabric in large scale apparel industry in Sri Lanka. In order to identify the factors, the structured questionnaire was constructed with 29 latent variables. Because of the large number of variables available in the research, factor analysis was carried out to reduce the number of variables. Four factors were extracted from the results of factor analysis. With the help of the comprehensive literature review these four factors were named for the ease of interpretation. They are “Supplier Criteria”, “Service Performance”, “Product Performance”, and “Environmental Criteria”. According to the research findings these four factors were used for further analysis.

Further hypothesis test has been carried out by using Chi-Square test to find out the significant factors among these four extracted factors. The results were as follows,

Table 5.3-Chi-Square Test Results for Extracted Factors

Factor	Pearson Chi-Square Value	df	Asymp. Sig. (2-sided)
Factor 1 (Supplier criteria)	356.389a	99	**.000**
Factor 2 (Service performance)	318.300a	57	**.000**
Factor 3 (Product performance)	244.520a	72	**.000**
Factor 4 (Environmental criteria)	194.283a	36	**.000**

According to the P value, it clearly reveals that all these four factors are highly significant on large scale apparel fabric supplier selection. Moreover, these four factors can be considered as the main factors affecting to the supplier selection for fabric in large scale apparel industry in Sri Lanka

The second objective of the research is to study the overall existing fabric supplier satisfaction of the large-scale apparel industry in Sri Lanka. Throughout this research this objective also has been tried to accomplish. The following table shows the existing fabric supplier satisfaction levels of large-scale apparel industry in Sri Lanka.

Table 5.4-Overall Supplier Satisfaction Levels

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Dissatisfied	9	4.4	4.4	4.4
	Neutral	45	22.2	22.2	26.6
	Somewhat Satisfied	111	54.7	54.7	81.3
	Strongly Satisfied	38	18.7	18.7	100.0
	Total	203	100.0	100.0	

According to the Table 5.2 it clearly highlights that majority of the apparel companies are somewhat satisfied about their fabric suppliers where it amounts 40.9%. 24.6% of the companies are strongly satisfied their fabric suppliers. Altogether out of 15 large-scale companies 65.5% companies are satisfied with their fabric suppliers. Only 12.3% of companies are dissatisfied towards the services which they were served from fabric suppliers. All these figures highlight that Sri Lankan large-scale apparel industry

and fabric suppliers have considerable understanding about each other. According to the above results it can be justified that main two objectives were clearly accomplished.

5.3 Recommendation

Based on the research finding recommendations for the developed study are,

- These 4 main criteria can be recommended to supplier selection as well as supplier evaluation of any company in large-scale apparel industry in Sri Lanka in order to select appropriate supplier in pool of fabric suppliers.
- These identified and developed criteria can be used other raw materials as well to select and evaluate suppliers more efficiently and accurately.
- The developed supplier selection criteria very accurate and can be used in large-scale apparel industry in Sri Lanka.

5.4 Limitations of the Study

As other research studies, there are certain limitations to this study as well.

- Lack of previous literature in Sri Lankan context and apparel industry context is the main limitation for the study, therefore research was completely redesigned according to the Sri Lankan context.
- These identified criteria were developed by considering general procurement or purchasing aspect of large-scale apparel industry in Sri Lanka.
- During the research time variation of the industry such as technical changes, technological advancement, market conditions, volatility and legal background assumed as constant.
- This study was limited to fabric suppliers in large scale apparel industry in Sri Lanka and it was limited again to Sri Lankan geographical context.
- Some companies have restrictions for providing information. So personally, request for the information and attached cover letter with the email provides trust on confidentiality for their data.

5.5 Future Research

Since there are no researches in similar topics in Sri Lankan context, the research can be carried out for different material wised. And further research can be carried out using medium and small-scale companies as well.

Since the present study examines only one dynamic situation, order changing, it is recommended to consider about other dynamic conditions with future research.

In this research specific regression model was not developed. Therefore, it is expected to develop model through multinomial logistics regression in future research.

5.6 Chapter summary

This chapter summarized all the research findings with the recommendations for procurement professional in apparel industry, apart from that limitations and recommendations were identified which were captured throughout the research study. Furthermore, future research direction was identified to expand these findings in different contexts. Finally, it can be concluded that supplier selection plays a significant role in supply chain management in large scale apparel industry in Sri Lanka.

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ANNEXURE A

Dear Sir/Madam,

I am Thanu Matheesha, a final year undergraduate, following B.Sc. (Hons) in Transport & Logistics in CINEC Maritime Campus. In order to fulfil the requirements for the degree, I am supposed to carry out a research in any of transportation and logistics related fields.

My research study focuses on "**Factors affecting to Supplier selection for fabric sourcing in large scale apparel companies in Sri Lanka**".

One of the main objectives of research is to identify major factors that influencing the supplier selection for fabric sourcing in large scale apparel industry in Sri Lanka. To facilitate the research with primary data, this questionnaire has been intended covering large scale apparel manufacturing companies in Sri Lanka.

I assure that all your responses will be held strictly confidential, be used only for research purposes and your organization will not be identified in the final report.

Thank You.

Thanu Matheesha

Personnel information

Designation ……

Experience in apparel industry ……..

Supplier information

1. Does your company have separate department for procurement?

Yes ☐

No ☐

2. If no, what is the responsible department for procurement?

……

3. What is the company average annual procurement cost? (Percentage with respect to annual total cost)

1) 0%-20% ☐
2) 20%-40% ☐
3) 40%-60% ☐
4) 60%-80% ☐
5) 80%-100% ☐

4. Supplier selection is crucial part of the business process.

Yes ☐

No ☐

5. Does your company have pool of suppliers?

Yes ☐

No ☐

6. How many suppliers are supplying your company at present? Approximately?

1) 1-10 ☐
2) 11-20 ☐
3) 21-50 ☐
4) More than 50 ☐

7. How many out of those suppliers are supplying fabric?

1) 1-10 ☐

2) 11-20 ☐
3) 21-50 ☐
4) More than 50 ☐

8. How do you identify potential suppliers in the first place? (Multiple marking possible.)

1) Search the internet ☐
2) Search among current suppliers ☐
3) Third party consultants ☐
4) Word-of-mouth propaganda ☐
5) Others (Please name them.): ☐

……

9. What kind of relationships do you have with your suppliers?

Long-term relationship	☐
Short-term relationship	☐

10. Would you term the long-term relationships as partnerships?

1) Yes ☐
2) No ☐

Supplier Requirements

11. Please rate each of the following criteria according to their importance for your company, when you are selecting a supplier for fabric sourcing

Criteria	Unimportant	Somewhat unimportant	Neutral	Somewhat Important	Important
1) Communication system					
2) Degree of collaboration with supplier					
3) Delivery lead time					
4) Environment-friendly					
5) Financial position					
6) Geographical location					
7) On-time delivery					
8) Performance history					
9) Product availability					
10) Product price					
11) Product quality					
12) Product quantity					
13) Quality of relationship with supplier					
14) Reliability					
15) Responsiveness to customer needs					
16) Reputation					
17) Similar management approach					
18) Supplier quality system					

19) Technical abilities					
20) Inventory Capability					
21) Customization according to requirement					
22) Transportation costs					
23) Warranties and claim policies					
24) Industry knowledge					
25) Trade regulations					
26) Willingness to continuously improve the product and process					
27) Presence of certification or other documentation					
28) Clean technology availability					
29) Pollution reduction capabilities					

Supplier Evaluation

12.Please rate your overall satisfaction of your current existing fabric suppliers

Description	**Strongly Dissatisfied**	**Somewhat Dissatisfied**	**Neutral**	**Somewhat Satisfied**	**Strongly Satisfied**
Overall satisfaction of existing fabric suppliers					

13. Do you use certain general methods for evaluating your suppliers (Linear Programming, Activity Based Costing, Mathematical Programming, Statistical Analysis, Artificial Intelligence-based methods)?

1) Yes ☐
2) No ☐

If yes please continue with question 14 to 15.

14. Which specific evaluation methods are you applying in your company? (Multiple marking possible.)

1) Analytic Hierarchy Process ☐
2) Total Cost of Ownership ☐
3) Analytical Network Process ☐
4) TOPIS ☐
5) Others (Please name them.): ☐

……

15. Have those methods been customized to fit your company? If yes, what has been changed and why?

1) Yes ☐

……
……

2) No ☐

16. Are you conducting regular continuous supplier performance evaluations for your current supplier base?

1) Yes ☐
2) No ☐

!!Thank you very much for the completion of this questionnaire!!