

**INVESTIGATION OF RAW MATERIAL PROCUREMENT  
MODEL SUITABLE TO SRI LANKAN FASHION  
APPAREL INDUSTRY TO MEET THE CUSTOMER  
EXPECTATION**

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Master of Logistics & Supply Chain Management

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## **ABSTRACT**

For the past decade purchasing department role evolved to a crucial role aligning for overall corporate strategy. With the globalization, organizations have adopted to the complexity of global sourcing. There are conceptual approaches under development towards procuring where the supplier relationships increase from short term to long term.

This thesis investigates an approach that falls in the middle - Namely strategic procurement. The purpose of this thesis was to develop a tool for readymade garment manufacturing companies in Sri Lanka to evaluate characteristics of their raw material procurements. Later this guide towards choosing the right procurement approach, by doing a case study for an existing garment manufacturing process and conducting 30 semi-structured interviews, the thesis contributes in two major ways. First, the theoretical definition of strategic procuring was compared to real-life practice, improving the concept's empirical accuracy.

Second, a theoretical approach (Karljic Matrix) was adopted to develop a framework identifying potential for strategic procuring.

Key words: strategic procuring, purchasing characteristics, buyer supplier relationship, Karljic matrix).

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## **LIST OF ACRONYMS**

RMG – Ready Made Garments

ILO – International Labour Organization

EPZ – Export Processing Zone

SCM – Supply Chain Management

PO – Purchase Order

CM – Category Management

PSM – Procurement Supply Chain Management

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# **1 CHAPTER - INTRODUCTION**

## **1.1. Background of the research**

### **1.1.1 Apparel Industry in Sri Lanka**

After the open economic policies that came into role in the 1979's, Sri Lankan apparel industry has boomed to become the largest industrial sector in the country as well as the main source of foreign exchange earner and creator of employment opportunities by growing to be a major part of the local economy (Fernando,1997). Local apparel industry accounts for about 40% of total gross export revenue whereas 95% of exporting garments are readymade garments. In 2017, the gross export earnings from Textile, wearing apparel and Leather products accounted to Rs Mn 657,314 which is 2.5 times more than the figure at the beginning of the last decade, 2008(Central Bank of Sri Lanka,2018)

After the removal of Multi Fiber Agreements /quota system in 2004, some apparel manufacturing countries were able to increase the export volume to the market while some failed(Kelegama,2005). However, Sri Lanka was able to retain and grow its market share during the last few decades, despite the challenges from other countries such as Bangladesh, Indonesia, etc.

#### **1.1.1.1 Features of apparel Industry (Role of manufacturer)**

The local apparel industry is fully owned by private sector and has successfully exploited opportunities in the international market catering to world class retail brands such as GAP, Marks and Spencer, Nike, Soma, Ralph Lauren, Tommy Hilfiger, Victoria's Secret etc. The industry has well established for above well-known brands and specialized in niche products such as intimates (bra, panties and boxes) for prestigious customer base (Kelegama,2005).

Sri Lankan apparels have got the title "Garments without guilt" for using ethical practices without the use of child labor, forced labor or sweatshops in all its manufacturing facilities all over the island. By regaining the GSP+, local apparel industry could look forward for a prosperous dawn in the near future (Jayamaha & Silva, 2012).

The international brands' main objective is to cater the fast-changing consumer interests by fulfilling their demands as and when the demand arises without getting delayed (Jayamaha & Silva, 2012). The growth of internet marketing and social media has also impacted the apparel industry as new sales channels are emerging the market space is growing day by day (Kapuge & Smith,2007). The apparel manufacturers are in a continuous struggle to produce high quality garments at a short notice and also at a competitive price as new brands and new manufacturers are emerging worldwide (Kelegama,2009). Buyers increasingly looking in to cater fast changing consumer demand, to cater this agile processes in organizations are required. Use of BOT technology and other technical advancements have fueled the concept of speed manufacturing to facilitate fast fashion has become common in the industry (Jayamaha & Silva, 2012). Apparel manufacturers also try to compete on other factors in addition to cost, such as using ethical working practices and facilitating environmental sustainability, but given the economic conditions around the globe, consumers are more into buy a garment that provides a good value for the price they are paying (Kelegama,2009).

The competition for readymade garment manufacturers has risen, India and China are expected to increase their respective global market share (Kelegama,2009). Compared to those countries, Sri Lanka has to struggle as the industry heavily depends on the government and political initiatives (Jayamaha & Silva, 2012).

In comparison to other garment exporting countries, Sri Lanka has an advantage over its wider product base. From fabric to intimates to shirts, local manufacturers mostly maintain a balance of its product portfolio. A conscious effort has been made by the well-established and large RMG industrialists to specialize in high value-added products or ‘‘niche’’ products, namely women’s underwear, in which the country has a comparative advantage (Kelegama,2009). These products have shown exceptional export growth over the past decade. At present, Sri Lanka possesses a better educated and skilled labor force than many other Asian economies which a favorable situation (UNDP, 2006).

Another major competitive strength is that the local apparel industry has already established itself as a reliable manufacturer of quality RMGs with competitive pricing and fit capabilities (Kelegama,2009). Compliance with global labor and environmental standards has further benefited the country as an increasing number of buyers demand that particular standards be met by manufacturing countries related to health, environment, labor, and occupational safety (Kapuge & Smith,2007). This is evidenced as the EU granted Sri Lanka a 20% duty concession for its compliance with international labor standards in 2004. Yet, local government has not been able to “brand” Sri Lanka as an ethical garment producer (Jayamaha & Silva, 2012).

To improve its image the industry must address the real issues that drive negative popular sentiment by improving working conditions at the major firms’ clusters, such as the Export Processing Zone (EPZ) at Katunayake (Kapuge & Smith,2007). This includes increasing security for women workers by enforcing urban council regulations such as boarding houses (Busser, 2005). Additional requirements include building family housing and developing incentives to promote career employment. Moreover, media campaigns to combat the existing negative stereotypes will incentivize the image. The implementation of these solutions would lessen labour shortages and improve the morale of existing employees (Kapuge & Smith,2007). Due to long working hours, monotonous work and the negative social image surrounding the RMG sector textile and garment industry becoming less attractive to both medium skilled and low-skilled workers, especially young women. (Jayamaha & Silva, 2012). The sector is deficient in several areas of “decent work,” as stipulated by the ILO (Busser, 2005). The high concentration of RMG factories in the Western Province, particularly in the EPZ, has led to population congestion and an unhealthy working environment with limited welfare facilities (Kelegama and Wijayasiri, 2004). One of the primary complaints of firm managers is that the productivity of Sri Lankan workers is not only low compared to that of regional competitors, but lower than in firms abroad that employ expatriate Sri Lankans. Low productivity impedes competitiveness and is a significant problem in responding quickly to new orders (Amaleen,2006).

### **1.1.1.2 Fast fashion Impact on Garment manufactures**

Most of time manufactures are struggling to meet the customer demands due to high turnaround time and high production costs, poor backward integration, persistent labor shortages and low worker productivity. Insufficient labor flexibility and government interference in the wage structure also make it difficult for the industry to respond to the challenge of increased international competition. As the government support to the industry is low on some aspects such as contract with foreign buyers and poor marketing strategies to position Sri Lanka in the global apparel manufacturing map, foreign buyers and investors are simply unaware of Sri Lanka's potential to be a supplier of choice to many of them (Kelegama and Wijayasiri, 2004).

Moreover, the lack of accessory industries such as hand embroidery, beading, printing and washing has also become a weakness. Even though the number of skilled workers is high, workers skilled in pattern-making, bra technology, fabric technology and molding are scarce in number. The country's small textile industry does not possess the capacity to supply quality fabric inputs to the RMG sector. Thus, Sri Lanka's RMG industry is heavily dependent on imports of textiles and accessories as 80-90% of fabrics and 70-90% of accessories are imported from countries such as China, Thailand and India. (Kelegama and Wijayasiri, 2004).

## **1.2 Problem Statement/Need for the study**

The RMG industry is progressively moving towards low replenishment procuring and just -in-time procuring due to the fast fashion industry, which switches risk to the Supplier. Catering to the fast fashion requirements, manufacturer have to order small batches of various products with a shorter lead time (the time span between the placing of an order and its delivery) and it requires supplier and distributors to be able to quickly stitch and ship new orders.

The ability to do so requires sophisticated supply chain management. However, the poor backward integration, resulting dependence on imported inputs severely hinder production speed, additional costs and increased lead times.

Sri Lanka 's geographical distance from its major input suppliers lengthens its lead time to an estimated 90-150 days as compared to the ideal lead time of 60 days; lead



time in Sri Lanka has continuously been long compared to that of its competitors (Kelegama and Wijayasiri, 2004). While several factors contribute to the relatively long lead times of Sri Lankan RMG manufactures, raw material procurement plays a crucial role.

Procurement process responsible for sourcing the raw materials, and services which needed for manufacturing. Procurement is a link between an organization and its suppliers. Procurement supply chain management is one of the importance roles in the manufacturing process due to upwards of 60% of the cost of finished goods comes from material and services purchasing.

The Importance of purchasing is more than just the cost of goods purchased. Other important factors are quality of goods, On time delivery which will always have a significant impact on operations and manufacturing.

Current Garment manufacturing companies follow two methods for raw material procurement based on two types of customer requirements. First type of customers places their order with the specified technical package. In this case manufacturers don't have freedom to procure raw material unless with specific supplier base. Second type of customers place their order allowing manufacturers to source suitable raw material from flexible supplier base. Both cases take high lead time to source and import relevant raw material to the manufacture's warehouses. In terms of reducing lead time it is required to approach on procurement strategically.

In this study more, focus on second type of raw material procurement which has authority on material procurement from suitable supplier base. Figure 1 show the typical Bra (ladies intimate) material flow and time line from supplier to the customer.

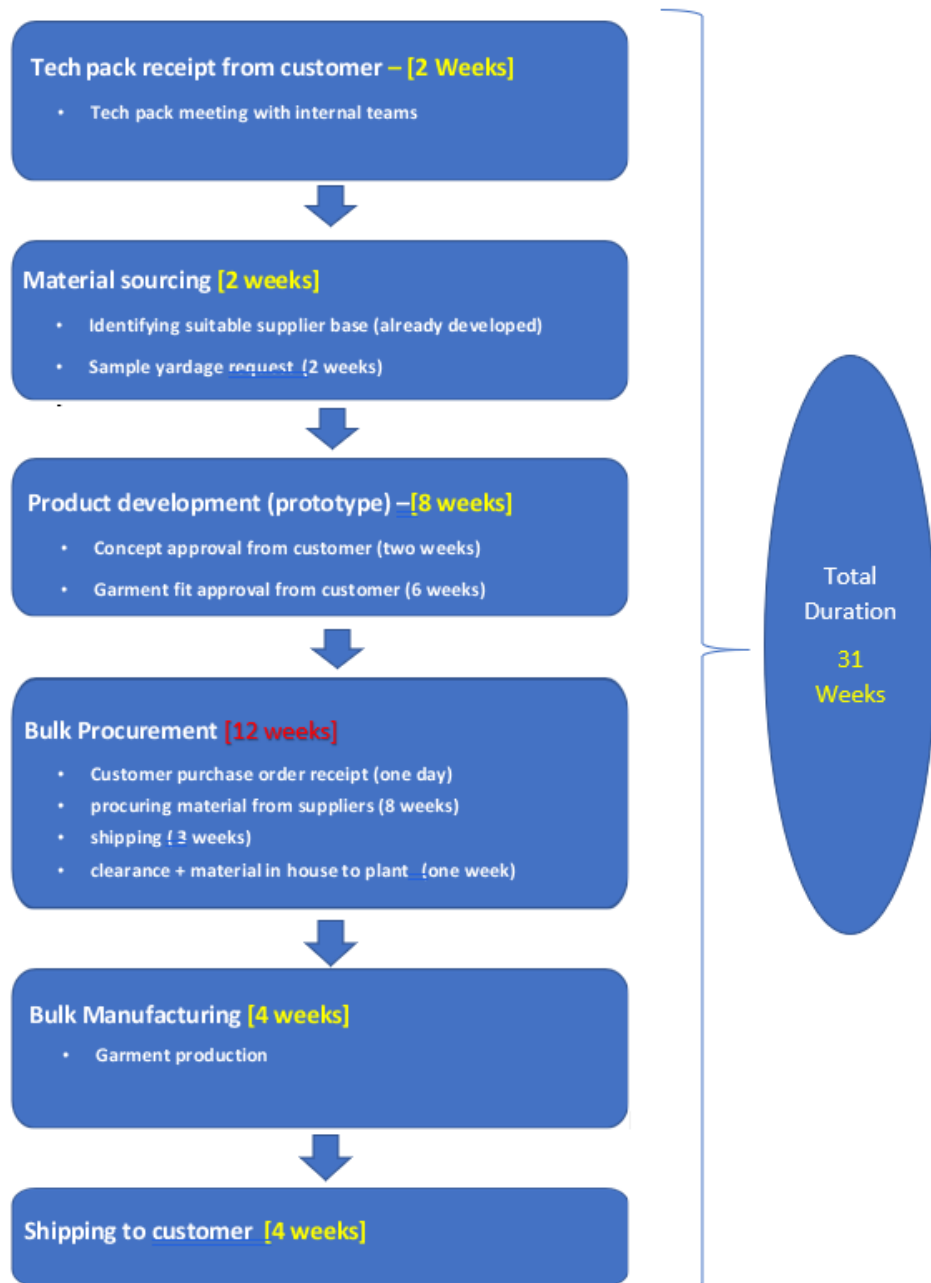
This process starts with the receipt of technical specification or a reference garment from the customer to manufacturer. Initially manufacturer's fabric and development team will have a meeting with the customer to finalize raw material specification. Then Manufacturers fabric team start to source raw materials according the specification. Most of Sri Lankan Garment manufacturers have a selected supplier base. Fabric team request sample yardage of required raw materials from their suppliers. Generally, this

takes around two weeks. Then Manufacturers fabric team will develop a prototype of the garment and will send for the customer for concept approval. Mostly, this take around two weeks. Then customer and manufacturer together work on getting the garment fit approval (approving the garments for standard body measurement of each size, as an example for 34C there are standard models on which garment will be put on and both manufacturer and customer will agree on garment qualitative and quantitative parameter, this will be the reference garment for bulk manufacturing) which usually consume 6 weeks.

Once the garment fit is approved manufacturer can finalize the Bill of Material (BOM) for product and they start sending purchase orders (PO) to the suppliers. Based on the system efficiency for PO generation this usually consumes 2 days. Once the supplier receives the PO they send PO confirmation. Based on the material complexity supplier request their lead times, usually it is 8 weeks. Based on the supplier origination these needs to ship to Sri Lanka which will averagely consume 3 weeks and for material clearance it will consume additional 1 week.

On receipt of fabric, manufacturer starts making the garment which will normally consume 4 weeks and based on the destination the shipping lead time vary and it averagely comes to 4 weeks lead time a shipment from Sri Lanka.

In terms of reducing above process lead time, manufacturer can control only in three areas; product development, bulk procurement and garment manufacturing and rest of areas are out of control from the manufacturer. According to RMG making procedure, raw material purchasing consumes 12 weeks which is the highest lead time and act as a bottleneck for manufacture's process. Thus, it is required to strategically approach on raw material procurement and this study focus on strategically utilize procurement process for shorter lead time.



**Figure 1: Readymade bra manufacturing Process (material flow) in Sri Lanka**

### **1.3 Research Gap**

Currently Sri Lankan RMG industry is moving forward successfully and in 2018, they earned US\$ 5.32 billion from exports, becoming the first industry in the island to cross the US\$ 5 billion mark. Research and innovations of garment manufacturing is one of main key feature of the industry. There are lot of research study has conducted on reducing lead time of manufacturing and reducing time line for product development cycle through concept like lean manufacturing. Supplier selection and evaluation of their performances are another focused research area and score card method is the most popular one. Less number of research studies have carried out on raw material procurement in garment industry. Current raw material procurement process for conventional process such as day today requirement. Thus, it is required to study on raw material procurement with research perspective towards creating a general framework for procurement strategy formulation, present how to create and implement a procurement strategy in Sri Lankan Garment industry.

### **1.4 Research Objectives**

- 1.1.1. Study on raw material procurement characteristics in Garment manufacturing in Sri Lanka
- 1.1.2. Study on Global procurement strategies and models
- 1.1.3. Develop a procurement model suit to Sri Lankan Garment Industry
- 1.1.4. Model validation using Case studies

## **2 CHAPTER - LITERATURE REVIEW**

### **2.1 Procuring Supply Management (PSM)**

#### **2.1.1 Introduction**

Procurement is the process of getting the goods and services required for the company to support relevant business. (Anderson & Narus ,1990). Mainly this includes good and services sourcing and purchasing. Supply chain management (SCM) is the broad range of activities required to plan, control and execute a product's flow, from acquiring raw materials and production through distribution to the final customer, in the most streamlined and cost-effective way possible (Gelderman & Weele, 2002). Thus, procurement supply management can be defined as the activities involve in sourcing raw material and purchasing those based on production specifications.

As the global economy gradually become competitive, retain in the market by keeping profit margin without increasing prices of the product is a major challenge for cooperates (Pagell & Wasserman,2010). Hence companies are focusing on supply chain with product innovation, quality maintenance and faster response times at the lowest costs attainable to stay ahead in the competitive market. The supply chain consists all the activities and steps of material and information flow and transformation from origin to the end customer (Lysons & Farrington,2012). Supply Chain Management (SCM) the integration of these activities and steps and manage those to achieve sustainable competitive advantage (Drake et al ,2013). Average manufacturing company spend around 50% of its sales revenue on procuring material and services to manufacture its final product (Lysons & Farrington,2012). Today's supply chains are experiencing a remodeling from being dignified, uni-dimensional sequences of discrete functions to being dynamic, adventurous and interconnected network to be able to cater the rapidly changing demand patterns and agile business operating model (Drake et al ,2013). Consequently, multinational corporations must capture opportunities and build competitive advantage by globally sourcing their inputs. In congruence with this transformation, procuring has progressively become crucial roles. Following the prompt escalation in globalization, outsourcing and the rapid

development of information technologies, the environment in which procuring resides in more complex (Lysons & Farrington,2012).

### **2.1.2 Importance of Procuring Supply Management**

To achieve business objectives and deliver maximum customer satisfaction, functions such as manufacturing, planning, procurement, inventory management, and logistics are collectively collaborating end-to-end supply chain (Canie & Gelderman,2006). Traditionally, procuring has been a rather generic role within organizations, where theory and practice alike promoted that activities were to be kept in-house (Drake et al ,2013). Along with globalization, where specialization allowed for value chains to be disaggregated and reassembled according to individual capabilities, corporates have been more focused on procuring and allocated more resources. (Van Weele & Van Raaij, 2014).

In the manufacturing process, the percentage of purchases to sales averages 50% (Drake et al ,2013). This means that for every dollar of revenue collected on goods and services sales, more than half goes back to suppliers. It is not difficult to see why purchasing is clearly a major area for cost savings. However, savings come in different forms; the traditional approach is to bargain hard for price reductions (Canie & Gelderman,2006). A newer approach is to build relations with suppliers to jointly pull costs out of the product or service (Drake et al ,2013). Procuring, acting as the liaison between suppliers and engineers, can also help improve product and process designs. For example, companies that involve with supplier's base early, compared to companies that do not involve with suppliers, accomplish an average 20% reduction in materials cost, 20% improvement in material quality, and 20% reduction in product development time (Drake et al ,2013). Development teams that include suppliers as members also report they receive more improvement suggestions from suppliers than teams that do not involve suppliers. Thus, involving suppliers early in the design process is a way purchasing can begin to add new value and contribute to increasing their competitiveness.

Carter and Narasimhan (1996) argue that purchasing must continually recognize its own strengths and market those throughout the organization. Van Weele and

Rozemeijer (1996) demonstrate that the horizontal dimension of business, e.g. tasks and goals, is becoming more important than the vertical dimension, e.g. managers issuing job instructions. They argue that driven by the need for lean organizations with focused efforts and rapid growth of information technology, outsourcing has become a strategic issue relying heavily on the purchasing function's effectiveness as a key success factor. Chadwick (1995) suggests that an evaluation of purchasing effectiveness should include: how much does the purchasing operation cost in practically? How much value does it deliver? Is the function targeted on goals that align with the strategic plan of the organization? What progress is being made towards meeting these goals? Is purchasing accountable for the basic load of the organization? Is the infrastructure being developed to meet the requirements of the organization, by optimizing administration and inventory management? How effective is the employee development plan at increasing the professional competence and standing of the supply's management function?

Past research studies already emphasized that the organizing supply chain resources, structures, responsibilities, and policies more effective than focusing on simple departmental cost savings. Thompson (1996) argues that strategic procurement is a new area for empirical measurement beyond basic monitoring of processes. Carter and Narasimhan (1996) suggest the linkage between purchasing strategy and organizational performance began to be established when organizations began to realize the impact the purchasing function can have on their competitive position, and they gradually shifted the role of purchasing from tactical to strategic. Purchasing personnel must think in terms of the potential strategic implications of their actions and routinely interact with other functional managers to develop coherent and integrated strategies (Chadwick, 1995). Overall it is clear that Carter and Narasimhan's work brings an exciting, as well as superbly presented, aspect to the question of whether procurement is strategic. Spekman et al. (1994) argue that there are fundamental changes in practice of business and that there are significant implications for the procurement/ purchasing profession; indeed, they suggest the purchasing professional should be a key player in nurturing and managing both internal and external relationships. Ferguson et al. (1995) postulate very credibly that purchasing

must continue to demonstrate its ability to positively impact on organization financial effectiveness. An indication of this enhanced reputation and recognition is the higher salaries that are being paid to purchasing professionals.

Supplier relationships are shifting from an adversarial approach to a more cooperative approach with selected suppliers. The activities that the modern purchasing organization must put in place are quite different from just a few years ago. Supplier development, supplier design involvement, the use of full-service suppliers, total cost supplier selection, long-term supplier relationships, strategic cost management, enterprise wide systems (enterprise resource planning, or ERP) and integrated Internet linkages and shared databases are now seen as ways to create new value within the supply chain (Lysons & Farrington,2012). Purchasing behavior is shifting dramatically to support the performance requirements of the new era.

Additionally, alternative ways of categorizing or classifying items and/or suppliers is necessary. Necessities for a competitive purchasing strategy configuration are external resources, location, suppliers network design, purchasing organization (from process and functional perspectives) and standardization and improvement of the purchasing and procurement processes. Additionally, the globalization necessarily affects the purchasing function, forcing it to be global too (Pagell & Wasserman,2010). Van Weele ,2012 defined global purchasing as “the activity for searching and obtaining goods, services and other resources on a possible worldwide scale, to comply with the needs of the company and with a view to continuing and enhancing the current competitive position of the company”. It includes all phases of the purchasing process, starting even before the definition of the specification list, through supplier selection and buying, up to the follow-up and evaluation phase. Moreover, global purchasing management is one of the first steps to define and design a global supply chain (Lysons & Farrington,2012). Category Management To define a category strategy it is advisable to have systematic classifications (Monczka et al,2011) to help defining and visualizing the different categories. One of the most commonly used tools for categorization was developed by Kraljic (1983), who proposed a matrix that classifies items into categories according to their profit impact and supply risk. This matrix has become the standard in models of purchasing categories (Spina et al., 2013). In the



early 90s in the UK new principles of management throughout the supply chain was developed, the so called "Efficient Consumer Response" (ECR). Its best-known process, Category Management (CM) (Monczka et al,2011), is defined as 'a process that involves managing product categories as business units and customizing them on a store-by-store basis to satisfy customer needs' (Lysons & Farrington,2012) and shifted the focus from brand management approach to a category management approach (Ryals and Rogers, 2006). Later, CM was also adapted to categorize purchased items (Monczka et al,2011).

Therefore, this CM can be used as the basic unit of strategic analysis, which measures the competitive improvement on purchasing management (Spina et al., 2013). A differentiated purchasing strategy then involves managing the suppliers within the different categories. According to some authors (Spina et al., 2013), it is considered that there should be a leadership by purchasing managers per category to improve the competitiveness of the company.

### **3 CHAPTER - THEORETICAL FRAMEWORK**

The literature review above highlighted some important factors about procurement supply chain to assure a comprehensive understanding of the theories constituting the base for this the study. Based on the literature this study more focused on the Kraljic Matrix which is used under methodology. The following section will in more detail present Karljic (1983) purchasing portfolio matrix.

#### **3.1 Kraljic Matrix**

In 1983, Peter Kraljic devised a method to segment the supplier base in the article in HBR. In this, the supply items are mapped against two key dimension risk and profitability. This is introduced as the Kraljic Matrix which is one of the most effective ways to deliver accurate supplier segmentation (Anderson & Narus, 1990). In Kraljic portfolio approach to purchasing, the Items are classified by evaluating and positioning them into one of the four quadrants of the two-dimensional portfolio model. Each quadrant depicts different purchasing strategies. Hence the portfolio model can be defined as a tool that uses two or more dimensions to define heterogeneous categories for which different strategic recommendations are provided. Bensaou (1999) and Olsen and Ellram (1997) have developed similar portfolio models based on a two-dimensional framework after the development of Kraljic Matrix. A definite advantage of the Kraljic's (1983) arguments is that, it highlights the importance of constantly re-evaluating and updating the categorization of items purchased, since the demand and supply sequences may change over time. A critique is that the recommendations generated based on the matrix are rather generic and mediocre. This leads to the limitations of purchasing approaches. (Gelderman and Van Weele, 2005).

It is advisable for managers to guard their firms against damages caused due to anomaly in the supply and to deal with progressive technological change and economic growth (Kraljic (1983)). In his seminal paper he called attention to the need for companies to achieve more effective supply management. He claimed that purchasing need to be supply management (Kraljic 1983, p. 109).

When the supply market is complicated, and the importance of purchasing is high, the supply management is relevant Kraljic (1983, p. 111). In the second part of his article

Kraljic (1983) proposes a four-stage approach as a framework for developing supply strategies for single products or product groups.

### 3.1.1 four-stage approach

Phase 1: Classification To determine in which segment of the model fits an article best

Phase 2: Market analysis Determine the bargaining position

Phase 3: Strategic positioning to identify the opportunities

Phase 4: Action plans What to do?

For this article we will use the same line as well.

#### 3.1.1.1 Phase 1: Classification

Kraljic opens his article directly with the core for setting up a long-term strategy for purchasing:

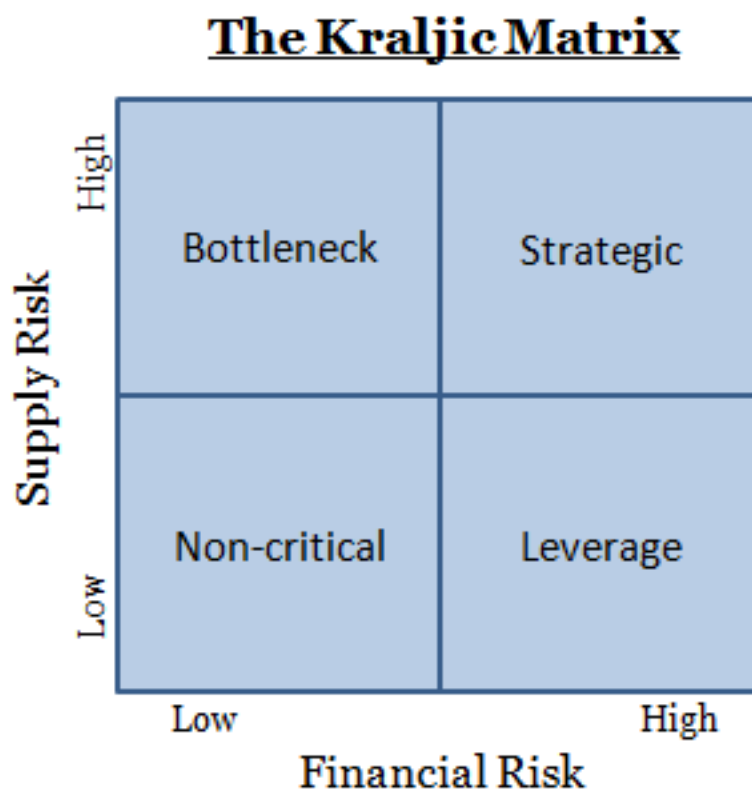


Figure 2 : Quadrants of Karljic Matrix

**Table 1: The different purchasing strategies**

	<b>Non-critical items</b>	<b>Leverage items</b>	<b>Bottleneck items</b>	<b>Strategic items</b>
Procurement focus	purchasing management	materials management	sourcing management	supply management
Time horizon	limited: normally 12 months or less	varied, typical 12 to 24 months	variable, depending on availability versus short term flexibility	up to 10 years determined by long term strategic impact
Key performance indicators	functional efficiency	cost/price and material flow management	cost management and reliable short-term sourcing	long term availability
Items purchased	commodities and some specific materials	mix of commodities and specific materials	mainly specified materials	scarce and/or high value materials
Typical sources	established local suppliers	many suppliers mainly local	global, predominantly new suppliers with new technology	established global suppliers
Supply	abundant	abundant	production based scarcity	natural scarcity
Decision authority	decentralized	mainly decentralized	decentralized but centrally coordinated	centralized

**3.1.1.2 Phase 2: Market Analysis**

For the market analysis we can look at it in supplier capacity, cost breakeven point, volume of purchase, potential cost if not received the delivery or inferior quality products.

✓ **Use of supplier's capacity**

If manufacturer use available capacity with supplier, it will always be a risk to the manufacturer.

✓ **Costs breakeven point.**

A supplier who would operate at a 70% capacity utilization will have to offer a lower price when he operates a capacity utilization of 80%.

✓ **Volume of purchase.**

With economies of scale it is known with the qty purchase price goes down.

✓ **Potential costs in case of no delivery or insufficient quality.**

On boarding a supplier mean taking a risk so it is important we onboard them gradually.

**3.1.1.3 Phase 3: Strategic Positioning**

In the first phase, the company classifies all products it purchases based on profit and supply risks. The company then compares the bargaining power of its suppliers with its own power. Next, the company places the products identified in the first phase as strategic (high income impact and high risk of supply) in a portfolio. Depending on its own strength and the strength of the supply market, ultimately it develops purchasing strategies and action plans. Three general purchasing strategies are recommended (Canie's, & Gelderman2006):

- exploit (in case of buyer dominance)
- balance (in case of a balanced relationship)
- diversify (in case of supplier dominance).

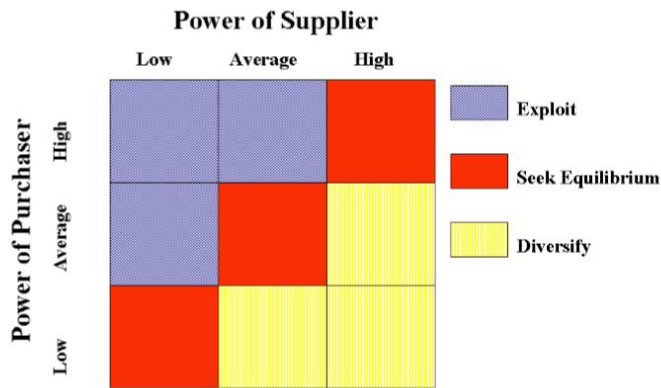


Figure 3. The Purchasing Portfolio Matrix [Kraljic 1983]

### 3.1.1.4 Phase 4: Action Plans

Finally, we know what we want and what we may expect to be able to get. After analyzing this information, we should set up a plan of action. In the table below, possible policies as found in the purchasing portfolio matrix are placed next to each other using aspects like volume, price etc.

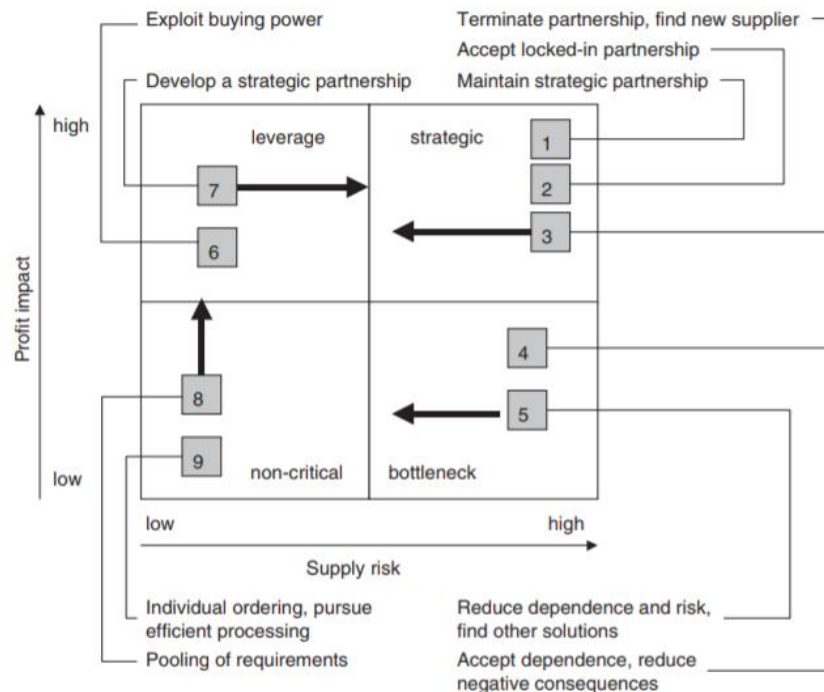


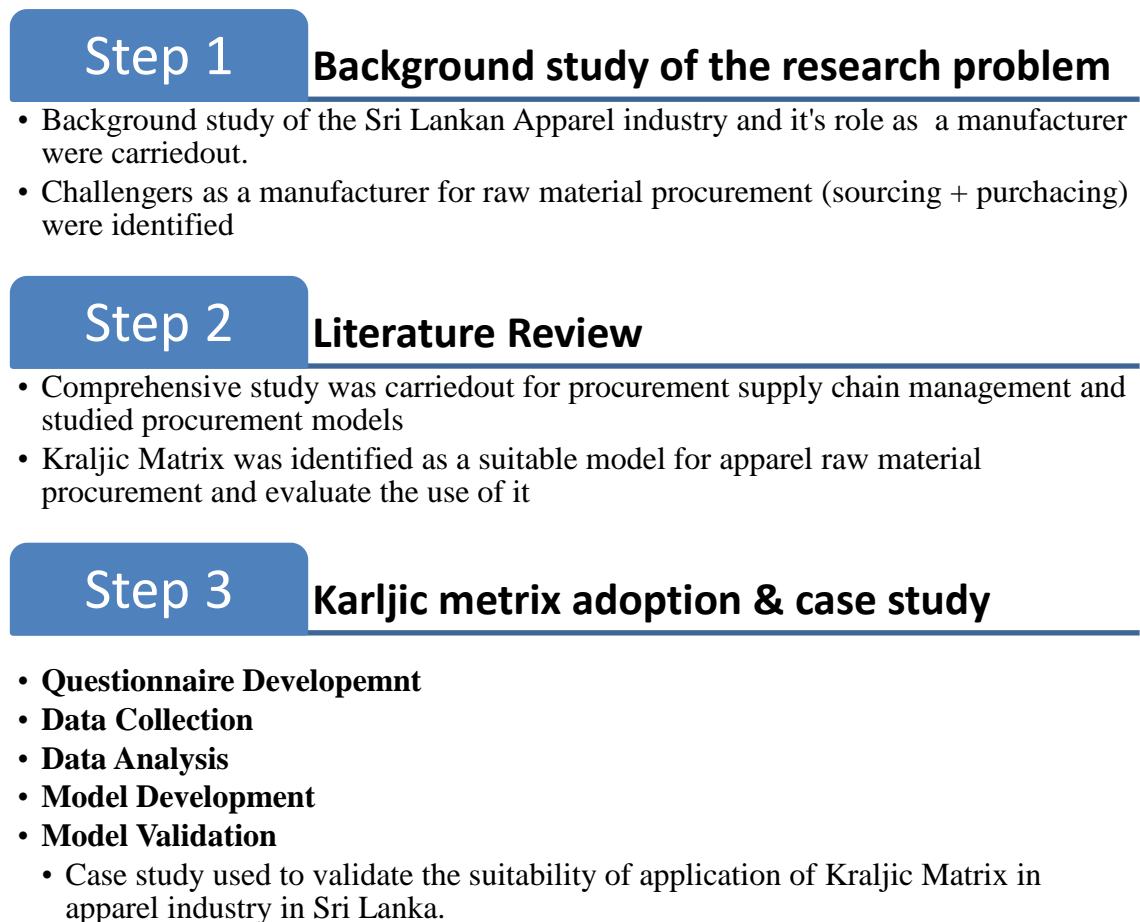
Fig. 1. Overview of purchasing strategies for all portfolio quadrants (modified from Gelderman and Van Weele, 2003, p.

## 4 Chapter Methodology

### 4.1 Introduction

Based on literature review Karljic Matrix was identified as a suitable model to adopt for apparel raw material procurement since its purpose is to help purchasers maximize supply security, reduce cost and lead time, through purchasing power. In doing so, procurement moves from being a transactional activity to a strategic activity.

Following flow chart illustrates the whole methodology adopted for the study

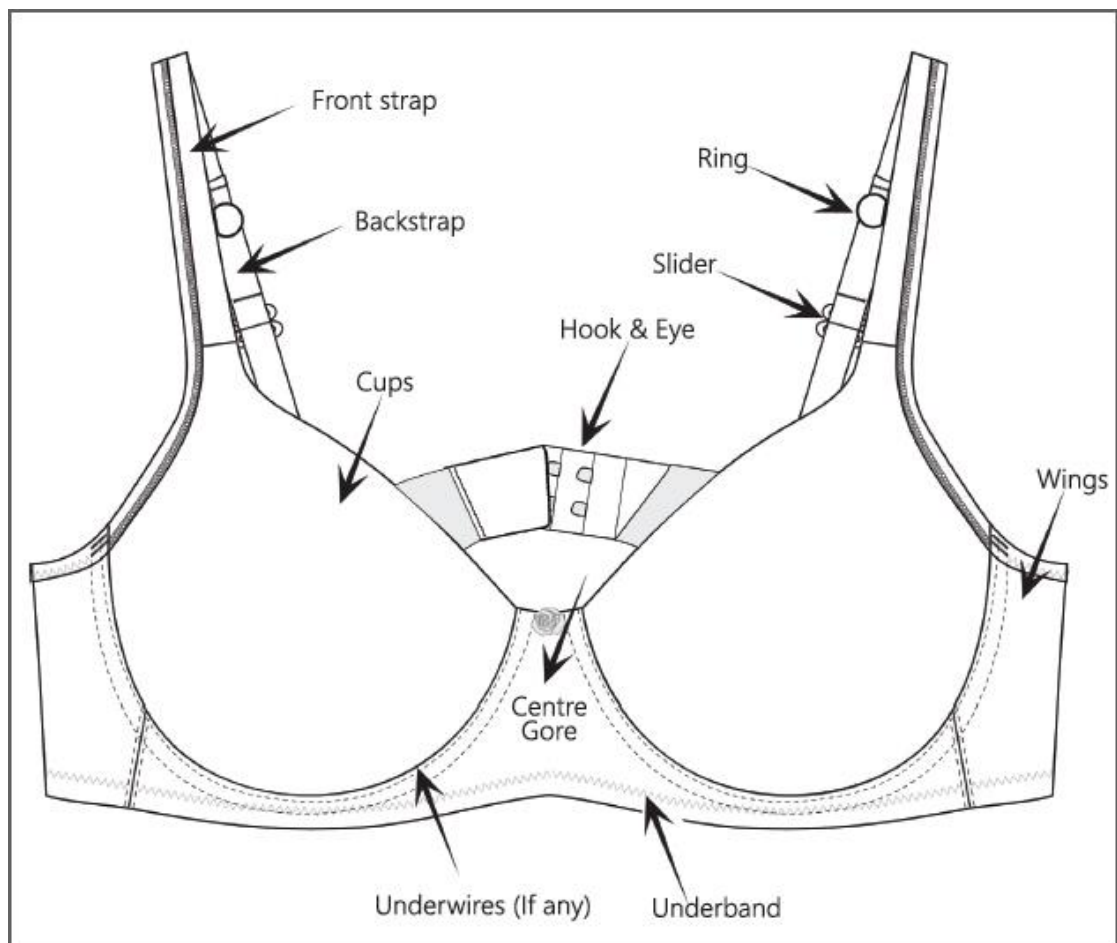


**Figure 4 :Flow chart of the methodology.**

## 4.2 Case study

One type of readymade garment which is produced in Sri Lanka involving complex material sourcing was selected as the case study for raw material procurement model. Ladies Intimates are more complex garments. When it comes to a bra the raw material requirement varies tremendously depending on the design requirements of that product. The choice of fabrics, cups, padding, straps, and closure vary not only from buyer to buyer but also from style to style. The sheer raw material variety, a high number of components per piece, and variations in product anatomy and size, all make the procurement process, more complex for a bra. Generally, there are 10 main components contain in a bra structure and 15 type of different raw materials are required to complete the garment.

Figure 5 illustrate the main components of a bra.



**Figure 5 : components of a bra.**



It was Identified that generally bra raw material purchasing takes around 12 weeks. Table 2 shows time line for bulk procurement for bra. It takes only two-days to send the purchasing order to selected supplier base. Suppliers take around 8 weeks to manufacture raw materials according to the purchasing order. Generally shipping takes around 03 weeks and custom clearances and inhouse to plant takes another one week.

**Table 2: Time line for bulk Purchasing**

<b>Item</b>	<b>Duration</b>
Customer purchase order receipt	02 days
Procuring material from suppliers (8 weeks)	08 weeks
Shipping	03 weeks
Clearance + material in house to plant	05 days
<b>Total Time</b>	<b>12 weeks</b>

**Table 3: Supplier Leadtime Breakdown**

Raw material component	Raw Material Development time	Cup/H&E/R&S Making Time	Greige Lead Time	Dye & Finish Lead Time	Minimum Order Qty	Minimum Color Qty	Supplier Origin	Shipping time	Total Lead Time for purchasing
Main Fabric - Solid	4wks	NA	4wks	4wks	1000m	500m	China	4wks	12wks
Cotton liner	4wks	NA	4wks	4wks	1000m	500m	Sri Lanka	NA	8wks
Stabilizer	4wks	NA	4wks	4wks	1000m	500m	China	4wks	12wks
Under wires	4wks	2wks	4wks	NA	2500pairs	NA	Sri Lanka	NA	6wks
Bra Cups	12wks	4wks	4wks	4wks	10,000pairs	5000pairs	China	4wks	16wks
Hook & Eye	3wks	2wks	4wks	4wks	5000sets	5000sets	Sri Lanka	NA	10wks
Ring & Slider	2wks	2wks	2wks	NA	5000pieces	5000pieces	China	4wks	8wks
Mesh	4wks	NA	4wks	4wks	1000m	500m	China	4wks	12wks
Narrow Lace (decorative items)	4wks	NA	4wks	4wks	5000m	1000m	China	4wks	12wks
Elastic (front strap, Back strap, under band)	2wks	NA	4wks	4wks	5000m	1500m	China	4wks	12wks
Thread	NA	NA	NA	2wks	100cones	100cones	Sri Lanka		2wks
Care Label	1wk	2wks	NA	NA	NA	NA	Sri Lanka	NA	2wks
Price ticket	1wk	2wks	NA	NA	NA	NA	Sri Lanka	NA	2wks
Poly Bags(packing)	1wk	2wks	NA	NA	NA	NA	Sri Lanka	NA	2wks
Cartoons (packing)	1wk	2wks	NA	NA	NA	NA	Sri Lanka	NA	2wks

- \*Material Development Time: Development of the fabric using available yarn, Suppliers has already developed the materials and this duration is not directly involve with the bulk purchasing time of manufacturer.
- Cup/H&E/R&S Making Time: Bra Cup, Hook and eye, Ring and side making time
- Greige Lead Time: Undyed material manufacturing time (bulk)
- \*Dye and Finish lead time: Time taken to prepare fabric in to colored and finished material.
- Minimum Order Qty: Minimum bulk quantity is required to purchase from supplier
- Minimum Color Qty: Minimum color quantity required to purchase from supplier
- Supplier origin: Country where these raw materials are produced

Table 4 describes each material running in a Bra and their timelines for development and bulk manufacturing.

The main solid fabric of a bra if the yarn and other chemicals are available with suppliers generally a supplier would knit and supply it to the garment maker in 4 weeks. This is the initial sample yardage supplier will arrange to garment maker. After purchase order placed with supplier they will proceed to knit the bulk quantity which is mentioned as greige lead time and then relevant fabric coloration and finishing happens.

Due to the machinery limitations there is a minimum order quantity a garment maker should place with supplier and moreover there is a minimum colour quantity as well. Based on industry norms greige knitting dyeing and finishing would take 8 weeks.

Sri Lanka is not competitive in making bra main solid fabric therefore most of the time these would imported from China, Taiwan, Thailand etc. after placing bulk order it will take 12 weeks for a main material to arrive in Sri Lanka.

Cotton liner of a bra would use on a bra at the human body touching areas where the sweat generation is comparably high. On a bra it would be centre front in most of the time. Most of the time this goes inner side of a bra Since Sri Lanka is competitive in cotton liner fabric making this can be procured from Sri Lanka. After placing PO in 8 weeks' time bulk quantity will be in housed to the garment making facility.

Stabilizer is used on a bra at the areas where the stretch ability of the garment should be controlled. As an example, under bust area of a bra needs to stabilize. Most of the time this material will also go inside of the garment. Since Sri Lanka is not competitive in making stabilizer material this will be procured from China. After placing PO for bulk delivery, it will take 12 weeks.

Bra underwires are made using metal to provide the shape of the breast. For a Bra wire development, it will consume 2 weeks if the relevant wire gauge is available. Sri Lanka is competitive in bra wire making but the manufacturer will have to import relevant wire gauges which will consume 4 weeks. Moreover, for bra wire making it will consume 2 weeks. After placing PO for bra wire within 6 weeks it will be delivered to the plant.

Bra cup is one of the major components on bra, for the development of a bra cup it takes generally 12 weeks as it consumes several iterations with garment fitting. After placing

the bulk PO generally a bra cup manufacturer would take 12 weeks since it is required relevant liner fabrics to be dyed. Most of the bra cup manufacturers use standardized few liner qualities for which they will always have knitted greige available. In this manner eliminating 4 weeks of greige lead time Bra cup can be manufactured within 8 weeks. Since supplier base in Sri Lanka is not competitive most of the time bra cups are imported from China.

### **4.3 Adoption of Karljic matrix**

According to the karljic matrix above bra raw material components are required to classify in to four categories such as; Non-critical items (Low supply risk, Low profit risk), Leverage items (Low supply risk, high profit risk ), Bottle neck items ( high supply risk, Low profit risk ), Strategic items ( high supply risk, high profit risk ). It was required to evaluate characteristics of above four categories relevant to the apparel raw materials.

#### **4.3.1 Characteristics of Non-Critical Items**

These products generally has a small value and suppliers can be found easily. Normally purchasing departments spend more time on this. In general, in this situation purchasers are advised to pool purchasing requirements. In addition, Gelderman and Van Weele (2003) identify the strategy of individual ordering and pursue of efficient processing.

In Bra manufacturing if the material is running across the company for several production facilities where we do not see an issue with availability it can be considered as a non-critical item. More over for selection of these materials' designer would not involve and most of the times colors are not required to Dye to Match and it can be finalized through a color pallet. These non-critical items will not play a major role for unique selling point of the garment, but it will affect the performance of the garment.

Aiming to reduce the logistic and administrative complexity noncritical products requires a purchasing strategy (Olsen and Ellram, 1997). Systems contracting is generally advised as the way of doing business with suppliers of routine products (Elliott-Shircore and Steele, 1985; Kempeners and van Weele, 1997). The main idea is to enhance purchasing power by standardization and bundling of purchasing requirements.

Whenever it is not possible to pool the purchasing requirements, professional purchasers adopt individual ordering such as purchase card. This strategy is aimed at reducing the indirect purchasing costs such as ordering and invoicing.

In apparel industry for non-critical item procurement solutions are standardization and pool purchasing.

#### **4.3.2 Strategic items**

When considering the impact on profit supply risk both rates at high for strategic items. These products give a significant value to the organization. Engines and gearboxes for automobiles, turbines for the chemical industry and bottling equipment for breweries are few examples. Strategic items have a single source of supply which leads to a significant supply risk. Maintaining a strategic partnership is the general recommendation for supplier management in this quadrant. Procurement practitioners employ two additional purchasing strategies in this quadrant, namely accept a locked-in partnership and terminate a partnership, find a new supplier (Gelderman and Van Weele, 2003).

In Apparel industry bra manufacturing strategic item could be an innovative material. This can be an Innovative Fabric, Bra cup or other component which is custom designed for unique specification. These may be patented products.

##### ***4.3.2.1 Maintain strategic partnership:***

To counterbalance the supply risk, firms will aim at building a partnership relationship with its supplier (Elliott-Shircore and Steele, 1985). The mutual trust and commitment that is associated with an intensified relationship is likely to reduce the supply risk to a minimum. A close and lasting co-operation with suppliers will lead to improvements in product quality, delivery reliability, lead times, product development, product design, and it will result in cost reduction (Tuten and Urban, 2001; Hadelar and Evans, 1994).

##### ***4.3.2.2 Accept a locked-in partnership:***

This strategy often occurs when the buyer is subject to unfavorable conditions of the supplier and is unable to pull out of the situation. The locked in position might be caused by the fact that the supplier holds the patent to a certain product and therefore has monopoly power to some extent. This situation can be characterized as one dominated by the supplier.

#### **4.3.2.3 *Terminate a partnership:***

This strategy is employed when a supplier's performance has become unacceptable and incorrigible. The buyer will try to reduce his dependence on the supplier. One way of achieving this is to search for alternative suppliers. In this situation the buyer still depends on the supplier. The involvement of both parties in the relationship is expected to be the lowest in this situation compared to the one described above.

The solution for this kind of product in apparel industry is to develop the relevant custom design product inhouse and gaining the patent. Developing the material with a tier 1 supplier who has a strong relationship will minimize the supplier risk. Moreover, there is a possibility of going in to locked in partnerships with these suppliers or cross developing the same product with similar supplier base will mitigate the risk.

#### **4.3.3 Bottleneck items**

These products have a moderate influence on the financial results of a firm however suppliers have a dominant power position for these products (Kempeners and van Weele, 1997).

Features of bottleneck Items in apparel industry are materials for which the technology is involved but not to the level of a strategic item. If these products have their own specification it could be counter developed with other available suppliers. On supplier base there are few suppliers who could develop the same material. These materials may be a main fabric on a bra, therefore based on sales fluctuation at customer end quantity fluctuation can be expected.

##### **4.3.3.1 *Accept dependence, reduce negative consequences:***

To assure the required supply organization will have to understand the criticality of the material and will have to keep the required material available even at an additional cost. In apparel industry for understanding the bottleneck items organization can share the production plan with their suppliers or provide a raw material booking ahead of time to mitigate the risk.

##### **4.3.3.2 *Reduce dependence and risk, find other solutions:***

To reduce the dependence upon one supplier for same material buyer can find out few other suppliers.

In apparel industry having few selected suppliers for same product will mitigate the risk. As a contingency plan buyer can understand these materials and counter develop and keep it available with them to use at any time. Moreover, buyer could split the order to two suppliers and proceed manufacturing so the supplier risk can be mitigated fully.

#### **4.3.4 Leverage items**

Materials which are with low supply risk and higher profit risk can be categorized in to this quadrant. Buyers has many possibilities and incentives for negotiation. Small percentages of cost savings usually involve large sums of money (Olsen and Ellram, 1997). These characteristics justify an aggressive approach to the supply market (e.g. Van Weele, 2000).

In apparel industry if it is a running core material with higher volumes without supplier scarcity it could be considered as a leverage item.

##### **4.3.4.1 Exploit buying power:**

Since suppliers and products are interchangeable organizations can adopt to bidding, there is no need for long-term supply contracts. In general, a coordinated purchasing approach is adopted that has the form of a centrally negotiated umbrella agreement with preferred suppliers. Call-off orders are then placed as an administrative formality. The buying power is actively used to get better deals with interchangeable suppliers. This scenario is therefore characterized by buyer dominance (Kempeners and van Weele, 1997).

In apparel industry providing a raw material commitment and renegotiating on prices for leverage items will work as a solution. Moreover, if these materials are cross developed and available with other supplier base with prior agreement with customer, buyer can call for biddings.

#### 4.4 Questioner development

Main two axis of Kraljic Matrix are supplier risk and profitability risk. Bra's raw material components are required to place on karljic matrix base on their characteristics in supply risk and profit risk. General factors which make impact on profit risk and supply risk were identified and most critical factors were identified as dimensions for the adopted Karljic matrix.

**Table 4 : Factors Determining Dimensions of the Kraljic Matrix for Remote Environments**

<i>Supply Risk</i>	<i>Profit Impact</i>
<ul style="list-style-type: none"> <li>• Market conditions</li> </ul>	<ul style="list-style-type: none"> <li>• Volume purchased and Expected growth in demand</li> </ul>
<ul style="list-style-type: none"> <li>• Availability</li> </ul>	<ul style="list-style-type: none"> <li>• Percentage of total purchase cost</li> </ul>
<ul style="list-style-type: none"> <li>• Scarcity</li> </ul>	<ul style="list-style-type: none"> <li>• Impact on product quality</li> </ul>
<ul style="list-style-type: none"> <li>• Number of suppliers</li> </ul>	<ul style="list-style-type: none"> <li>• Business growth</li> </ul>
<ul style="list-style-type: none"> <li>• Competitive demand</li> </ul>	
<ul style="list-style-type: none"> <li>• Make-or-buy opportunities</li> </ul>	
<ul style="list-style-type: none"> <li>• Storage risks</li> </ul>	
<ul style="list-style-type: none"> <li>• Substitution possibilities</li> </ul>	
<ul style="list-style-type: none"> <li>• On-time delivery (lead times)</li> </ul>	
<ul style="list-style-type: none"> <li>• Cultural differences</li> </ul>	
<ul style="list-style-type: none"> <li>• Lack of logistical knowledge</li> </ul>	
<ul style="list-style-type: none"> <li>• Supply interruptions (strikes, hurricanes, etc.)</li> </ul>	
<ul style="list-style-type: none"> <li>• Duty and customs regulations</li> </ul>	
<ul style="list-style-type: none"> <li>• Shortage of qualified personnel</li> </ul>	
<ul style="list-style-type: none"> <li>• Complicated import procedures</li> </ul>	
<ul style="list-style-type: none"> <li>• Logistical-related facilities (harbor, roads, warehouses, communications, etc.)</li> </ul>	



Table 4 shows the general factors effect on supply risk and following describe each factor

#### **4.4.1 Supply risk**

- Market Condition

Based on the market condition for a product there is a level of risk involved with suppliers. if there is a considerable market there will be a relevant supplier base.

- Scarcity

Quantity availability in required material for customer purchase order

- Availability

Relevant material readily available in market

- Number of suppliers

Having too much of suppliers or not having required number of suppliers on supplier base is a risk due the complexity of management

- Competitive demand

The other countries who are in garment making, request the same material and it will create a competitiveness in the market

- Make-or-buy opportunities

We can consider either to make the raw material or purchase. It is a decision to make based on cost and technology know how. If the relevant supplier could not deliver the raw material it will be a risk.

- Storage risks

Not having required amount of stocks in inventories it is risk.

- Substitution possibilities

Having suppliers who could copy the same material is a risk

- On-time delivery (lead times)

Not delivering the goods on time is a risk

- Cultural differences

Since we have to work with different countries ex: China, USA, Taiwan, Thailand will create cultural differences which is a risk. Most of time Communication issues will arise.

- Lack of logistical knowledge

Not having international regulation knowledge on material logistic and transportation is a risk

- Supply interruptions (strikes, hurricanes, etc.)

Having interruption from supplier's side such as company work strikes, Natural disasters, Terror attacks will intrude to the supply.

- Duty and customs regulations

Government policies regarding duties and regulations change is a risk.

- Shortage of qualified personnel

Shortage of people with technical knowhow is a risk.

- Complicated import/export procedures

In Sri Lanka the import procedures are complicated which discourage the garment manufacturers.

- Logistical-related facilities (harbor, roads, warehouses, communications, etc.)

Harbor facilities and roads are also key factors to consider because raw material will be imported and RMG will be exported through these facilities.

Following factors were identified as critical factors for supply risk for our research and under these three factors it was given Business managers of company A to rate based on risk. Having three factors made the rating easier for business managers and above discussed factors are connected in to each factor and described as below.

#### **4.4.2 Identified factors to evaluate Supply risk**

- Market

Ability to Source from available (existing) supplier base, in current Sri Lankan condition there is a stable supplier base for intimate garment manufacturing. Out of available supplier base, selecting the right supplier is required for material procurement. Availability of right supplier in selected supplier base for the relevant material is a risk for sourcing. We would consider Market, Availability, scarcity, number of suppliers, Lack of logistical knowledge, Supply interruptions, Cultural differences

- Performance

Material performance as per expected standards, Shortage of qualified personnel, On-time delivery (lead times), Competitive demand

- Complexity

Complexity of material sourcing process. Logistical related facilities, Complicated import/export procedures, Duty and customs regulations, Substitution possibilities, Make-or-buy opportunities

#### **4.5 Profit risk**

Following factors were identified as critical factors for profit risk, under these three factors it was given Business managers of company A to rate based on risk. Having three factors made the rating easier for business managers and above discussed factors are connected in to each factor and described as below.

##### **4.5.1 Identified factors to evaluate profit risk**

- Impact on profitability: Level of value addition material can add to the product  
Volume purchased and Expected growth in demand, Business growth
- Cost / Value of Sourcing: Expenditure for sourcing Percentage of total purchase cost
- Criticality of material: Patent product Impact on product quality

## **4.6 Rating quadrants of the Karljic matrix**

Questionnaire was developed to rate quadrants of the Karljic matrix (Non-Critical, Strategic, Bottleneck and Leverage) using critical selected factors for supply risk and profit risk asked to rate those factors. Rating was given as 1,2,3

- 1 - Minimum risk
- 2 - Moderate risk
- 3 - High risk

Each Interviewer was explained about the quadrants of the Karljic matrix, supply risk and profit risk and each area were explained to rate accordingly.

### **4.6.1 Characteristics of quadrants of the Karljic matrix**

Characteristic of quadrants of the Karljic matrix were summarized based on the literature for interviewers understanding and ask each interviewer rate selected supply risk and profit risk components.

#### ***4.6.1.1 Non-Critical Items***

Characteristics of Noncritical Item

- Running material available
- Colour can finalize through pallet
- Designer does not involve
- It is not a selling point on garment only but affect for performance

#### ***4.6.1.2 Leverage Item***

Characteristics of Leverage Item

- Running material which are available
- Volume is available
- Colour can be dyed
- Competitive supplier base
- Substitution possible

#### ***4.6.1.3 Bottleneck Items***

Characteristics of bottleneck Items

- Unique specification
- Technology involved
- Few source of supply (scarcity)
- Usage fluctuation
- Not routinely predictable

#### ***4.6.1.4 Innovative Item***

Characteristics of Innovative items

- Custom design or unique specification
- Supplier technology important (patent product)
- Changing source of supply costly or difficulty
- Substitution difficult

## **5 Chapter - Data Collection**

In order to create a deep understanding and ensure that the collected information stayed as unbiased as possible a diversified sampling was preferred. Therefore, the focus was on purposefully selecting a sampling population, which is often the case in qualitative studies (Onwuegbuzie & Collins, 2007).

Sampling population was selected based on below criteria

- Job position
- Exposure on bra manufacturing
- Exposure on fashion apparel
- Direct exposure to customer
- Number of years in industry

Fabric sourcing managers who are directly involved in sourcing materials for customer reference garments, development business managers and account managers who are directly involved with customers and suppliers for product developments, bulk business managers and account managers who are directly involved with customers and suppliers for bulk purchasing based on customer sales order were selected for this.

Based on these criteria a list of interviewee candidates was selected. While the interviews progress candidates proposed other suitable candidates, who would be valuable interviewing. This phenomenon is not uncommon in qualitative research and is referred to as 'snowball sampling' (Bryman & Bell, 2015).

Questionnaire was circulated among 20 interviewers including raw material sourcing managers, development business managers and account managers, bulk business managers and account managers across three major bra manufacturing companies in Sri Lanka.

The interviews were conducted in a face-to-face setting. The data collection process begun in the middle of February and was initiated with four pilot interviews.

To improve the quality, assure consistency and to enhance comparability of the interviews an interview guide was used. The first part of the guide was structured to gather some general information about the interviewees as suggested by Bryman and Bell

(2015). The rest of the guide was developed to reflect the conducted literature review and the theoretical framework.

This structure was used as it would gather data on aspects that through the literature review had been determined desirable in answering the research questions.

### 5.1 Interview Guide 1

10 senior managers were individually interviewed to set the parameters values for Karljic Quadrants.

<b>Background</b>	<ol style="list-style-type: none"> <li>1. How long have you been working within the company?</li> <li>2. What is your current position?</li> <li>3. What are your main responsibilities?</li> </ol>
Before moving in to more details of the research we would like to have an introduction about yourself	
PURCHASING / SOURCING	<p>Raw material Item has classified in to 4 sections: Please read the characteristics of 4 types of raw materials and rate them based on supply and profit</p> <p>Your rating should be give based on following criteria</p> <p><b>Profitability risk</b></p> <ul style="list-style-type: none"> <li>• Impact on profitability: Level of value addition material can add to the product Volume purchased and Expected growth in demand, Business growth</li> <li>• Cost / Value of Sourcing: Expenditure for sourcing Percentage of total purchase cost</li> <li>• Criticality of material: Patent product Impact on product quality</li> </ul> <p><b>Supply risk</b></p> <ul style="list-style-type: none"> <li>• Market</li> </ul> <p>Ability to Source from available (existing) supplier base,</p>
We would now like to move towards get to know your point of view on Procurement	

- **Performance**  
Material performance as per expected standards, Shortage of qualified personnel, On-time delivery (lead times), Competitive demand

- **Complexity**  
Complexity of material sourcing process.  
Please rate following Raw material classes based on above information

**Non-critical Item**

Features of Non-critical Item

- Running material available
- Colour can finalize through pallet
- Designer does not involve
- It is not a selling point on garment only but affect for performance

<b>Supply Risk</b>	<b>Rating</b>		<b>Profit Risk</b>	<b>Rating</b>
Market			Impact on profitability	
Performance			Cost / Value of Sourcing	
Complexity			Criticality of material:	



	<p><b>Leverage Item</b></p> <p>Features of Leverage Item</p> <ul style="list-style-type: none"> <li>• Running material which are available</li> <li>• Volumes are available</li> <li>• Colour can be dyed</li> <li>• Competitive supplier base</li> <li>• Substitution possible</li> </ul> <table border="1" data-bbox="582 739 1481 1104"> <thead> <tr> <th>Supply Risk</th> <th>Rating</th> <th></th> <th>Profit Risk</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Market</td> <td></td> <td></td> <td>Impact on profitability</td> <td></td> </tr> <tr> <td>Performance</td> <td></td> <td></td> <td>Cost / Value of Sourcing</td> <td></td> </tr> <tr> <td>Complexity</td> <td></td> <td></td> <td>Criticality of material:</td> <td></td> </tr> </tbody> </table>	Supply Risk	Rating		Profit Risk	Rating	Market			Impact on profitability		Performance			Cost / Value of Sourcing		Complexity			Criticality of material:	
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	<p><b>Bottleneck Items</b></p> <p>Features of bottleneck Items</p> <ul style="list-style-type: none"> <li>• Unique specification</li> <li>• Technology involved</li> <li>• Few source of supply (scarcity)</li> <li>• Usage fluctuation</li> <li>• Not routinely predictable</li> </ul> <table border="1" data-bbox="582 1675 1481 2040"> <thead> <tr> <th>Supply Risk</th> <th>Rating</th> <th></th> <th>Profit Risk</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Market</td> <td></td> <td></td> <td>Impact on profitability</td> <td></td> </tr> <tr> <td>Performance</td> <td></td> <td></td> <td>Cost / Value of Sourcing</td> <td></td> </tr> <tr> <td>Complexity</td> <td></td> <td></td> <td>Criticality of material:</td> <td></td> </tr> </tbody> </table>	Supply Risk	Rating		Profit Risk	Rating	Market			Impact on profitability		Performance			Cost / Value of Sourcing		Complexity			Criticality of material:	
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	<b>Strategic items</b>				
	Features of a strategic item				
	<ul style="list-style-type: none"> <li>• Custom design or unique specification</li> <li>• Supplier technology important (patent product)</li> <li>• Changing source of supply costly or difficulty</li> <li>• Substitution difficult</li> </ul>				
	<b>Supply Risk</b>	<b>Rating</b>		<b>Profit Risk</b>	<b>Rating</b>
	Market			Impact on profitability	
Performance			Cost / Value of Sourcing		
Complexity			Criticality of material:		

## 5.2 Interview Guide 2

20 managers were interviewed to rate the materials based on the risk factors for each material.

Pease Rate following components of a Garment based on Profitability and Supply Risk
Your rating should be give based on following criteria
<b>Profitability risk</b>
<ul style="list-style-type: none"> <li>• Impact on profitability: Level of value addition material can add to the product Volume purchased and Expected growth in demand, Business growth</li> <li>• Cost / Value of Sourcing: Expenditure for sourcing Percentage of total purchase cost</li> <li>• Criticality of material: Patent product Impact on product quality</li> </ul>
<b>Supply risk</b>

- **Market**  
Ability to Source from available (existing) supplier base,
- **Performance**  
Material performance as per expected standards, Shortage of qualified personnel, On-time delivery (lead times), Competitive demand
- **Complexity**  
Complexity of material sourcing process.

Material	Supply Risk			Profitability Risk			Total Score
	Market	Performance	Complexity	Impact on profitability	Cost/Value of Sourcing	Criticality Of Sourcing	
Main Fabric							
Stabilizer							
Liner							
Lace							
Hook and Eye							
Ring and slider							
Bra Cup							
Bra Wire							
Elastic							
Thread							
Care Label							
Mesh							
Price Label							
Poly Bag							
Carton							
<b>Innovative Materials</b>							

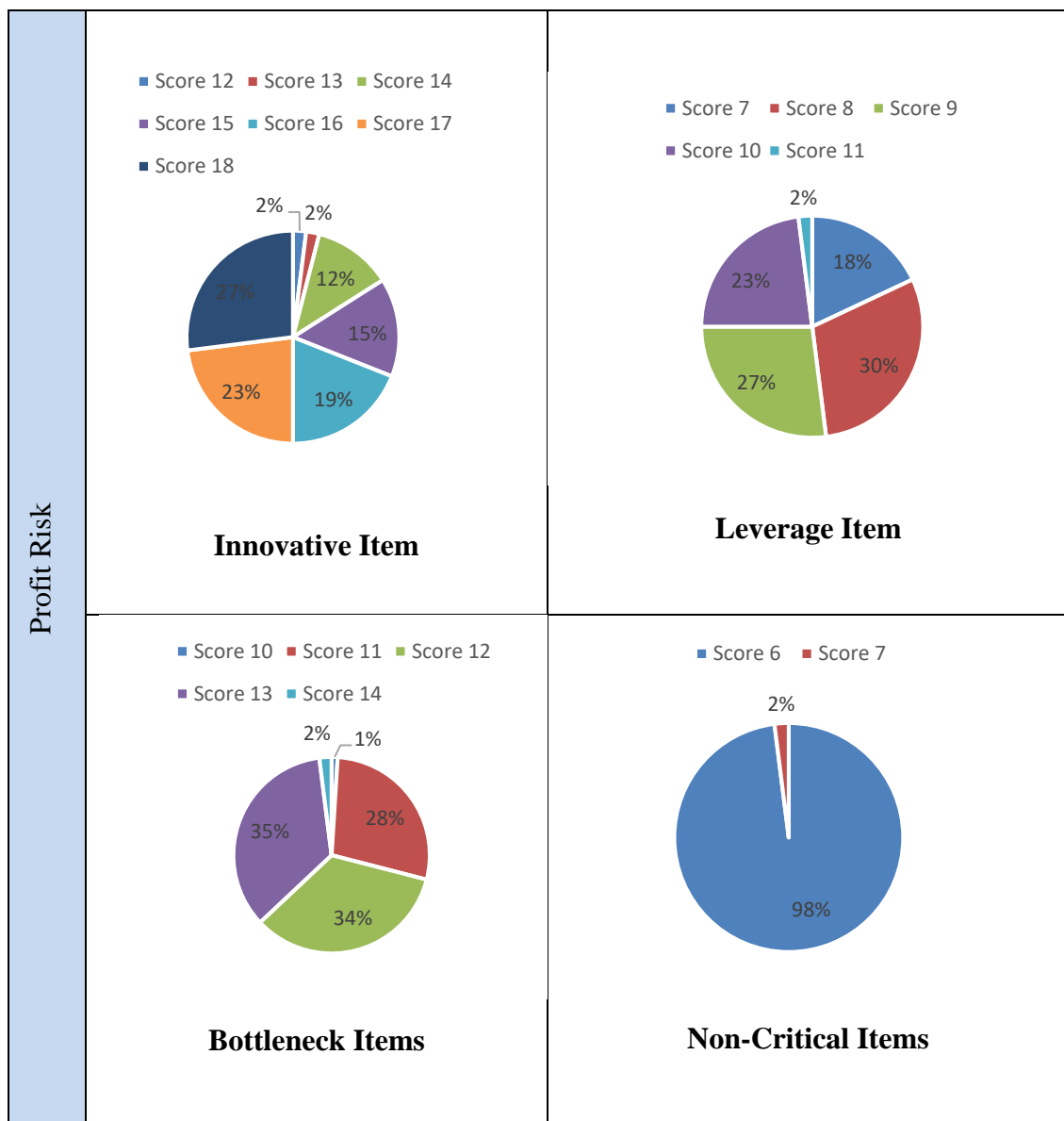
## 6 Chapter - Data Analysis

10 risk assessment sheet were analysed individually for interview guide 1.

### 6.1 Analysis of interview Guide 1

The purpose of the Interview Guide 1 questionnaire was rate main criteria of Karljic matrix relevant garment raw materials. Industrial experts' knowledge and experience count on rating karljic matrix. Figure 6 shows the summary of total ratings for each quadrant of Karljic Matric.

Total Score more than 10% was used to rate the quadrant of Karljic Matric.



**Figure 6: Summary of the Interview Guide 1 results**

Following features and total score summary finalized for each quadrant of Karljic Matrix

**6.1.1 Non-Critical Items**

As per interview guide 1 analysis if the summation of risk (X) is 6 it is a Non-Critical item. Following are the characteristics of a Non-critical item in apparel industry.

- Running material available
- Colour can finalize through pallet
- Designer does not involve
- It is not a selling point on garment only but affect for performance

Standardization of material can be used as a solution for this type of items.

**6.1.2 Leverage Item**

As per interview guide 1 analysis if the summation of risk (X) is  $(7 \leq x \leq 10)$  it is a Leverage item. Following are the characteristics of a Leverage item in apparel industry.

- Running material which are available
- Volumes are available
- Colour can be dyed
- Competitive supplier base
- Substitution possible

Raw Material Greige commitment and price renegotiations is a solution for this type of materials.

**6.1.3 Bottleneck Items**

As per interview guide 1 analysis if the summation of risk (x) is  $(11 \leq x \leq 13)$  it is a Bottleneck item. Following are the characteristics of a Bottleneck item in apparel industry.

- Unique specification
- Technology involved
- Few source of supply (scarcity)
- Usage fluctuation
- Not routinely predictable

Developing Strategic partnerships and sharing planning forecast or providing monetary commitment for the materials are a solution.

#### **6.1.4 Strategic items**

As per interview guide 1 analysis if the summation of risk (X) is ( $14 \leq x \leq 18$ ) it is a Strategic item. Following are the characteristics of a Strategic item in apparel industry.

- Custom design or unique specification
- Supplier technology important (patent product)
- Changing source of supply costly or difficulty
- Substitution difficult

Locked In partnerships are a solution for this kind of item in apparel industry.

## **6.2 Analysis of interview Guide 2**

Total score for each component of bra was calculated. Frequency of total score for each bra component was calculated and mode of the total score was selected to represent bra component in the karljic matrix.

Table 5 shows the sample of the risk assessment (ratings were given by the interviewer) for components of bra

**Table 5: Sample of risk assessment for bra components by a selected business manager**

Material	Supply Risk			Profitability Risk			Total Score
	Market	Performance	Complexity	Impact on profitability	Cost/Value of Sourcing	Criticality Of Sourcing	
Main Fabric	2	2	2	3	3	1	<b>13</b>
Stabilizer	1	1	1	1	1	1	<b>6</b>
Liner	1	1	1	1	1	1	<b>6</b>
Lace	2	2	2	3	3	1	<b>13</b>
Hook and Eye	1	1	1	2	1	1	<b>7</b>
Ring and slider	1	1	1	2	1	1	<b>7</b>
Bra Cup	2	2	2	3	3	1	<b>13</b>
Bra Wire	1	2	1	1	1	1	<b>7</b>
Elastic	1	2	2	2	1	1	<b>9</b>
Thread	1	1	1	1	1	1	<b>6</b>
Care Label	1	1	1	1	1	1	<b>6</b>
Mesh	1	2	1	1	1	1	<b>7</b>
Price Label	1	1	1	1	1	1	<b>6</b>
Poly Bag	1	1	1	1	1	1	<b>6</b>
Carton	1	1	1	1	1	1	<b>6</b>
Innovative Materials	3	3	3	3	3	3	<b>18</b>

<b>Material</b>	<b>Total Score</b>	<b>Frequency</b>	<b>Total Score</b>	<b>Frequency</b>	<b>Total Score</b>	<b>Frequency</b>	<b>Total Score</b>	<b>Frequency</b>	<b>Total Score</b>	<b>Frequency</b>
Main Fabric	10	1	11	5	12	6	13	8	N/A	N/A
Stabilizer	6	18	7	2	N/A	N/A	N/A	N/A	N/A	N/A
Liner	6	15	7	5	N/A	N/A	N/A	N/A	N/A	N/A
Lace	11	4	12	4	13	10	14	2	N/A	N/A
Hook and Eye	7	10	8	6	9	2	10	2	N/A	N/A
Ring and slider	7	9	8	4	9	4	10	3	N/A	N/A
Bra Cup	11	6	12	5	13	9	N/A	N/A	N/A	N/A
Bra Wire	7	9	8	3	9	4	10	4	N/A	N/A
Elastic	7	5	8	3	9	8	10	4	N/A	N/A
Thread	6	20	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Care Label	6	17	7	3	N/A	N/A	N/A	N/A	N/A	N/A
Mesh	7	9	8	3	9	5	10	3	N/A	N/A
Price Label	6	18	7	2	N/A	N/A	N/A	N/A	N/A	N/A
Poly Bag	6	20	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Carton	6	20	N/A	N/A	N/A	5	N/A	N/A	N/A	N/A
Innovative Materials	14	1	15	2	16	3	17	6	18	8

Table 6 : Summary of the Total score for each component of a bra



## **7 Chapter - Results and Discussion**

Based on Interview Guide 01 responses we can set a value for risk(x) as below for each quadrant.

Non-Critical Items ( $x=6$ )

Leverage Item ( $7 \leq x \leq 10$ )

Bottleneck Items ( $11 \leq x \leq 13$ )

Strategic items ( $14 \leq x \leq 18$ )

Based on the interviewer's responses for interview guide 2 total score mode values for raw material components risk classified according to Karljic matrix (see Table 7)

**Table 7 : Classification of bra component according Karjic matrix rating**

<b>Material</b>	<b>Mode of total Score</b>	<b>Quadrant of Karljic Matrix</b>
Main Fabric	12	Bottleneck Item
Stabilizer	6	Non-Critical Item
Liner	6	Non-Critical Item
Lace	12	Bottleneck Item
Hook and Eye	8	Leverage Item
Ring and slider	8	Leverage Item
Bra Cup	12	Bottleneck Item
Bra Wire	8	Leverage Item
Elastic	8	Leverage Item
Thread	6	Non-Critical Item
Care Label	6	Non-Critical Item
Mesh	8	Leverage Item
Slide	8	Leverage Item
Price Label	6	Non-Critical Item
Poly Bag	6	Non-Critical Item
Carton	6	Non-Critical Item
Innovative Materials	18	Strategic item

<b>Profit Risk</b>	<b>Leverage Item (<math>7 \leq x \leq 10</math>)</b> Slide Mesh Hook and Eye Ring and slider Elastic Bra wire	<b>Strategic items (<math>14 \leq x \leq 18</math>)</b> Innovative Materials
	<b>Non-Critical Items (<math>x=6</math>)</b> Price Label Tread Care Label Poly Bag Carton Stabilizer Liner	<b>Bottleneck Items (<math>11 \leq x \leq 13</math>)</b> Main Fabric Lace Bra Cup
<b>Supply Risk</b>		

The Bra components can be placed as in table 07 based on interview guide 01 and interview guide 02 results and analysis.

We can strategically utilize Garment making know how in Sri Lanka to order non-critical material ahead of time, for bottleneck items garment makers can share forecast with the suppliers. Providing greige or financial commitments for leverage items raw material prices can be renegotiated. If there is any innovative item garment maker needs to have to go in to a locked in partnership with supplier and customer making sure the material will arrive to the factory on time. For this customer will have to provide a commitment for both garment maker and raw material supplier.

Procuring material in this manner will drastically reduce the total garment making timeline as the concept development will happen while bulk raw material is in manufacturing stage. Development garment making and bulk ordering happening in parallel will drastically cut down the total time line of garment making cycle.

As the trend is moving towards small quantity fast replenishment models giving raw material commitment ahead of time will not put customer cash flow in risk as it will help to convert the material in to cash in quick turnarounds.

Table 08 is a model after applying this how we can produce a Bra from concept to customer distribution center in 12 weeks.

	Model quadrant	Solution	Industry solution	Raw Material Development time	Lamination Lead Time	Cup/H&E/R&S Making Time	Greige Lead Time	Dye & Finish Lead Time	Minimum Order Qty	Minimum Color Qty	Supplier Origin	Shipping time	Total Lead Time		1	2	3	4	5	6	7	8	9	10	11	12			
Main Fabric - Solid	Bottleneck Items	Develop Strategic partnership	Sharing material requisition plan, Using supplier for future developments, Integrating systems	NA	NA	NA	NA	4wks	1000m	500m	China	4wks	8	Main Fabric - Solid															
Gusset	Non-Critical Items	Standardizing	using across other styles	NA	NA	NA	NA	4wks	1000m	500m	Sri Lanka		4	Gusset															
Stabilizer	Non-Critical Items	Standardizing	using across other styles	NA	NA	NA	NA	4wks	1000m	500m	China	4wks	8	Stabilizer															
Bra Cups	Bottleneck Items	Develop Strategic partnership	Sharing material requisition plan, Using supplier for future developments, Integrating systems	NA	NA	4wks	NA	4wks	10,000pairs	5000pairs	China	4wks	12	Bra Cups															
Hook & Eye	Leverage Item	Raw Material Greige commitment		NA	NA	2wks	NA	4wks	AA	AA	Sri Lanka		6	Hook & Eye															
Ring & Slide	Leverage Item	Raw Material Greige commitment		NA	NA	2wks	NA	NA	AA	AA	China	4wks	6	Ring & Slide															
Mesh	Leverage Item	Raw Material Greige commitment		NA	NA	NA	NA	4wks	1000m	500m	China	4wks	8	Mesh															
Bra wire	Leverage Item	Raw Material Greige commitment																											
Narrow Lace	Bottleneck Items	Develop Strategic partnership	Sharing material requisition plan, Using supplier for future developments, Integrating systems	4wks – Knit whole Bulk requirement	NA	NA	NA	4wks	5000m	1000m	China	4wks	12	Narrow Lace															
Elastic	Leverage Item	Raw Material Greige commitment		4wks – Knit whole bulk requirement	NA	NA	NA	4wks	5000m	1500m	China	4wks	12	Elastic															
Thread	Non-Critical Items	Standardizing	using across other styles	NA	NA	NA	NA	2wks	AA	AA	Sri Lanka		2	Thread															
Care Label	Non-Critical Items	Standardizing	using across other styles	1wk							Sri Lanka		1	Care Label															
Price tag	Non-Critical Item	Standardizing	using across other styles	1wk							Sri Lanka		1	Price ticket															
Poly Bags	Non-Critical Items	Standardizing	using across other styles	1wk							Sri Lanka		1	Poly Bags															
Cartoons	Non-Critical Items	Standardizing	using across other styles	1wk							Sri Lanka		1	Cartoons															
Innovative items	Stategic Item	Locked In partnership																											
														Garment Fitting															

- Through airing the material, it is possible to cut down shipping lead time of 4wks to 1wk. Considering strategic item bringing down through air.
- All the materials will be in-housed to garment making facility by 9<sup>th</sup> week, but the order placement will happen at different stages starting from 1<sup>st</sup> week.
- From 1<sup>st</sup> week to 9<sup>th</sup> week Bra concept submission and fitting will happen and by 9<sup>th</sup> week Bra fit will be approved.
- 10<sup>th</sup> and 11<sup>th</sup> week bra will be stitched at manufacturing plant in Sri Lanka.
- 12<sup>th</sup> week PO will be shipped to customer.

## **8 Chapter - Conclusion**

The role of procuring has evolved and supplier relationships are changed from short term to long term. Sri Lanka being a major garment maker in the world it is important looking in the raw material procuring in a strategic manner to mitigate the country risk due to poor backward integration.

Through this thesis it is established the ability to practice strategic procuring of raw material for RMG making being selective in raw material sourcing. The main findings have successfully addressed the issues in readymade garment industry, leading to both academic and practical contributions.

In this thesis it was carried out to place bra components in to each quadrant of Karljic matrix through proper study of the risk associated with quadrant and the material.

The first recommendation we can provide through this research to an RMG manufacturer in Sri Lanka is focus on standardizing raw material as much as possible.

Moreover it is advised to be selective on the raw material supplier base and develop long term strategic relationships rather than onboarding suppliers without being selective.

If there is a garment delivery which require fast response or agile manufacturing, it is advised to follow this model for the relevant garment. Based on the risk level associated with material based on styling, materials may fall in to different quadrants oppose to what mentioned above.

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