UGC & Govt. Approved
Sonargaon University [SU]
সোনারগাঁও ইউনিভার্সিটি (এসইউ)

Dhaka, Bangladesh

Thesis Paper
On

GREEN SUPPLY CHAIN MANAGEMENT IN READY MADE GARMENTS (RMG) SECTOR OF BANGLADESH.

Submitted by:
Md. Samaul Huque
Student ID: EMBA 2201025010
Program: EMBA, MSCM-Major
Semester. Spring 2023

Submitted to:
Department of Business Administration
Sonargaon University

Program: Executive Master of Business Administration (EMBA)
Major: SUPPLY CHAIN MANAGEMENT (MSCM)
Semester: Spring-2023

Date of submission:

Date: 13-May-2023

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Submitted by:
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Student ID: EMBA 2201025010

Program: Executive Master of Business Administration (EMBA)
Major: SUPPLY CHAIN MANAGEMENT (SCM)
Semester: Spring-2023

Supervised by:
Professor Abul Kalam
Department of Business Administration
Sonargaon University

Date of Submission:

Date: 13-May-2023

LETTER of TRANSMITTAL

Date: 13-05-2023

To

Abul Kalam
Professor
Department of
Sonargaon University

Subject: Submission of Thesis Paper on Green Supply Chain Management in RMG. **A Case Study on Orion Group of Companies".**

Dear Sir,
With humble honor and respect, I am submitting my dissertation report on "Implementation of Green Supply Chain Management in Ready-made Garments (RMG) Sector of Bangladesh". I have written this report based on my experience in "Orion Textiles & Garments, Sister Concern of Orion Group" as per partial accomplishment of the requirements for the MSCM degree, this dissertation has been carried out under the supervision of you.

This report is an integral part of our academic courses in completion of the MSCM program which has given me the opportunity to have an insight into the Implementation of Green Supply Chain Management in Ready-made Garments (RMG) Sector of Bangladesh. I hope this report reflects on the contemporary issues on the risk management that are being practiced by organizations in our country.

In completing the report, I tried my best to blend all my knowledge, experience and imparted every available detail and also attempted to avoid unnecessary amplification of the report.

I humbly request you to accept this report for your kind evaluation.

Sincerely yours,

Md. Samaul Huque
Student ID: EMBA 2201025010
Program: EMBA-MSCM Major
Department of Business Administration
Sonargaon University.

STUDENT DECLARATION

I hereby solemnly declare that the work presented in this research Monograph entitle " Green Supply Chain Management in Ready-made Garments (RMG) Sector of Bangladesh" has been carried out by me under supervision of Abul Kalam , Professor, Department of Business Administration, Sonargaon University.

I also declare that it has not been previously submitted as a whole for any other degrees at Sonargaon University or at any other institution.

.....

Md. Samaul Huque

Student ID: EMBA 2201025010

Program: EMBA, MSCM-Major

Department of Business Administration

Sonargaon University

LETTER of AUTHORIZATION

This is to certify that the Dissertation report titled "Implementation of Green Supply Chain Management in Ready-made Garments (RMG) Sector of Bangladesh" for the partial fulfillment of MSCM Program from Sonargaon University (SU) has been carried out by Md. Samaul Huque, Student ID: EMBA2201025010, under my supervision and guidance.

This report is a record of the bonafide work carried out successfully.

Supervisor

Abul Kalam

Professor

Department of Business Administration

Sonargaon University

EXECUTIVE SUMMARY

The core objective of the Dissertation is to fulfill the requirement of the in MSCM program as prescribed by the Sonargaon University. I have been working as a supply chain professional of Orion Textiles & Garments, Sister Concern of Orion Group in the last three years. The main objective of the dissertation is to get the hands-on experience of the real-world organization. The Dissertation was completed with the objective of getting practical knowledge in the Supply Chain Management department of Orion Textiles & Garments. Green supply chain management is the consideration of environmental issues in supply chain management. I have to participate a lot of supply chain management work of the organization. I realized that I was successful to gather a lot of significant learning experiences which would be helpful in my future career. The Supply chain department of Orion Textiles & Garments. Offered me ample space and opportunities, not only to learn but also to exhibit my skills as a part of supply chain management department. I could use my theoretical knowledge of Green Supply Chain Management in real practice while participating in many discussions. I was actively involved in the department meetings where I shared my knowledge and views regarding Implementation of Green Supply Chain Management Practices of Orion Textiles & Garments.

I also attempted to gather more information on basic job functions of other departments to have better understanding of the relation between them and the supply chain management department. It was commendable to see how wholeheartedly they welcomed, acknowledged and appreciated new ideas and knowledge. I have provided few recommendations based upon my understanding and knowledge. I successfully completed all the assigned duties and handed them over to the senior supervisor at the end of the Dissertation. I thoroughly enjoyed the challenges that came along every single day. I could also bring some minor improvisations during my professional life which were able to leave their marks. These lessons that I have learned will be a valuable one for my future endeavors as well

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INTRODUCTION

Introduction :

In Bangladesh, ready-made garment (RMG) is one of the biggest industries which are facing many challenging issues recently. The study aimed to analyses material, manufacturing, and distribution system and recovery procedures of RMG sector to apply green (sustainable) supply chain management. The study used primary data source. The interviewees are selected based on some specific standards. Interviewees are selected according to their position in management and job experience in RMG sector, transport companies engage with garment sector and third party companies such as Buying House. The sample sizes are four respondents which selected from executive level. Three respondents had more than 10 years experiences in RMG sector and a respondent had eight years experiences in Transportation Company engage with RMG sector. The garments had encouraged to find green designing of raw materials by using eco-friendly elements which not affect the environment. Moreover, the garments had proper use of the raw materials in their production process to minimize the waste of resources due to limited of natural resource.

The ready-made garments (RMG) industry is the number one export earner of Bangladesh. However, the industry contributed vigorously to what specialists depict as a water contamination calamity, particularly in the substantial modern regions of Dhaka. Many rice paddies are currently immersed with dangerous wastewater. In this manner, changes to garment production forms that influence sort and volume of emanating are important.

The dyeing industries (dyeing mills) has been criticized as being one of the world's most guilty parties as far as contamination. Bangladesh has now turned

into an important supplier of Ready-made Garments to both North America and Europe. There are 56.5% of Bangladeshi piece of clothing fares go to European Union and 27.8% to the USA. There are numerous dyeing factories in Bangladesh which are mostly situated at Gazipur and Narayanganj industrial zone. Moreover, these suppliers' mills or factories (dyeing mills) of garments industry basically situated near the banks of river. These factories deplete wastes directly into the river with no thought of the natural environment.

As green supply chain management (GSCM) also focus on sustainability of business. A study in 2015 in Bangladesh based on manufacturing sector (Ready-Made Garments) showed that Style Garden Ltd is over produced of 6% of items (ski jacket) from the aggregate request received by manufacturing plant unit while Fakir Apparels Ltd. and AJI Apparels Industry Ltd. are found to produce 8-10% of more items (tank top and shirt). Furthermore, in Mim Dresses Ltd. 0.5% over generation was found for request amount of one lac pieces, 1% for request amount between 20,000-1 lac pieces and 2% over manufactured for request amount under 5000 pieces. As per industry individuals which considered extra amount to bypass the probability of having short number of things because rejection of defective items during quality checking time. In this manner, overproduction produced a number of wastes and limited the benefit of the company. Holding up time and bottlenecks were observed to be for the most part regular in the sewing segment of RMG sectors because of absence of designing and wrong assembling format.

The ready-made garments (RMG) sector of Bangladesh is also facing infrastructure problem such as transport, utility and supply. The transportation

system used in that industry is not green conscious as well as not efficient which affect the sustainability of the entire industry. Purchasers are compelled to choose items from Bangladesh and congested streets, restricted inland transport options and absence of Remote Ocean harbour increased clothing lead time. Moreover, Port of Chittagong is the main transportation hub of international trade of ready-made garments (RMG) products. In additions, Port of Chitttagong also has lack of equipment to handle huge number of order from client and Dhaka - Chittagong train system offers limited capacity for cargo transporting.

The waste disposal from RMG sector also impacts the environment. The waste disposal is one of the biggest polluters on the planet from the clothing industry. There are 8,000 chemicals utilized to make raw materials into our garments and cloths. In knit-wear processing time, huge amount of small piece extra knit wear produced which has no value and harm to the environment. The study aimed to analyse material, manufacturing, distribution system and recovery procedures of RMG sector to apply green (sustainable) supply chain management.

DEFINITIONS AND SCOPE

GSCM has been defined as follows:

Green supply chain management (GSCM) is the consideration of environmental issues in supply chain management.
"GSCM encompasses a set of environmental practices that encourage improvements to the environmental practices of two or more organizations within the same supply chain"

"GSCM is the process of incorporating environmental concerns into supply chain management including product design, material sourcing and selection, manufacturing, delivery of final products, and the management of product's end-of-life"

"GSCM is the integration of environmental concerns in the inter-organizational practices of supply chain management"

Srivastava (2007) defines GSCM's scope as ranging "from reactive monitoring of general environmental management programs to more proactive practices implemented through various Rs (Reduce, Re-use, Rework, Refurbish, Reclaim, Recycle, Remanufacture, Reverse logistics, etc.)." From an entrepreneurial perspective, entrepreneurial GSCM is a new approach to environmental management executed by green entrepreneurs across whole supply chains instead of thinking in terms of individual non-environmental firms. This new holistic view can integrate individuals, companies, and supply-chains of different entrepreneurs from various countries together in an environmental friendly way.

METHODOLOGY

The study has been used primary data source. In this study, primary data is collected by an organized interview of professionals from RMG sectors in Bangladesh. Besides, the qualitative method used to collect data in gathering information with the detail through interviews. Information and data which are used in this study has collected through several interviews.

Interviewees are selected according to their position in management and job experience in RMG sector, transport companies engage with garment sector and third party companies such as Buying House. The interview duration was approximately about 30 minutes. The sample sizes are four respondents which selected from executive level. Three respondents had more than 10 years experiences in RMG sector and a respondent had eight years experiences in Transportation Company engage with RMG sector.

This study had selected a respondent from transportation company because knowledge on sustainable and green transportation. Meanwhile, other respondents were RMG sector with knowledge sharing on green raw materials, green manufacturing, and recovery procedure to implement sustainable operational task or business. The interview question validity and reliability toward study was observed by supervision of professor in the faculty. Descriptive analysis method was used to analyze data, draw the foundation of the results and finding by interviewing. The data and information were justified frequently and responsively to understand the findings. The understanding of the interviewees perception was imitated the conceptual framework. Moreover, the data and information during interview session was reflected the study question.

Profile of the Organization

Overview

ORION GROUP is one of the leading industrial conglomerates in Bangladesh over the years. With the support of a highly skilled management structure and 18000 dedicated professionals, ORION has achieved a degree of success that is unparalleled in the country's business history.

Company Chairman

MOHAMMAD OBAIDUL KARIM

Born on : 27 December 1954
Born in : Brahmmanbaria, Bangladesh
Occupation : Leading Industrialist / Entrepreneur
Position : Chairman, ORION GROUP
Address : Orion House, 153-154 Tejgaon Industrial Area, Dhaka-1208, Bangladesh

ACHIEVEMENTS

Mohammad Obaidul Karim is the Founder Chairman of ORION GROUP, one of the largest business conglomerates in Bangladesh. He is an innovative, self-motivated and enterprising Bangladeshi business icon who has instrumented his success in the field of diversified business portfolios.

Mohammad Obaidul Karim is a maverick trailblazer who laid the foundations of the Orion in 1982 in Bangladesh and has managed through his stewardship to build a successful business sphere of Orion Group with an annual turnover of US$350 million and employment of over 18,000 people on that foundation within 2013.

Company Director

Salman Obaidul Karim

Salman Obaidul Karim is a distinguished and ingenious businessman in Bangladesh. He is the Managing Director of ORION, one of the largest conglomerates in Bangladesh. Mr. Salman is one of the youngest successful entrepreneurs in the country, who has helped the portfolio of the Group to build category leadership in all its sectors.

Having graduated from the renowned Brunel University of London in 2005, he majored in Information Technology before undergoing a couple of professional trainings in the U.K. After completion of his graduation, he came back to Bangladesh and joined the family business ORION.

Vision of Orion Group :

"To be regarded as a world-class corporate house through products, services & values".

Mission of Orion Group :

Continuous development of people competency.

Values

The importance of commitment, integrity and responsibility towards development are implanted in us. At Orion Group, we strongly value and prioritize business ethics, employee empowerment, the advancement in technology and preserving the nature through our functional activities; combined together to deliver the finest. We emphasize on the livelihood and the smiles that it brings forth of all individuals associated with the Evince Family.

Board of Directors of Orion Group :

Mr. MOHAMMAD OBAIDUL KARIM, CHAIRMAN
Mr. MRS. ZAREEN KARIM, MANAGING DIRECTOR
Mr. MRS. ARZUDA KARIM, DIRECTOR
Mr. SALMAN OBAIDUL KARIM, DIRECTOR
Mr. MRS. HASINA BEGUM, DIRECTOR
Mr. MR. MD. SHAFIQUR RAHMAN, INDEPENDENT DIRECTOR
Mr. Mr. A. N. M. Abul Kashem, INDEPENDENT DIRECTOR

Valued Customer : Orion Knit Textiles Ltd.

We basically work on FOB basis. Our products are being made as per buyer's own design, Measurement and size. Fabric Accessories, Poly, Print and Packing remains under buyers own choice, though we arrange through our own sources. Products are 100% checked and inspected before packing in our finishing department.

Aim of the Company

- To deal fairly, open and honest with all employees, customers and suppliers.
- To value and support each other contribution.
- To always obtain the best value from the resources available.
- To achieve and maintain position of world class manufacturing.
- Continuous development of people competency.
- Recognizing individual contribution.
- Introducing new and innovative products and technologies.
- Assuring quality products from advanced manufacturing facilities.
- Exceeding customer satisfaction and granting trust through quality services.

Moreover, the Management and Employees of Orion Knit Textiles Ltd Ltd works to implement quality in all steps of their activity starting from selecting raw materials through all steps of productions to the ultimate finished products.

Values

To achieve its aspired vision, Orion subscribes the following values:

- Live up to our commitments.
- Transparent and fair in all our dealings.
- Take initiative to exceed standards.
- Trust and respect to each other.
- Work as a team.
- Share social responsibility.

Code of Conduct

- Prohibition of child labour.
- Prohibition of forced labour.
- Provide salary and wages within first 07 working days.
- Wages and leave facility according government laws & legislation.
- Working time 8hours.
- Keeping record of each employer.
- We provide medication & general health care requirements, pick and drop facilities, maternity leave, to our workers.

Machineries Details

Dyeing & Finishing Unit

As a key process unit, the dyeing and finishing section have been set by the latest state of machinery. Our plant is OEKO-TEX and Aero free certified. All dyeing machine are high temperature & high-pressure.

Dyeing Production capacity: 13,000 kg of Fabrics per Day.

Quality Control & Assurance : Orion Knit Textiles Ltd.

OKTL has honed its Quality Control System, which is comprised of thorough material, process and product checks. By remodeling & refining the system continuously, OKTL features now a unique capability in terms of industry-low rework and repair rate, thereby high quality product in quickest possible time. Rules like "fit for purpose" and "do it right first time" is not mere slogans rather deeply embedded cultures in Base. As a result, OKTL can meet whatever AQL requirement is placed by the value-savvy clients. OKTL succeeds because of its strict adherence to ethical business practices in dealing with its clients, suppliers and other stakeholders. Base's capability to extend short lead-time is being possible because of the mutual trust and commitment it shares with its suppliers.

Surface Area: Five Acres of land area and a total of 183,000 square feet of factory premises.

Floor Area: Garments Factory Area: 70,000 Sq. Ft. Production Space for Fabrics Dyeing & Finishing: 83,000Sq.Ft. Storage, Utility and others: 30,000 Sq. Ft.

Research Background

Research Background

Bangladesh is one of the leading exporters of RMG in the world. RMG industry is an economic propeller of Bangladesh and accounts for 76% of total export earnings and over 2.5 million direct employments of which 80% are women. Moreover, the industry has grown from 31.57 million US dollar business in 1983 to 10699.8 million US dollar during 2008 (BGMEA report 2007-2008). Because of enormous economic importance in the economy of Bangladesh long term sustainability in RMG supply chain is necessary. Besides, the RMG supply chain is facing a climax situation owing to myriads of challenges such as labour unrest for violation of human rights, poor wages, poor safety measures and hazardous working environment; environmental pollution, political instability, interruption in utility supply especially power shortage, inefficiency in customs and port management,

exchange rate fluctuation, warehousing problem, disruption in supply of fabrics and other accessories in time, increased competition, inefficiency in operation, (Chowdhury et al, 2012; (Islam and Deegan, 2008), Haider, 2007; Majumder 2001). The buyers, NGOs, Government, media and other stakeholders often express their concern for the working environment in RMG industry of Bangladesh. The recent incidence of fire in Tazreen fashion near Dhaka and loss of life of 112 workers has caught the attention of international media. For example, Washington post headlined the incidence as "THE TRAGEDY: A garment-factory blaze in Bangladesh this Saturday killed at least 112 people" (www.washingtonpost.com). World's largest fashion site fibre2fashion posted that more than 120 workers killed in Tazreen fashion in recent fire blaze and two years ago, a transformer blast had killed at least 117 people at a clothing factory in Dhaka. It also mentioned that over 500 people have lost their lives in fires at various apparel units across Bangladesh in the last 5-6 years (www.fibre2fashion.com). The buyers are criticized by the media and consumer groups due to sourcing from noncompliant factories and sacrificing social and environmental quality to reduce cost. For example, Wal-Mart was criticized for sourcing from Tazreen fashion and after the incidence of fire which is a reputation loss for both of Wal-Mart and RMG industry of Bangladesh. Further, increased lead time and cost due to disruptions in procurement and shipment of goods (Nuruzzaman, 2009) lack of linkages and co-ordination among related industries in the value chain and dependence on imported inputs and limited variety finished products (Quashem 2002; Ahmed 2011), fall of order because of global economic downturn (Chowdhury et al. 2012) are issues of high concern for RMG supply chain of Bangladesh.

LITERATURE REVIEW

9.1 Sustainability

As the time passes the concern for sustainability is growing. There are a number of factors that are responsible for a high level debate about sustainability; for example, supply and demand characteristics of energy consumption, concern for climate change, and demand for transparency regarding the environmental and the social performance of organizations (Carter and Easton, 2011). Scholars focused on different dimensions for achieving and improving sustainability but the most widely used dimensions can be found in the triple bottom line concept of John Elkington. The United Nations (UN) world summit 2005 also describes the three pillar of sustainability: environmental sustainability, social sustainability, and economic sustainability. These pillars or the "triple bottom line" served as a common ground for numerous sustainability standards in business, such as, Global Reporting Initiative (GRI), the Dow Jones Sustainability Index (Jones, 2005), and International Standard Organizations (ISO) 14001(Delai and Takahashi, 2011). Environmental sustainability refers the maintenance of natural capital (Goodland, 1995). Scholars argue that the depreciation of natural capital cannot go on endlessly (Lovins et al., 1999).

9.2 Measurement of sustainability

Stakeholders' demand for sustainability report generated the need for measurement of specific indices. As a result initiatives from different angles put forward to the development of specific indices and their measurement scale. Among those GRI, IchemE, DJSI, TBL and ETHOS corporate social responsibility indicators are related with business level sustainability indicators (Delai & Takahashi, 2011). Some indicators are commonly used in most cases for example, health and safety, wages, benefits, Hazard and safety, health, sanitation, forced and child labour, absenteeism, child labour and forced labour in the chain, compliance of health, safety and human rights by the suppliers are widely used social sustainability indicators.

9.3 Sustainable supply chain management

A sustainable supply chain (SSC) is one that "manage material, information and capital flows and cooperate among all entities in the chain with a view to achieve the economic, environmental and social goals deriving from customer and stakeholder requirements" (Seuring and Muller, 2008). To be responsible to stakeholders, environmental and social burden due to different stages of production need to be acknowledged. Therefore, focal firms of supply chains shall be held accountable for the environmental and social performance of supply chain members (Koplin, 2005). In this regard, branded companies sometimes come under pressure from stakeholders, such as government, activists, non-governmental organizations (NGOs) if there is problem in the chain (Seuring and Muller, 2008). Likewise, the branded apparel chains such as Nike, Disney, Levi Strauss, Benetton, Adidas or C&A have been accused few years back for problems in the upstream supply chain with respect to production of their clothing.

RESEARCH DESIGN

The field study has been conducted by employing qualitative method as the research paradigm (Zikmund, 2003). A semi-structured interview approach has been adopted in this regard so that the researcher may better understand the pros and cons of the research area. The review of the literature has provided the framework for initial development of the interview questions. The literature also helped in refining the interview questions so that it fits better to the actual situation. Once the method of collecting data is selected, it is obvious to select the samples. The sampling method used for thi study is a convenience non-random type.

10.1 Sample selection

Purposive sampling has been adopted to select the companies from the list of companies in the directory of BGMEA. The companies situated in Chittagong are considered for interview. Fifteen managers from middle and top management hierarchy have been chosen for interview. The supply chain managers and the persons dealing with supply chain functions of the organization where there is no supply chain manager have given priority for sample selection. The selection of all interviewees was based on personal contacts. Therefore, nonprobability sampling or convenience sampling is employed in this regard (Babbie 2001).

10.2 Data collection and recording

Once the sample selection is determined the interviewees were approached through telephone to take their interview schedule and eventually to participate in the field study. The response was encouraging as 15 of them out of eighteen have been agreed to participate in interview. The interviews were recorded with the permission of the participants and notes were taken throughout the interview. The interview duration was one hour and fifteen minutes on an average. The data were transcribed immediately after interview so that the senses and tunes of the interview are reflected properly.

4.3 Data analysis

In this research for analysis of the collected data from field study, content analysis has been used. From the content analysis the relationship between different constructs are explored. It is a good technique and widely applied in previous research for example, Xu and Quaddus (2005) employed it to examine the applicability of the qualitative data to transform into quantitative data for statistical analysis. NVIVO-9 software program has been used to facilitate the data analysis process.

RESULT AND DISCUSSION

RESULTS:

Material management is an important step in supply chain process of RMG sector. Basically, garments receive raw material from third party such as yarn mils and Fabrics Company. These materials had further justified for ensuring that harmless for environment. Garments had informed their suppliers to concern on the harmful material to avoid for produced yarn and fabrics or colour. Moreover, remnants materials was recycled for further use or reuse in manufacturing for producing other product and save the nature from hazardous waste.

Table 1. Factors in material management to ensure green supply chain management (sustainable) in RMG sector of Bangladesh.

Respondent	Explanation
Respondent 1	One important factor in material management was design the material with eco-friendly elements which not affect the environment and the profit of the garments.
Respondent 2	Most raw materials are received from third party suppliers by garments. Few garments had their own production house for produced the raw materials of knit-wear. Hence, important task for a supplier to ensure eco-friendly materials to distribute their garments to maintain a green supply chain material process. Moreover, there for garments to make proper raw materials usage to minimize the use of natural resources in order to long term use of limited resources.

Respondent 3	Suppliers have supplied the raw material for produced knit-wear in the garments. There was important to produce materials which are not a threat for human life and environment. Furthermore, short time material management also important for fulfilling the clients demand. The garments had to make sure smooth raw material supply process to increase business sustainability and established a green eco-friendly environment. Hence, the garments need to clarify raw materials with the suppliers and produced safe materials to secure human life.
Respondent 4	Raw materials were the heart of garments product as well as other products. In RMG sector in Bangladesh, raw materials came from abroad through seaport included factory that produce the raw materials of knit-wear. Hence, a green material management system implementation, it's important for local and foreign suppliers to produce and supplied eco-friendly materials in order to produce garments product. Moreover, garments need recaptured value from used materials such as yarn and colour and make reuse in production process. Garments could follow Levis's plan "8 bottle = 1 jeans" by utilized plastic wastage and saved the environment as well as made valuable profit for garments.

Green supply chain process is mostly depending on raw materials. If raw materials are defected or against environmentally friendly, hence there was impossible to build a well-organized green supply chain management in the garments. Manufacturing process was main task which ultimate product is transformed in garment industry.

Table 2. Factors in manufacturing process which ensure green (sustainable) supply chain management in RMG sector of Bangladesh

Respondent	Explanation
Respondent 1	Manufacturing process was contributed to the green supply chain system by applied efficiency in operational task. If workers in manufacturing department used minimum level of machineries, hence the cost effective and energy efficient which contributed to less resource utilization and sustainable of the operation. Worker safety is an issue of green system since impact the quality of human life. The important for garments to ensure worker safety. The workers who worked without any hesitation which increased output. Hence, these contributed to business efficiency and sustainability.
Respondent 2	The garments had concerned on minimum resource usage and gained maximum value. Moreover, the garments also concerned on eco-friendly environment maintenance within manufacturing area. Manufacturing plant design based on green factory concept which helped the environment. Machineries used in garments such as sewing machine. Some small garments were using manual sewing machine which did not need any electricity with less time consumption. Hence, the garments could decide which machine types based on client demand to ensure green safety and business sustainability

Respondent 3	Waste management is an important factor in green manufacturing process. In every processing time for producing a specific item, lots of yarns, fabrics and extra clothes are left or remain. The garment had utilized these remnants material to further used in manufacturing and made more product which helped the garments for decreasing production cost and reduced waste which helped the environment from pollution.
Respondent 4	The workers are worked in manufacturing department's plays important role for the garments. Lead time of product delivery depends on the manufacturing workers. The garments had effective use their workers by giving proper training on specific task which contributed to work efficiency and save times that lead a garment to fulfil the client's demand. Moreover, the garments had better use their resources and ensure workers security to meet the environmental and social responsibilities.

Bangladesh is an international player of RMG products which their garment products are distributed to various countries all over the world. Most of the trade of this garment product are done through seaport (Chittagong Port). The garments of Bangladesh use combined transport (Intermodal Transport) to delivery products to their clients. The garments thought its reverse logistics system. There were many defective products found by buying house (third party between buyer and seller).

Table 3. Factors in distribution system that implemented Green (sustainable) supply chain management in RMG sector of Bangladesh

Respondent	Explanation
Respondent 1	First garment sector need well-coordinated transport system which met the lead time of delivery and fulfil the customer demand just in time (JIT). The garments are situated at Gazipur district besides Dhaka and Chittagong port is situated far away in Chittagong district. Hence, it's important for Bangladesh garment industry for effective road usage for transportation garments products and saved valuable time for delivering goods.
Respondent 2	The garments is important to manage the product defective by receive and check for further improvement and resale in foreign or local market for reduced the loss and made minimum profit for the garments. This reverse process of defective product was cost effective and increased extra cost for garments. The vital factor of reverse logistics system was checked the defective product very clearly and if the product had no value of utilization then proper disposal to save the environment.
Respondent 3	Distribution was an important task for garments industry. The garments had designed a well-organized distribution system to achieve the customer demand which helped the business

	sustainability. The garments had to think about green transportation. Vehicles which are using in garments industry for delivering products are affected the environment by releasing CO2 gas. Furthermore, these vehicles consumed huge amount of fuel to delivery products. Hence, the alternative plan had created such as electric vehicles usage. In future green vehicles have applied to delivery products which saved environment and reduced consumption of natural resource such as fuel and oil. In additions, vehicles have used converted natural gas (CNG) instead of fuel which reduced air pollution
Respondent 4	Transportation is the important factor in distribution system of RMG industry. Cost effective transportation lead a garment to make more profit and fulfilled the business sustainability. Garments have minimized the number of delivery by effective use of order processing and distributing. Moreover, diver also plays vital role for saving fuel oil by treating the engine with its best outcomes and make effective use of road system. In garment business, lots of defective products are produced due to lack of skilled workers or machine failure. These defective products had gathered in cost efficient way with further improvement and reuse or resale in market to reduce wastage as well as save environment and make minimum profit.

In garment sector recovery was divided in two types includes product recovery and machine recovery. There are lots of extra clothes piece left while sewing a knit-wear in manufacturing garment product manufacturing. Recovery also played important roles for green supply chain process in RMG sector. A smooth recovery procedure made a garment to effective use of production activities.

Effective use of waste materials produced from a knit-wear cost effective for production. Recycling and reuse are vital points of recovery for any garment to establish a green supply chain system. Every garment should reuse their remnants piece of clothes for save the environment.

Table 4. Factors in recovery procedure which ensure Green (sustainable) supply chain management in RMG sector of Bangladesh

Respondent	Explanation
Respondent 1	The garments was reused the remnants clothes piece by further utilization such as use in inner pocket of a pant or jacket. However, these remnants clothes had no value and made proper disposal for these valueless items in order to save environment. On the other hand, garments also faced machine failure in production process. Moreover, the engineers had divided the part and collected valuable parts which the collected valuable parts with good condition will use in another machine. A proper recovery procedure of machines leads a garment to reduce its cost of production and increased the efficiency in operational activities.
Respondent 2	Moreover, a well-organized recycling system saves the nature from hazardous materials. If the garments recycled its raw materials from wastage, hence less material are needed from supplier. This result is contributed to the profit of the organization as well as ensures minimum use of resources which contributed to the eco-friendly world.
Respondent 3	Moreover, the wastage from production of knit-wear is dispose properly in safe zone which not spread out to environmental system. If garments made proper utilization of their waste materials that minimized their production cost by

	reusing the remnants items and made good profit for garments. Furthermore, this result leads a sustainable business in competitive market.
Respondent 4	In garment sector, smooth recovery procedure has applied to ensure green supply chain system. The management need to think on reuse of remnants materials which produced from knit-wear. There are various chemicals types left behind while produced fabrics or colour. These chemical types are harmful for natural environment as well as human health. The management was utilized these hazardous chemicals by reused and made proper disposal which secured the environment for living and reduced the cost in production process that contributed to the business sustainability.

DISCUSSION:

Material management was major factor for implementing the green supply chain management in RMG sector of Bangladesh. Raw material was key factor for any garments to produce the final product. The garments have encouraged finding green designing of raw materials by using eco-friendly elements which not affect the environment. These eco-friendly raw materials is produced from natural cotton, cotton produced using hemp, bamboo or soy strands [7].

Suppliers supply the raw material for producing knit-wear in garments such as yarn and colour (fabrics). Hence, there was important in produce materials which are not a threat for human life along with environment (Respondent 2 and Respondent 3). Some raw material was used for several times.

Besides, the garments sectors had concern on this factor by recaptured value of its used items in manufacturing process [8]. Raw materials such as yarn and fabrics were used second time after using in producing knit-wear (Respondent 4). The natural resources were limited in nature. Hence, the garments or supplier required to make sustainable system by which received or provided raw materials in a long-term process. Moreover, the garments had proper use of the raw materials in their production process to minimize the waste of resources because of limited source of natural resource (Respondent 2).

Manufacturing was the process of transforming raw materials into finished goods. However, a green manufacturing system was needed to implement in RMG sector in order to establish a green supply chain management system. Manufacturing process was main task for garment industry. In manufacturing process the ultimate product is transformed. The garments had concern on

minimum resources usage and gain maximum value such as effectiveness in equipment utilization and energy using in manufacturing process in garment (Respondent 1 and Respondent 2).

Distribution managements were a major factor for RMG sector. If the product did not deliver at the right time, person, quantity and quality, the customer might dissatisfy pertaining to the service.

Transportation plays important role in whole supply chain system. The transportation system also needs combined (inter modal) transportation system in order to make effective use of all three routes (air, sea and roads). Sustainability of product base business mostly depend on the efficient use of inter modal transport system. Moreover, the vehicles used in transport system for delivering goods also make impact on green supply chain system. Besides, the gas emission also increased the global warming which was harmful for human life as well for entire eco system. Green transportation has brought electric vehicles into their fleets which are less harmful for environment and required less fuel oil to transport goods.

Respondent 1 mentioned that the garment sectors and the seaport are located at different places.

The garment sector of Bangladesh needed to establish a well-organized intermodal transport network to distribute product to the client. Cost and green issues are important factors for transporting goods to its clients for ensuring green supply chain system. Driver also plays vital role in transportation system by effective use of engine power and minimum use of fuel energy. Respondent

3 mentioned vehicles are a great producer of CO2 which affect the entire environment. Converted Natural Gas (CNG) also used for ensuring green transportation in distribution system of Garment Product.

Reverse logistics is important factor for implementing green supply chain management. There is process of recapturing value from defected or return goods and further utilize in order to minimize the wastages and resale them in market [9].

Meanwhile, Respondent 2 mentioned that reverse logistics is important for any garments to ensure green supply chain process. Many defective items are produced in production process because of less skilled workers and lack of effective machines outputs. The garments has managed these defected products in cost efficient way and make further improvement in order to recapture value from them and resale them in foreign or local market.

In general, recovery meant repairing process on any defected product for further use. In recovery system, there are two main factors such as recycling and reuse. These two factors are important for implementing green supply chain system.

The recycling procedure started with the sorting of gathered materials as per there condition [6].

The materials are impossible to recycle in manufacturing process that items are sold to the flocking industry for rebuild and reuse purpose. In garments sectors, lots of remnants pieces of clothes are produced while making knit-wear. These

extra pieces of clothes should be further used to reduce production cost and save the environment from waste materials.

Reuse meant use any waste item for same or different purpose with no physical or natural change.

Reuse has both ecological and financial benefits for any organization. Some garments materials did not decompose with the soil which affected fertile system of land as well as the entire environment. In textile industry, various types of hazardous chemicals are left behind for producing fabrics or colour.

These chemicals are harmful for entire eco system. The garment or textile industry had reused these hazardous chemicals in fabrics manufacturing process and made proper disposal of these chemicals if these had no value to make eco-friendly environment and increased sustainability in production process by effective use of waste materials.

12.1 DISCUSSION IN THE LIGHT OF PROPOSED MODEL

Based on the findings of this paper a comprehensive model of Sustainable supply chain management (SSCM) has been developed which is shown in Figure-1. The inputs of the model are the factors and variables derived from the findings of the field study (shown in table-2) most of which are justified by the literature (shown in table-3). The model represents that for achieving sustainability, supply chains, specifically, the RMG supply chains of Bangladesh, need to comply with social, economic, environmental and operational compliance of the buyers and other stakeholders. This can be linked with the stakeholders' requirement of maintaining balance among social, environmental and economic interest as per stakeholder theory (Freeman, 1984). It is revealed from the field study that RMG manufacturers and the suppliers are conscious about some of the important social and environmental

factors which are highly emphasized by the buyers. For example, regarding wage, child labour, force labour, fire safety, and free from using hazardous material most of the respondents are serious. However, compliance of these issues is still needs to be governed properly so that incidences like fire, loss of life due lack of safety and labour unrest shall not occur time and again. Apart from the compulsory compliance issues, other social and environmental factors are not much observed by the organizations in general except the large and reputed organizations.

Along with the factors and variables of sustainability, some important relationships among the factors have been extracted in this study and included in the comprehensive research model. The existing literature supports that there is a positive relation between social and environmental sustainability with economic sustainability (Carter and Rogers, 2008). However, empirical evidence of these relationships is rare. The relationship between social compliance and operational compliance; operational compliance and economic sustainability; economic sustainability and social compliance are not exposed before by the existing SSCM models. The proposed model extends the traditional triple bottom line components and it explores some new relationship among the sustainability components which are mentioned above. Moreover, the other models are mostly developed based on conceptual study and very few of those have theoretical foundation but this model is based on empirical study and has theoretical base.

LIMITATIONS AND DIRECTIONS FOR FURTHER RESEARCH

Our study has some limitations which open opportunities for further research. Limitations of this study are inherent 1stly, in the chosen method of conducting the study. The study is based on case study which needs an empirical verification by survey research to prove the external validity of the SSCM model developed in this research. The researchers attempt to further examine the comprehensive SSCM model by taking quantitative research method through empirical surveys. Structural equation modelling (Barclay et al., 1995) will be used to test the relevant proposed hypotheses. Another limitation of this research is, it considers only the measurement components of Supply chain sustainability while the antecedents of supply chain sustainability, which are denoted as supporting facets of sustainability, such as risk management, transparency, strategy, culture (Carter and Rogers, 2008, 2011); inter-organizational resource and capability (Gold, et al 2010) are not included. A further research is needed considering the antecedents using other theories along with stakeholder theory

CONCLUSION

In conclusion, ready-made garment (RMG) sector was main exporter of Bangladeshi product to foreign market. This study had elaborated basic instruments of a well-established green supply chain management system in RMG sector of Bangladesh. Moreover, many businesses are shut down their activities since high production cost. Hence, there is important for RMG sector to apply green activities in their supply chain system to use effectively resource and save the nature from uncertain pollution which leads to sustainable business and eco-friendly world.

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