A Strategic Relationship Building through Procurement 4.0: An Analysis from the Apparel Industry

P. M. D. Rasanjani, W. W. N. Sachini, G. A. S. Sandamali and W. M. S. K. Weerabahu
Department of Industrial Management
Faculty of Science
University of Kelaniya
SriLanka
rasanjanipmd@gmail.com, wijendranavodya@gmail.com, gasubhashinisandamali@gmail.com, samanthiw@kln.ac.lk

Abstract

With the evolution of industry 4.0, the procurement 4.0 has recently emerged with higher advantages. With these higher advantages, procurement 4.0 plays a major role in the domain of organization value chain. In an organization, procurement division can create new business models for itself and more from being a cost center to a profit center whereas changing what they buy as well as the ways in which they buy. Therefore the purchasing of products and services will increase dramatically in a proper way. The purpose of this study is to explore how the pillars of procurement 4.0; specifically, competitiveness, collaboration, digitalization and agility can be integrated to build strategic relationship with suppliers in the procurement process to enhance the overall performance and organizational efficiency that simultaneously lead improving customer experience and supplier performance of apparel industry. This study is based on a comprehensive, systematic review of literature published in relation to the areas of strategic supplier relationship and procurement 4.0 applicable to the apparel industry. The findings of this research is based on reviews of 25 articles which describe different models, frames, processes and appropriate theoretical terms. Through the effective categorization and integrative analysis of above findings this paper expects to introduce an innovative conceptual model of how to develop strategic supplier relationships to maximize the effectiveness of the apparel industry.

Keywords
Apparel industry**,** Industry 4.0, Strategic relationships building

1. Introduction

With the evolution of the automation and data exchange in manufacturing technologies, the Industry 4.0 trend is currently evolving to different aspects. It includes cyber physical systems, the internet of things, cloud computing and cognitive computing. The concept is now applying for different functions in the value chain and procurement 4.0 is one of the latest approaches that develops new value propositions, meet new business needs and integrate data across functions and value chains. To make the most of the potential of procurement 4.0, reshaping the procurement organization and its capabilities will be required while taking the challenges and opportunities of the expanding global digital revolution.

Strategic relationship between suppliers and buyers can be defined as a mutual ongoing relationship involving a commitment over a long period of time and a sharing of information, risk, awards of the relationship among both parties (Lisa M.Ellaram, 1990). When it is reviewed the past few decades of business world, managers have been interested in having a long term collaborative strategic relationship with few suppliers rather than involving in large number of suppliers. Businesses are focusing their attention to not only select the most appropriate suppliers but also on finding ways to transform current buyer-supplier relationship such that buyers can achieve more appropriate value addition to the business in the future (Cox, 2001)

Sri Lanka's apparel industry is the second largest industry that contributes to the national income. Over the past four decades, apparel industry has enjoyed epic growth levels and is today Sri Lanka's primary foreign exchange earner accounting to 40% of the total exports and 52% of industrial products exports (Sri Lanka Export Development Board, n.d.)

The success of this industry lies on the building strategic relationship with business partners. Supplier relationships are a subset of business relationships. It is very different from other forms of relationship as it is important to cultivate and maintain good supplier relationships to ensure profitability and competitiveness of the Company. Although successive governments attempted to invest in the apparel sector, most of them have failed due to the high cost of machinery and non-availability of local raw material and the cost of electricity (Lyn Fernando, 2002). As a major supplier for the apparel industry, Textile Industries provides required raw materials to the apparel industries. Through the strategic relationships having with textile industry is required to obtain the appropriate value to the apparel industry (Lyn Fernando, 2002). Consequently, identifying potential enhancements in building strategic relationships with suppliers in the Apparel Export Industry is increasingly being a focal point in this research. This study comprehensively and systematically scrutinizes the research published in the context of building strategic relationships with suppliers, with the objective of identifying knowledge gaps in building strategic relationships with suppliers in the Apparel Export Industry. Hence, the directions for future studies will be deduced based on the identified knowledge gaps. The findings would especially be of strategic importance for Sri Lanka as the country moves towards a manufacturing based economy.

2. Methodology

The approach -content analysis applied to state the knowledge in the selected area. Content analysis is commonly used qualitative research technique method for summarizing the content. As the initial step in this process, content for analysis is selected through searching for articles relevant to the study and it resulted in thirty articles. After screening those articles based on their titles and abstract, 28 articles were resulted. After thoroughly screening the content, 3 out of the 28 articles were excluded due to the irrelevance of the scope. The findings of 25 articles were included in this study.

A comprehensive literature review was conducted with the aim of constructing a systematic classifications for supplier relationships studies in the Apparel export industry and revealing the research gap in the selected area. Most of the review focused on refereed journal papers and publications within the period of 2001-2017, in order to improve the relevance of the study to the current context. This review based on the articles which has been published on the fields of procurement 4.0, supplier relationships and apparel export industry.

3. Main results of the reviewed studies

The study which has been conducted on "Procurement 4.0: factors influencing the digitization of procurement and supply chains" has analyzed the information technology, supply chain management and operations management, performance management with respective to procurement and industry 4.0 (Barnes, 1999). The purpose of this paper is to identify the impact of digitization on procurement and its role within the area of supply chain management. While digitization is a key driver of the fourth industrial revolution (Industry 4.0); organizations have different approaches to deal with this topic to get a clearer picture of the opportunities and challenges concerning the digital transformation. The research will also explore potential barriers to digitizing procurement and supply chains and ways to overcome them. Finally, the significance of potential enabling technologies to the digitization will also be examined.

The article on the title on "The Impact of Industry 4.0 on Procurement and Supply Management" emphasizes that knowledge possessed by conceptual and qualitative analysis (Andreas, 2016). This research study about Industry 4.0, Internet of Things, Industrial Internet, Supply Management 4.0, e-Procurement and Digital Procurement. Author explores that while the use of digital technology has undoubtedly impacted the life of most individuals in developed societies, the picture of how it impacts business today is still vague in many respects. The ongoing discussions about a digital revolution and disruptive competitive advantages have led to the creation of such a business vision as Industry 4.0. Yet, the term and even more its actual impact on businesses is still unclear. This paper addresses this gap and explores more specifically, the consequences and potentials of Industry 4.0 for the procurement, supply and distribution management functions.

A survey followed by an introduction of E-procurement with respective to supply chain performance, partner relationships, information sharing, supply chain integration and supply chain management. The aim of this study is to discuss the relationship between e-procurement and supply chain performance (Chang, 2013). Both interviews with practicing managers and an empirical study were conducted in the current study. Interviews with four practicing managers were conducted to gather the practical insights of the theoretical framework. This paper contributes to the literature by proposing and testing the influences of partner relationships, information sharing, and supply chain

integration. This allows a strategic viewpoint when implementing e-procurement systems intended to improve supply chain performance.

An article on the title on "Managing with Power: Strategies for Improving Value Appropriation from Supply Relationships" which was written by (Cox, 2001)emphasizes that knowledge possessed by practitioners of the tools and techniques that assist with both proactive supplier selection and proactive supply development is required for the development of effective competence in procurement and supply chain. It was written with the objective of finding ways to transform the current power relationship between buyers and suppliers such that buyers can achieve more effective leverage of value. It has shown that Strategic source planning normally entails the effective alignment of demand and supply, as well as the development of knowledge and understanding of the power circumstances that exist between the buyer and the supplier. Both of them seek to maximize their own shareholder value through pursuing contradictory goals as well as find it necessary to involve in mutually interdependent exchange relationships. It has concluded that competence in procurement and supply management is based on the recognition that the best circumstance for the buyer is to be located in the buyer dominance box, as well as on the ability to devise strategies to move all supply relationships toward this ideal. (Cox, 2001)

A survey of How To Distinguish Innovative Suppliers has been conducted with the aim of providing a comprehensive tool or a set of criteria that can be used in managerial sourcing decisions to filter out innovative suppliers. As mentioned here, firm may first have to take time to create the competent supply base, in order to enjoy innovative input from the suppliers (Holger Schiele, 2006)). It has introduced a new direction for supplier development programs as creating a network of innovation-suppliers and long term planning is required for the creating the competent supply base. For that purpose, in analyzing the supply base, it may be helpful for buyers to distinguish between an inner circle of "innovation-suppliers" and an outer circle of "cost-suppliers".

The study under the title of "An AHP model for selection of suppliers in the fast changing fashion market" presents an example on solving the supplier selection problem in the apparel industry by using the Analytical Hierarchy Process (AHP), which takes the operational performance (for example, flexibility, cost, and delivery) into account for supporting supply chain strategies. The system was implemented with the aid of the commercial software package Expert Choice. Based on the results from the AHP model, benefits of implementing quick response in apparel supply chains can also be verified (Chan, 2010).

With the purpose of finding a solution for the issue affecting US textile/apparel companies in global business competition, a research has been conducted to find suitable suppliers for their operations. The selection and evaluation of their global suppliers to meet the goal of having effective and efficient supply chain operations and strengthening their position in the market become critical for US textile/apparel manufacturers to maintain their competitiveness in today's market. Further they have developed an evaluation model. A case presented in this paper shows that the model provides textile/apparel companies with an easy way to evaluate their suppliers and make their selection of suppliers more efficient and effective. Most textile/apparel companies using this model can help them establish strategic alliance with global suppliers to reduce costs and increase competitiveness in the market (S. Gary Teng, 2005).

The article under title of Redefining The Value Of Strategic Supplier Collaboration written by Deloitte in the field of Supplier Relationship Management (SRM) has highlighted the importance of looking beyond traditional Procurement-centric perspectives on supplier management, explored how relationships with key partners should be managed in a strategic and holistic manner .This study has emphasized that SRM is two-way, mutually beneficial relationships between an organization and its suppliers and it consists of collaborative and relationship-building activities targeted at the most strategic and critical supply partners that deliver great added value to the firm. Select the right partners, align internally and externally, establish mutually beneficial relationships, select meaningful KPIs and share information, commit to change are those 5 key steps which can be taken to successfully build strategic relationships with suppliers. (Deloitte, 2015)

The article under title of Investigating the Meaning of Supplier-Manufacturer Partnerships which was published in the International Journal of Physical Distribution and Logistics Management has revealed that supplier partnerships are very different from other forms of relationship and identified 5 distinct attributes of partnerships. It has highlighted that suppliers can have a significant influence on a manufacturer's performance, through their contributions to cost reduction, new product design and enabling the constant improvement of quality. The findings of this study is based on the key research question "what are the main attributes of suppliers – manufacturer relationships." and repertory grid technique was chosen as research tool. The result shows all of the attributes of supplier relationships such as

volume of turnover, organizational size, quality, and price. Among them, 5 attributes (personal business relationship, special product, new product development, relationship maintenance, and location nearby) help to differentiate partnerships as a special type of supplier relationships. (Fred Lemke, 2003)

A case study has been conducted under the title "Antecedents and Benefits of Supplier Satisfaction and the Influence of Segmentation and Status on Buyer-Supplier Relationships" (Fischer, 2017). According to the findings of the case study, it discusses what the influencing factors of supplier satisfaction, antecedents and consequences are: Customer segmentation can be a strategic relationship for a certain buyer for the supplier based on various factors. Apart from the segmentation buyers and suppliers typically differentiate between different actors. They think about reverse marketing that buyers need to compete with each other to win over suppliers. Buyer and supplier relationship is critical for strategies such as early supplier integration, collaborative research and development and joint venture. To improve the product quality, delivery performance support, and also leads to strong material cost reduction can be done by developing reverse marketing.

A journal has done on public procurement under the name of "An Analytical Framework for the Management and Reform of Public Procurement" has found political and business dimensions are sometimes misunderstand what procurement actually entails. And also significance of public procurement is being appreciated by globally. This article's main purpose is to develop a model to suggest why traditional reconstruction of public procurement as a narrow management concept is impossible to succeed beyond delivering minimal conservation benchmarks.

Nicola Dimitri (2013) has published a journal which explains the "Best Value for Money" in Procurement. Further it considers both the private and the public sector have evaluated successful procurement recent years. Both monitory and non-monitory components are considered under (BVM) Best Value for Money. Effective procurement could be the crucial factor in socio-economic development and growth of a state. Because of the multi-dimensional and complexity of the procurement, it is not an easy task to capture and make operational concept of BVM. The main purpose of this paper is to present some of the issues related with BVM such as how to define buyer's goal and how to make it operational. There are sequential steps to deliver the BVM. Further this paper has discussed the main procurer's goal and formalized ways. And also how depend on buyer's preferences and supplier's technology to procurement outcome.

A study on "A Synthesis of Best-Value Procurement Practices for Sustainable Design-Build Projects in The Public Sector" has been regulated to find sustainable building practices by project delivery methods which are measured by cost, schedule, and quality objectives to be successfully delivered green buildings (Keith R. Molenaar, 2010). Best value procurement is a common acquiring method to design-build projects in addition to price factor. Cost, time, qualifications, quality, and design can be identified as best value procurement parameters. And also this paper has discussed how owners communicate to meet their sustainable goals using LEED (Leadership in Energy and Environmental Design) points. The project management plan requires a LEED approach to determine team's approach for incorporate, document and obtain LEED certification (Keith R. Molenaar, 2010).

Gereffi and Memedovic (2003) published the book "The Global Apparel Value Chain: What Prospects for Upgrading by Developing Countries?" which has been discussed how change the apparel industry over the past decades in global value chain framework to describe the transformations in production, corporate strategies and trade and also changed the industrial innovation and learning. Retailers, marketers and branded manufacturers are three types of lead firms that have been identified as buyer driven value chain in apparel industry. Competition between the leading firms has increased because of the globalization of apparel industry. Full-package production is associated with the global apparel value chain with regarding the innovations (Gary Gereffi, 2003). The relationship between supplier and buyer has been changed fundamentally by the full-package production. The fact that retailers and marketers that order the garments have less knowledge with related to how to make them, because of that, full- package production is a need. And also they have revealed that can be changed the competitive dynamics of the textile and apparel supply chain, as retailers develop their own private-label collections.

A case study has been developed and refined by Kashiwagi et al., 2011 conducted a research on "Best Value Procurement/Performance Information Procurement System Development (BVP/PIPS)". BVP/PIPS are different from other processes according to:

• Technical decision making in the selection phase and the minimization of owner or buyer subjectivity.

- The best value vendor can define delivered service and how it will be delivered due to the allowance of the process.
- Apart from controlling, directing, and inspecting the vendor they uses the contract to minimize and manage the risk.
- By using risk management plan (RMP) and weekly risk report (WRR), vendors are allowed to measure and document the performance of all parties who involved and make them accountable.

PIPS have three developing periods involving performance information period, the PIPS testing period and the implementation period. For run organizations, deliver services, and optimized supply chains, the best value PIPS/PIRMS is a new way. To get optimal results, it is a good way and forms a leadership structure for inexperienced project managers. Best value procurement PIPS/PIRMS is the future of the delivery of the services since its ability to minimize the need to manage, direct control and increases value and its quality (Kashiwagi, 2011).

According to Michael Essig and Ulli Arnold (2001) electronic procurement is the currently one of the most important topic in supply management. They have published a journal under the name "Electronic procurement in Supply Chain Management: An Information Economics-Based Analysis of Electronic Markets." It reveals from a theoretical perspective, what are the possibilities of electronic marketplaces for buyers. From electronic marketplaces, various data types are analyzed with a business model for electronic marketplaces. Real value added e- procurement can be shown by these kinds of business models. Most marketplaces are run by joint ventures and other individual groups of companies to deliver full e-market services to e-market customers. Marketplaces providers will be considered the marketplace data. So for buyers, it is necessary to be able to judge these marketplaces and their future role. Strategic e-procurement provides lower transaction cost and also will create value for the firm.

Apart from the general methodology followed to minimize rework, a paper through practical study has developed a model after identifying various options at the check points to capture defects and selecting various tools to be used the model. The model includes inline inspection through defect frequency rating system, defect capturing at the end line through check sheets, analysis of defects, cause & effect analysis of highest occurring defects and finally effective solutions are provided. Those solutions have been implemented after identifying the cause and effect for major occurring defects. (Islam, Khan, & Khan, 2013)

A survey has been conducted under the title "Computer Vision-based Fabric Defect Detection" which is a categorization of fabric defect detection methodologies According to the findings of the survey the, available techniques were classified into three categories: statistical, spectral and model-based. However, due to the lack of uniformity in the image dataset, performance evaluation and the nature of intended application, it is not prudent to explicitly declare the best available methods. Therefore, this survey paper has attempted to classify some of the proposed methods using the approximate resolution of employed images, i.e. low, medium and high, and their computational complexity. The selection of image resolution, for the textile web inspection, is largely determined from the available computational power and expected performance. (Ajay Kumar, 2004)

A framework is proposed using the case of Web-based B2B procurement systems to quantify and measure the value of B2B e-commerce systems and identify the factors that determine it. The methodology is applied to evaluate the potential of Web-based procurement system of a major heavy-equipment manufacturer located in the Midwestern United States. Further the value of Web-based procurement is discussed under three factors: process characteristics, organization of business units, and the "extended enterprise". (Chandrasekar Subramaniam, 2002)

An empirical survey-based research has been conducted to assess the linkages between strategic sourcing, buyer-supplier relationships, supplier evaluation, and sourcing performance in the context of the textile and apparel industry under the title of "Strategic sourcing in the textile and apparel industry". A structural equation model has been developed and examined using data from 180 US textile and apparel firms connecting these variables and found support of the significant and positive performance outcomes of strategic sourcing. (Su, 2013)

4. Discussion

The categorization of factors studied in the selected articles is discussed in the following sections.

4.1 Impact of/on Procurement 4.0

Under this study we categorized factors which impact on procurement 4.0 such as competitive advantage for the buyer organization, ways of building strategic relationships, impact of value procurement on aspects of strategic supplier relationships and causes and impacts of conflictions of supplier relationships in procurement 4.0.

Proceedings of the International Conference on Industrial Engineering and Operations Management Bangkok, Thailand, March 5-7, 2019

Two of above studies has described the competitive advantage of value procurement for the organizations in terms of improve quality, reduce wastage, improve efficiency and effectiveness, increase profit, brand reputation and etc.

Most of the above studies classifies under the ways of building supplier relationship through strategic point of view. Two articles are described about the applicability of AHP model to supplier selection process and problem evaluation. The article written by Deloitte describes a process consisting 5 key steps which can be taken to build successful strategic relationships .All of these articles emphasizes the importance of move away from traditional supplier-buyer relationships to long term collaborative supplier relationship to improve value appropriation.

Table 1: Impact of/on procurement 4.0

Study	Impact of/on Procurement 4.0			
	Competitive advantage for the buyer organization	Ways of building Strategic Relationships	Impact of Procurement 4.0 On aspects of Strategic Supplier Relationships	Causes and Impacts issues of relationships Supplier Procurement 4 in .0
(Cox, 2001)	*		*	
(Holger Schiele, 2006)		*		
(Chan, 2010)		*		
(S. Gary Teng, 2005)		*		
(Deloitte, 2015)		*	*	
(Fred Lemke, 2003)	*	*		
(Fischer, 2017)	*	*		
(Paul R. Schapper, 2006)	*			
(Dimitri*, 2013)	*			
(Keith R. Molenaar, 2010)				*
(Gary Gereffi, 2003)		*		
(Kashiwagi, 2011)			*	
(Michael Essig, 2001)				*

4.2 Considerations in Procurement 4.0 Strategies

Procurement 4.0 concept is included with competitiveness, collaboration, digital and agile method. Competitiveness means competing value chains from tier 1 to n-tier visibility. Collaborative means co-creation which leverage supplier innovations from buyer centricity to supplier centricity. Digital means digital transformation that deploy advanced technologies from spend transparency to holistic and intelligence platforms. Agile means the leadership that actively shapes an agile organization from hierarchy to autonomy.

Procurement 4.0 framework focuses on technology, competition, suppliers, globalization, shareholder expectations and megatrends which are called as trends or drivers. Procurement 4.0 framework is included with six main areas. Firstly, new procurement value proposition, procurement as service provider to key suppliers and customers monetization of field application data with suppliers. Secondly digital category and service procurement, new categories (ex – software, hardware, new services) innovative contracting of services, technologies, markets and

suppliers. Thirdly digital supply chain and supplier management, supplier risk management and key performance indicators. Fourthly innovative procurement data utilization, big data analytics field application data analysis to improve design and performance. Fifthly digital processes and tools, digital tools and interfaces procurement IT architecture. Sixthly organization and capabilities, digital skills and talents experts for new categories.

Making Strategies to maintain strategic supplier relationship for procurement 4.0 in the Sri Lanka Apparel Industry is significantly more competitive and challengeable to these companies. Reasons for procurement 4.0, Value procured area, Supplier selection strategy / model, Supply chain drivers and priorities were identified in the studied articles and considered for further analysis. (Refer to the Table 2).

Nowadays governments are more focusing on applying procurement4.0 approach when purchasing goods and services, compared to the approach that select suppliers based on cost. It is a traditional "low-bid" approach. The best value procurement model allows selecting the best combination of quality, cost and other considerations rather than choosing a lower cost supplier.

Success of apparel industry has lied on providing right quantity of quality outputs to the relevant customers on the specified time. Thus having right quantity of quality of raw material is important to keep smooth flow of the apparel productions. Most of the raw material required for the Sri Lanka apparel export industry is imported from foreign leading companies. Therefore, building a long term collaborative relationships are required to all apparel companies to obtain significant competitive advantage. Careful considerations and analysis is required to proper supplier selection and continuing strategic relationships to improve the value appropriate to the apparel industry with the aim of reducing the defects percentage. Supplier selection strategies and model were identified in 8 articles.

Table 2: Considerations in procurement 4.0 strategies

Study	Reasons for Procurement 4.0	Value Procured area	Supplier Selection Strategy/models	Supply Chain Drives and Priorities
(Andreas, 2016)	*			
(Barnes, 1999)	*			
(Bienhaus, 2017)	*			
(Chang, 2013)	*			
(Cox, 2001)			*	
(Holger Schiele, 2006)			*	
(Chan, 2010)			*	
(S. Gary Teng, 2005)			*	
(Deloitte, 2015)			*	*
(Fred Lemke, 2003)			*	
(Fischer, 2017)			*	
(Paul R. Schapper, 2006)		*		*
(Dimitri*, 2013)		*		
(Keith R. Molenaar, 2010)		*		
(Gary Gereffi, 2003)		*		*
(Kashiwagi, 2011)		*	*	
(Michael Essig, 2001)		*		*

4.3 Selection and Retention of Strategic Supplier Relationships

For any company that are interested in building strategic supplier relationships, it is important in to choose the right suppliers to add values to the supply chain. An efficient and effective supply chain drives companies to the successful by allowing them to keep smooth functioning of every operation.

Factors related to Supplier selection and retention which are identified through the articles are mentioned in the table.3.

Some of these studies have examined what is the Apparel companies' criteria to select their suppliers, how the performance measurement of the supplier is done and how they make decisions to keep the strategic suppliers as key business partners to keep sustainability of the company.

Table 3: Selection and Retention of Strategic Suppliers

Study	Selection and Retention of Strategic Suppliers		
	Supplier selection criteria	Supplier performance measures	Decision of retaining Suppliers
(Cox, 2001)	*		
Innovative supplier		*	
(Chan, 2010)	*		
(S. Gary Teng, 2005)	*		
(Deloitte, 2015)	*	*	*
(Fred Lemke, 2003)		*	
(Fischer, 2017)		*	
(Paul R. Schapper, 2006)		*	
(Dimitri*, 2013)		*	
(Keith R. Molenaar, 2010)	*		
(Gary Gereffi, 2003)		*	
(Kashiwagi, 2011)	*	*	
(Michael Essig, 2001)		*	

(Chan, 2010) Has highlighted the applicability of AHP model to the supplier selection process and problem evaluation with addressing the most relevant issues in searching suppliers. The article written by Deloitte has covered above three areas through introducing a set of core complementary processes which focus on supplier segmentation, SRM governance, supplier performance management, and supplier development with aim of drive more value out of the supplier relationships.

4.4 Other Factors

The role of IT and the introduction of new models/frameworks are discussed under the title other factors (Refer to the Table 4).

Table 4: Other Factors

Study	Other Factors	
	Role of IT procurement in process	Introduction of a model/Framework
(Chan, 2010)		*
(S. Gary Teng, 2005)	*	*
(Chandrasekar Subramaniam, 2002)	*	

AHP-based model was formulated to select the best supplier (Chan, 2010). The system was implemented with the aid of the commercial software package Expert Choice. Based on the results from the AHP model, benefits of implementing quick response in apparel supply chains can also be verified.

Web-enabled business-to-business (B2B) e-commerce enhancement in inter organizational coordination, results in saving transaction cost and having competitive sourcing opportunities for the buyer organization while eliminating the uncertainty in existing information technology, such as EDI. The introduced framework is proposed to quantify and measure the value of B2B e-commerce systems and identify the factors that determine it. (Chandrasekar Subramaniam, 2002)

4.5 Models/Frameworks

Models and frameworks presented in the selected articles are further discussed in this section (Refer to the Table 5).

Table 5: Models/Frameworks

Study	Model/Framework	Uses/Advantages
(Chan, 2010)	Develop a decision support model by using AHP to solve the supplier selection problem in the apparel industry	The model presented here addressed the most relevant issues in searching suppliers the apparel industry. With the use of the model, supplier selection will be much easier and effective for buyers.
(S. Gary Teng, 2005)	The development of a simple, flexible, and easy to use evaluation model that includes the consideration of five main clusters to reflect the performance of a global supplier in a textile/apparel supply chain.	Textile/apparel companies can use this model to find capable suppliers as their partners in the supply chain. With minor modifications, this model also can help companies in most industries for enhancing their supply chain operations with capable suppliers.
(Deloitte, 2015)	Developed a framework for the Supplier Relationship Management approach	To build successful strategic relationship with supplier To drive more value out of them through supplier development
(Chandrasekar Subramaniam, 2002)	A framework based on a multistage impact model of information technology on enterprise processes	To identify the impact on a set of intermediate variables which lead to improve in performance measures by enabling B2B operations using certain features or capabilities. Ultimately the effectiveness of the procurement process achievement which is the B2B goal of the enterprise is identified improving the performance variables.
(Su, 2013)	An empirical investigation of a theory-based model integrating the resource-based view and the relational view of strategic management.	The study contributes to the literature by developing a research model based on a multi-theoretical perspective and conducting a large-scale empirical survey in the textile and apparel industry and analyzing the model by structural equation modeling.

The model (S. Gary Teng, 2005) discusses the supplier performance level under five clusters namely; delivery, flexibility, cost, quality and reliability. The delivery cluster consists of four factors that include geographic location, freight terms, trade restrictions, and total order cycle time. Evaluating supplier's flexibility is according to five factors including capacity, inventory availability, information-sharing, negotiability, and product customization. The three factors considered in the evaluation of cost cluster are the supplier's selling price, internal cost, and the cost for ordering and invoicing. The quality cluster includes four factors that consist of continuous improvement, certifications, customer service, and percentage of on-time deliveries. The last cluster for supplier performance evaluation is the reliability of a supplier's operations to fulfill supply chain activities. Four factors, the feeling of trust, the country's political situation, the currency exchange situation, and the warranty, influence the reliability of a supplier. All the factors and clusters considered in this model gather the most important issues that must be addressed for effective sourcing and partner collaboration in the supply chain for this industry. With the use of this model, sourcing and supplier evaluation and selection will be much easier and effective for buyers in textile and apparel industry.

For future studies, more supplier alternatives which encompass both domestic and international aspects can be added to the current research (Chan, 2010). This may include ethical issues as it is increasingly important to know whether or not the chosen suppliers have complied with ethical guidelines set by the buying firm. Moreover, all the criteria were determined from the literature that means they are all secondary data. Therefore, the next stage of the study is to conduct surveys with the experts from the industry (purchasing manager, sales manager, product manager, quality manager, and production manager) in order to verify or to refine the model. Questionnaire which is based on the proposed AHP model can be designed for the survey and then weighting for each criterion can be found from the survey results.

 (Deloitte, 2015) Study has introduced a framework for the SRM approach which is developed by Deloitte for their client – Global consumer Business Company. It includes the followings elements:

• Agreement on SRM strategy
• Definition of supplier segmentation process and tools
• Establishment of a governance model and definition of roles and responsibilities, for both internally and externally
• Improvements and guidance to the performance management process and measures
• Supplier development processes and responsibilities including measures for underperforming suppliers, business development initiatives and management of Innovation opportunities
• Deployment of SRM within the organization and implementation planning

From the buying enterprise's point of view, the use of a Web-based system affects four major categories of B2B operations: search, order processing, monitoring and control, and coordination. The effects of a Web-based B2B procurement system are introduced in three main layers: impact on intermediate measures, impact on performance measures and impact on enterprise B2B goal. Impact on Intermediate Measures consists lower transaction costs, inventory holding costs and price for products purchased. Impact on performance measures consists higher process quality, lower total procurement costs, increased user satisfaction and increased responsiveness of the system. The enterprise B2B goal is the effectiveness of the procurement process. (Chandrasekar Subramaniam, 2002)

The model (Su, 2013) which is based on four main key concepts or variables is integrating the structural and measurement models and each variable is divided into several items in order to measure each variable in the survey. The concept of strategic sourcing includes strategic orientation, relationship development with key suppliers, and top management support. The four items of buyer-supplier relationship include buyer-supplier loyalty, frequent face-to-face communications with key suppliers, high corporate level communication on important issues with key suppliers, and the buyer's influence on key supplier's responsiveness. The three items of supplier evaluation include formal supplier certification program, formal system to track the performance of the suppliers, and formal program for evaluating and recognizing suppliers. The three items measuring sourcing performance includes focusing on contributions of sourcing to the overall success of the firm and to the firm's bottom-line profit, and sourcing's value creating outcomes.

5. Conclusion

Emerging trends in Supply Chain Managements (SCM) has drawing the attention of business to building up strong collaborative and long term supplier base in order to enhance the competitive advantage within industry. Therefore, there is a growing interest in carrying out research in SCM field for exploring new dimensions to reach the operations excellence through effective supply base. This article is expected to provide current state of the knowledge of these concepts relating the apparel export industry which make significant contribution to our National Income. Based on the review, classification and analysis of the articles, knowledge gap can be discovered for further investigation.

Considering the selected studies, it could be seen that most of the research that describes models/frameworks which can be appropriate for developing strategic supplier relationships from perspectives. Most of those models has been developed for selection and evaluation of supplier development. Also most of these studies are concentrated on cost reduction through value procurement strategies to efficient and effective flow of operation. However, this paper expected to introduce the new model for illustrate the new approach for supplier – buyer relationship to increase value percentage as well as to reduce the defects percentage with the integration of procurement 4.0. This framework describes how the pillars of procurement 4.0; i.e. designing competitive value chains, leveraging supplier innovation through collaboration, deploying digital transformation and creating agile organization can be integrated to build strategic relationship with suppliers in the procurement process to enhance the overall performance and organizational

efficiency that simultaneously lead improving customer experience and supplier performance of apparel industry while suggesting collaborative information systems and joint improvement research and development efforts to be implemented.
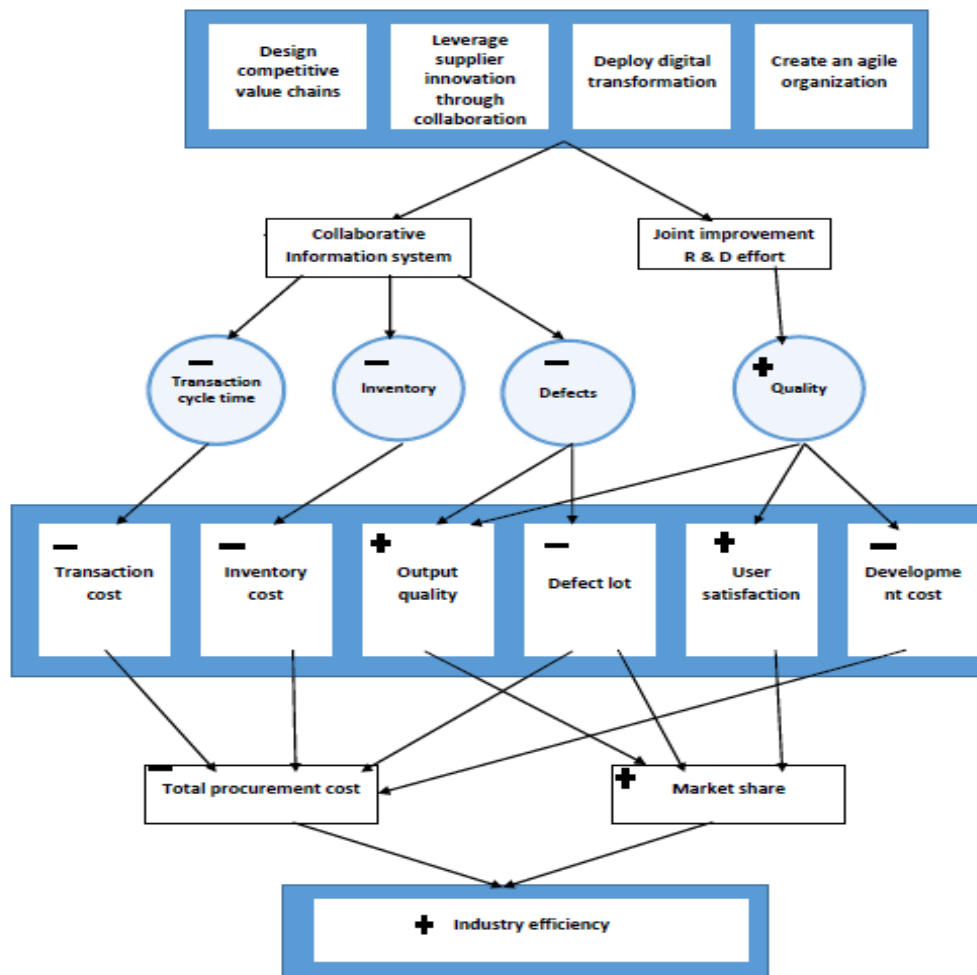

Figure 1. Conceptual model

New communication and information technologies such as EDI (Electronic data Interchange) can be used to enhance inter organizational coordination result in reducing transaction cycle time, inventory and defects. The reduction in transaction cycle time will result to reduce the labor time used in the process and the labor cost component of the transaction cost. Cost incurred due to use of information technologies are several magnitudes lower than those involved in manual processing and coordination. The lower incident of errors in a new system will reduce the need for labor for error resolution, thereby reducing transaction costs with less lead time for acquiring products, organizations can store less in inventory and increase inventory turns, leading to lower inventory costs. A business unit always try to deliver a defect free product which will fully meet customer expectations to the customer and to minimize order rejection. In the apparel industry manufacturers keep a huge defect lot in order to increase the output quality. This type of system which is accessible to both supplier and the manufacturer will forecast business demand effectively, require minimum effort, resolve complaints faster and reduce defect lot. Further suppliers gradually increase the volume of business may be enabled with the close and strategic relationships.

With the evolution of new technology and involvement of procurement 4.0 both incremental and radical changes can be found in apparel industry. Improved materials such as synthetic fabrics would be an incremental change and fabric developed using nanotechnology would be a radical change. In order to achieve organizational goals organizations

must concern about the adaptation for the changes. R & D investments may provide benefits after a certain period while increasing the operating cost in the short run would be an issue in this situation. A joint improvement driven by mutual interdependence can be suggested to overcome these confounding problems where the cost and expert knowledge can be collaboratively contributed. Further innovative solutions or technology enhancements can be conducted to reduce defects in the material where the supplier and buyer separately incurred then can be shared. This will increase output quality and user satisfaction while reducing development cost.

Success of apparel industry has lied on providing right quantity of quality outputs to the relevant customer on the specific time at a reasonable price. This framework will support that by reducing transaction cycle time, transaction cost, inventory cost, defect lot and development cost while increasing output quality and user satisfaction. These will reduce total procurement cost and increase market share that keep smooth flow of apparel production. In the long run, the efficiency of apparel industry is expected to be improved.

In future researches can be conducted to collect data for a comprehensive measurement of value gained by strategic relationship building with suppliers in apparel industry and can be extended for empirical verification of the frame work. Therefore, further research is needed to identify new trends in the apparel industry and innovation to improve the process, strategies and operations.

References

Ahmed Abouelela, H. M. (2005). Automated vision system for localizing structural defects in textile fabrics. *Pattern Recognition Letters*, 1435–1443.

Ajay Kumar. (2004). *Computer Vision-based Fabric Defect Detection.* New Delhi.

Andreas, H. (2016). The Impact of Industry 4.0 on Procurement and Supply Management. *International Journal of Business and Management Invention, Volume 5 Issue 6, PP—55-66*

Sri Lanka Export Development Board. (n.d.). Retrieved 2018, from http://www.srilankabusiness.com/apparel/

S. Gary Teng, H. J. (2005). A model for evaluation and selection of suppliers in global textile and apparel supply chains. *International Journal of Physical Distribution & Logistics Management*, 503-523.

Bienhaus, F. (2017). Procurement 4.0: factors influencing the digitization of procurement and supply chains. *Business Process Management Journal, Vol. 24 Issue: 4, pp.965-984*

Chandrasekar Subramaniam, M. J. (2002). A Study of the Value and Impact of B2B. *International Journal of Electronic Commerce*, 19–40.

Chang, H. (2013). E-procurement and supply chain performance. *Supply Chain Management: An International Journal, Vol. 18 Issue: 1, pp.34-51*

Chan, F. T. (2010). An AHP model for selection of suppliers in the fast changing fashion market. *Int J Adv Manuf Technol*, 1195–1207.

Cox, A. (2001). Managing with power: Strategies for Improving Value Appropriation from Supply Relationships. *The Journal of Supply Chain Management, spring 2001*, 9.

Deloitte. (2015). *Supplier Relationship Management (SRM).* Retrieved from Deloitte: https://www2.deloitte.com/de/de.html

Dimitri*, N. (2013). "Best Value For Money" In Procurement. *JournalL Of Public Procurement, Volume 13, ISSUE 2*, 149-175.

Fischer, M. (2017). Antecedents and Benefits of Supplier Satisfaction and the Influence of Segmentation and Status on Buyer-Supplier Relationships. *9th IBA Bachelor Thesis Conference,*, (pp. 1-24). Enschede.

Fred Lemke, K. G. (2003). Investigating The Meaning Of Supplier-Manufacturer. *International Journal of Physical Distribution and Logistics Management*, 12-35.

Gary Gereffi, O. M. (2003). *The Global Apparel Value Chain: What Prospects for Upgrading by Developing Countries?* Vienna.

Holger Schiele. (2006, November). How to distinguish innovative suppliers? Identifying innovative suppliers as new task for purchasing. *Industrial Marketing Management*, pp. 925-935.

Islam, M. M., Khan, A. M., & Khan, M. R. (2013). Minimization of Reworks in Quality And Productivity Improvement in the Apparel Industry. *International Journal of Engineering and Applied Sciences*, 147-164.

Kashiwagi, D. (2011). Best Value Procurement/Performance Information Procurement System Development. *Journal for the Advancement of Performance Information and Value VOL. 3 NO.1*, 12-45.

Keith R. Molenaar, N. S. (2010). A Synthesis of Best-Value Procurement Practices for Sustainable Design-Build Projects. *Journal of Green Building*, 148-157.

Lisa M.Ellaram. (1990). The Stargic Supplier Decisions in Strategic Partnerships. *Journal of Purchasing and Material Management*.

Lyn Fernando. (2002). *ADDING VALUE: BUILDING VALUE-ADDITION ALLIANCES Backward Linkages in the Textile and Clothing Sector – Sri Lanka.* Executive Forum on National Export Strategies.

Md. Mazedul Islam, A. M. (2013). Minimization of Reworks in Quality and Productivity Improvement in the Apparel Industry. *International Journal of Engineering and Applied Sciences*, 147-164.

Michael Essig, U. A. (2001). Electronic procurement in Supply Chain Management: An information EconomicsBased Analysis of Electronic Markets. *Journal of Supply Chain Management*, 43-49.

Paul R. Schapper, J. N. (2006). An Analytical Framework for the Management and Reform of Public Procurement. *Journal of Public Procurement, Volume 6, ISSUES 1 & 3,*, 1-26.

Su, J. (2013). Strategic sourcing in the textile and apparel industry. *Industrial Management & Data Systems*, 23-38.

Biographies

Rasanjani P. M. D. is an undergraduate, following B.Sc. (Hons) in Management and Information Technology specializing in Operations and Supply Chain Management in the Department of Industrial Management, Faculty of Science, University of Kelaniya, Sri Lanka. She has obtained the student membership of CILT (Chartered Institute of Logistics and Transport) and certified in Lean white belt in LASL (Lean Academy Sri Lanka). She is currently following CA in ICASL (Institute of Chartered Accountants Sri Lanka). Her area of interest in research are in capital markets and supply chain management.

Sachini W.W.N. is a university undergraduate, following B.Sc (Hons) in Management & Information Technology specializing in Business Systems Engineering in the Department of Industrial Management, Faculty of Science, University of Kelaniya, Sri Lanka. She has certified in Lean white belt in LASL (Lean Academy Sri Lanka). She has completed computer science degree programme in SLIIT (Sri Lanka Institute of Information Technology). She is currently following CGMA (Charted Global Management Accountant). Her research interests include Simulation, Optimization, and Supply Chains.

Sandamali G. A. S. is a university undergraduate, following B.Sc (Hons) in Management & Information Technology specializing in Operations and Supply Chain Management in the Department of Industrial Management, Faculty of Science, University of Kelaniya, Sri Lanka. She has obtained the student membership of CILT (Chartered Institute of Logistics and Transport) and certified in Lean white belt in LASL (Lean Academy Sri Lanka). Her research interests include Optimization, Supply Chain Management, Transport and Logistics.

Weerabahu W.M.S.K. is currently a fulltime lecturer in Department of Industrial Management, University of Kelaniya, Sri Lanka. She obtained her MBA in Management of Technology from University of Moratuwa in 2016.Her first degree was in Management and Information Technology, graduating with first class honors from University of Kelaniya in 2013. After finishing her first degree she worked in the industry for about four years as a SAP functional consultant for Camso GIT(pvt) Ltd, Associated Motorways (pvt) Ltd and Printcare PLC. She has gained expertise in material management, SAP workflow, Plant maintenance modules. She is also a visiting lecturer to other institutions in Sri Lanka. Her research interests include, Business Process Management, Process automation with Enterprise Resource Planning systems, Management of technology and supply chain management.