

An Analysis on the changes on Supply chain flow on post covid-19 pandemic era: A Case study on RMG Industry in Bangladesh

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Abstract

Epidemic COVID-19 has severely affected the global garment industry and paralyzed the supply chain management of the garment industry. This study has been conducted to understand the impact of COVID-19 on the supply chain management flow of the garment industry. Data were collected through direct interviews among 17 industry expert groups and direct surveys among 38 RMG employees. The study found that the epidemic had severely affected the supply chain system of Bangladesh's RMG industry and affected the entire supply system through supply management. The supply chain management components have been fully analyzed on the basis of survey results through statistical analysis and it has been observed that the major components of the supply chain correlate with each other, affecting all of them due to one component flow obstruction. The supply chain management components have been fully analyzed on the basis of survey results through statistical analysis and it has been observed that the major components of the supply chain correlate with each other, affecting all of them due to one component flow obstruction. And in that continuity, it is going to be noticed that there will be inconsistencies between the supply chain flow after the epidemic. Some theoretical and practical strategies have been discussed.

Keywords: COVID-19; RMG Industry; Supply Chain Flow; Supply Management; Bangladesh

1. Introduction

The garment industry has played a pioneering role in the development of the industrial sector of Bangladesh. Though it took a rather late start in 1976 but it soon established its reputation in the world market within a short span of time. Bangladesh Garments Manufacturing and Export Association (BGMEA) is a national trade organization of garments manufactures. There is a staggering total of 4560 apparel factories in Bangladesh exporting apparel products in the global market. At present, Bangladesh ranks second in the world as the largest apparel business in which almost 80% is earned by exporting. The apparel sector in Bangladesh is continuing its positive trend in export earnings, fueled by value-added products and becoming a more popular apparel sourcing destination for Western retailers. one of the most significant things regarding RMG is it has empowered a huge number of rural and urban women. Alongside The “Made in Bangladesh” tag has also brought glory for Bangladesh, making it a prestigious brand across the globe.

Although supply chain is considered as one of the most important revenue generating sector for Bangladesh still this pandemic hits the supply chain flow of the RMG sector. There goes some clear assumption that the supply chain shift after the pandemic will determine the future of our RMG sector. Unfortunately, significant amount of knowledge gap regarding what will be happening in the supply chain process of RMG might create an additional burden to revive the industry. This study will find out all the necessary steps required to thrive the sector after a massive hit of the pandemic. From current situation, In the perspective of Bangladesh this study can help to find out the loopholes and area of improvement in the RNG industry of the country. Moreover, the strategic move that will be discussing as solution in this article can help to mitigate the loss due to the pandemic

2. Literature Review

2.1 Bangladesh RMG Industry:

The principal source of foreign export income for Bangladesh is textile and garment. This is the only sector that has consistency. After Liberation war all privately owned tactile mills were taken over than created a state-owned enterprise named Bangladesh textile mill Corporation (BTMC). But it didn't work according to the expectation. BTMC started to lose money in every year after fiscal year 1975-1976. In early 1980, all spinning mills belonged to state and state was owner of 85% of total textile industry assets. And after 1982 the sector was decentralized and mills were returned to the actual owners. Now this sector has become export dominated sector for Bangladesh. Bangladesh is now second largest apparel exporter of western brands. This sector represents 76% of total export income. Bangladesh exported 34.13 billion USD worth of RMG products in the 2018-19 fiscal.

2.1.1 COVID-19 Effect in RMG Industries:

COVID-19 not only effect the RMG sector but also whole country's economy. After detecting of first covid-19 patient in Bangladesh, the govt announced for lock down. As consequences, many factories could not run and the ultimate outcome is for the first time this sector break its upward consistency for cancellation of orders, shut down of small & medium factories, leakage of supply chain. In July 2020, earnings over that of last year declined by 11.74 percent.

2.1.2 Steps Taken by BGMEA in Response of COVID-19 Effect:

BGMEA, the parents Institute for all garment's manufacturers, has developed a guideline in response of Covid-19 effect. BGMEA has been appealing to the buyers to continue ordering. Some trade unions have asked for a shutdown of the factories, while most others are working with government bodies and BGMEA to ensure that the factories remain open and people have jobs and salaries. They are trying to ensure the safety of workers and already opened corona test center and corona hospital. BGMEA is inspecting the factories for ensuring working environment. Prime Minister Sheikh Hasina announced a stimulus package of Tk 5,000 crore for the export-oriented industry to overcome the impact of COVID-19.

2.2.1 Supply Chain Management in RMG Industries:

Supply chains are simply the process in which goods reach consumers from producers. In the garments industry, orders are made by end-retailers – an example is Walmart. This work order is then requested to suppliers, going through various agents. Ultimately, 60-90 days are kept for most knitwear orders, giving ample time to import raw materials from foreign firms. The time limitations in the garments sector means that orders are often fast paced – even the most minutes failure can result in a massive setback. Consequently, the advent of the pandemic has created significant issues for the garments industry, particularly due to its reliance on international trade and strict time constraints. One of the outright challenges in the supply chain is non-payment. The economic downturn caused by the coronavirus stuck various firms – first in China, and then to several other epicenters, such as the United States and Europe. The latter are key customers for the garments industry, and the economic downturn had resulted in several buyers cancelling their orders. The cancellation of orders had disrupted the supply chains for manufacturers: without the flow of payment, they were unable to provide wages for workers. Several completed orders were cancelled, causing further warehouse costs to manufacturer. In an effort to break even, firms are prompted to cut costs. In the long run, this may have several consequences in terms of compliances. Factories are expected to follow compliances set by buyers that often impose regulations such as safety and health. Strict compliance measures will definitely lose out as firms strive to cut costs.

a) Supplier: The producer of fabrics, packing, and accessories are mainly defined as supplier in garments industry. Fabrics items can be sourced from anywhere in the world but packing and accessories items most of time procure locally. During pandemic both local and foreign procurements are impeded.

b) Logistic: Logistics relates to one of the essential components of supply chain management. Inbound outbound logistics from manufacturers to retail houses Acts as a supply network. Under the pandemic situation, the logistics network in most of the world's industries, including Bangladesh, has been damaged like the rest of the supply components.

c) Transportation: At the same time, transportation has also seen significant shocks during the pandemic. Garments offers are often delivered maritime. The pandemic has severely limited the frequency of transportation. As a result, orders which would be moved via logistics are also at the risk of facing delayed movement due to lack of sufficient merit transport. Similar

to order cancellations, this issue persisting will pose significant challenges to manufacturers meeting time constraints.

d) Ultimate Buyer: Customer (who buys the products for ultimate use) is the most important point for value chain in garments industry. All the works has been done by keeping the customer is the middle. Due to pandemic situation the demands for garments goods have been declined.

2.2.2 Effect of COVID-19 in Garment Industries Supply Chain:

The RMG industry in Bangladesh is facing a serious crisis because of COVID-19, with virtual freeze on new business and mass cancelation of existing orders. As a result, the whole supply chain of Rady Made Garment industries has been affected fatally. As China has stooped the production, the other apparel manufacturing countries like Bangladesh apparel industry has shaken. Bangladesh export more than 50 percent of apparel raw materials from China, and about 40 percent of the machinery and spare parts for RMG industry. Manufacturing factories have to stop production for raw material shortages. A recent study result shows that, about 93 per cent of garment manufacturers in Bangladesh reported that they faced delays in raw materials shipments during the epidemic. As a result, supply chain management in almost all industries was completely disrupted due to production shutdown. The rest of the supply chain like industry logistics, warehousing, shipment, ordering, supply channel network has come to a complete standstill due to the complete breakdown of the production process.

The RMG supply chain management are frequently affected by various types of obstacles due to the Mismanagement of policy makers and the Adequate supply of raw materials in time. At present, as a result of COVID-19, the opinion has emerged that a little efficient of supply management, technological support, decision based on the opinion of the experts on the supply chain flow inconsistency will only keep the supply chain flow out of the overall unwelcome constraint.

3. An Overview of RMG Industries Supply Chain in Bangladesh

The findings of study have been discussed under the following sub-heads:

3.1 Bangladesh and Its Garment Industry:

Ready-made Garment (RMG), the big fish of the economy, is now export trade dominated industry for Bangladesh. Being the 2nd largest exporter, it creates about 4.2 million employment opportunities for the country. The competitive advantage in RMG is low production cost and ensuring best product quality. The eliminating of quota system by developed countries importing garments and rising labor cost in that decade impeded the growth of the industry in East Asian nations and created new opportunities for the sector of Bangladesh (Rashid, 2006). Huge labor force, skilled man power, Government assistance for textile and clothing, incentives for using of local inputs and international support are the main factors which has great influence on RMG Sector of Bangladesh. Since the nineties the sector has played the biggest role in the ever-growing export sector of Bangladesh (Bajlul & Naznin). In 2014-15, the total export of Bangladesh was \$31.20 billion where the contribution of RMG sector is 81.67% and the exported amount was \$25.48 billion. Most optimistic view is the growth is consistent for the following years. From 2014-15 to 2019-2020 the growth rate of total contribution was increased by 1.34%. It is shown that the market of RMG is expanding and Bangladesh is likely becoming the market leader. The statistical data of total export, total RMG export and percentage of total contribution to total export of year 2014-15 to 2019-2020 is shown as follow:

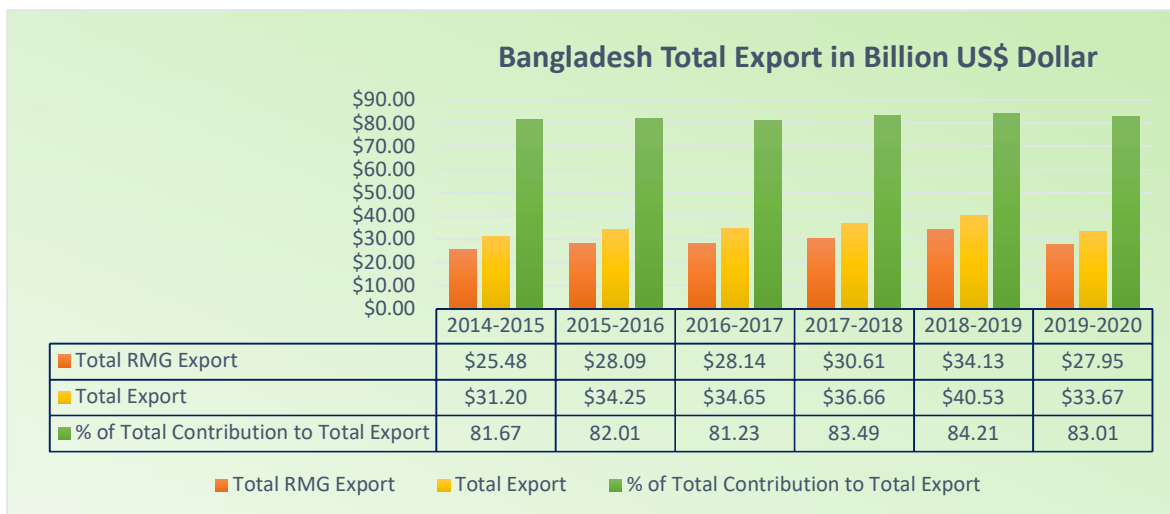


Figure 01: Percentage of total contribution to total RMG export (source: Textilefocus.com)

The main indicator of development of economy is garments industry in third world developing countries like Bangladesh. The RMG sector is the largest employer in the country and is considered the backbone of country's job market. In 1980, there were only 50 garments factories in the country and they employed a few thousands (Kabir & Mahmud, 2004). In 2012, there were 5400 factories in the country and employed about 4 million workers of whom 85% were women (Mahmud, 2012). For this reason, this sector is called single largest employer of women in the country. This employment of rural low-income women has given them economic freedom and increases their participation in the economic development of Bangladesh (Foujia, 2006). Bangladesh is now just one step behind to secure the leading position of top sourcing country hot spots within the next five years. The respondent percentage for Bangladesh is 89% and the difference between the immediate is 37%. The following data table shows the information about top sourcing country-

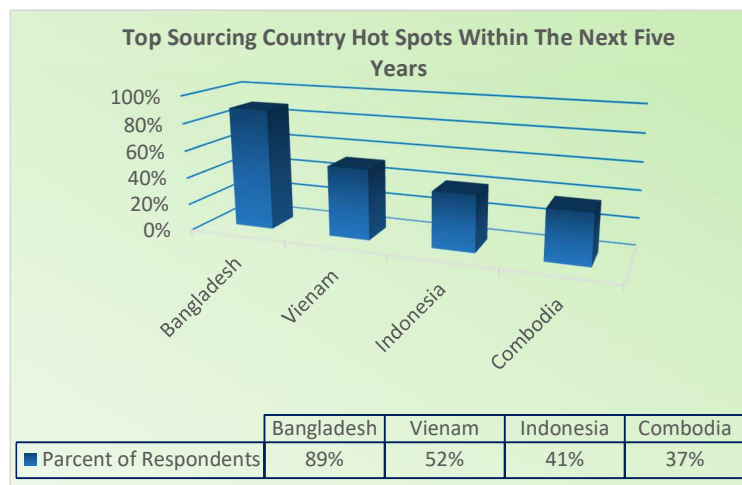


Figure 02: Top sourcing country within next five years
Source: McKinsey Bangladesh RMG Case Study

3.2 RMG Industries in Bangladesh are the Framework of the SCM Process:

Proper implementation of SCM (Supply Chain Management) is so imperative for RMG sector of Bangladesh to remain as competitive as present in the highly competitive global market. Struggling issues for Bangladesh is now ensuring quality, lead time of customer compering with other nations. The main elements of supply chain process in garment industry of Bangladesh are supplier, raw materials, garments industries, Payment, individuals, Finishes goods etc. The supply chain process starts with suppliers then manufactures, distributors,

retailers and customers or suppliers to service provider, customers and ends with consumers respectively. The customer satisfaction is the most concerning issue of the process of supply chain and the customers remain at the central point of all supply chain elements and trying to fulfilling the needs. The basic diagram of supply chain garment industry is shown as follow:

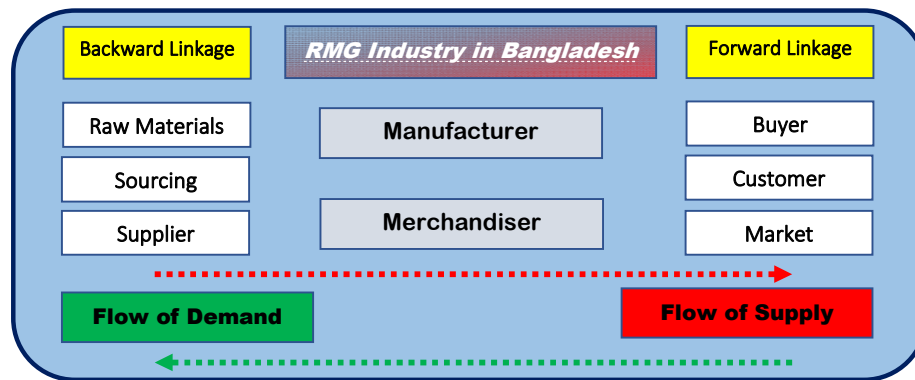


Figure 03: The basic Diagram of Supply Chain in Garment Industry (Tanvir & Muqaddim, 2013)

Domestic and Export are the main two groups of customers for textile industry in Bangladesh. With some prior assistance from distribution centers and logistics, the textile products can easily be delivered to the final customers. The process is given below:

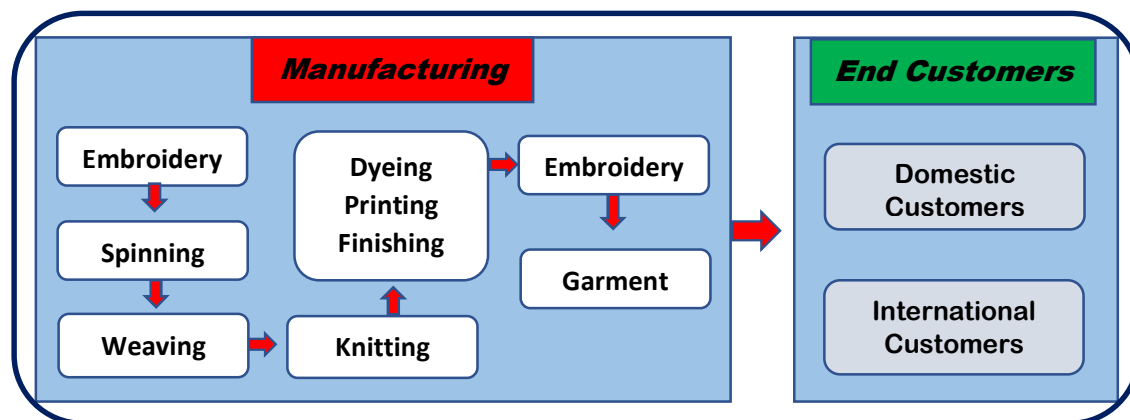


Figure 04: Process of producing textile products

RMG manufacturer are mostly importing the raw materials China, Indonesia, Pakistan and India. For the subject of competitiveness, it is putting negative impact because of longer lead time. However, in reality the trading process of garments supply chain is influenced by other key players in Bangladesh. For Bangladesh garment industry the exporting process generally connected with more entities in the chain which is depicted as follows:

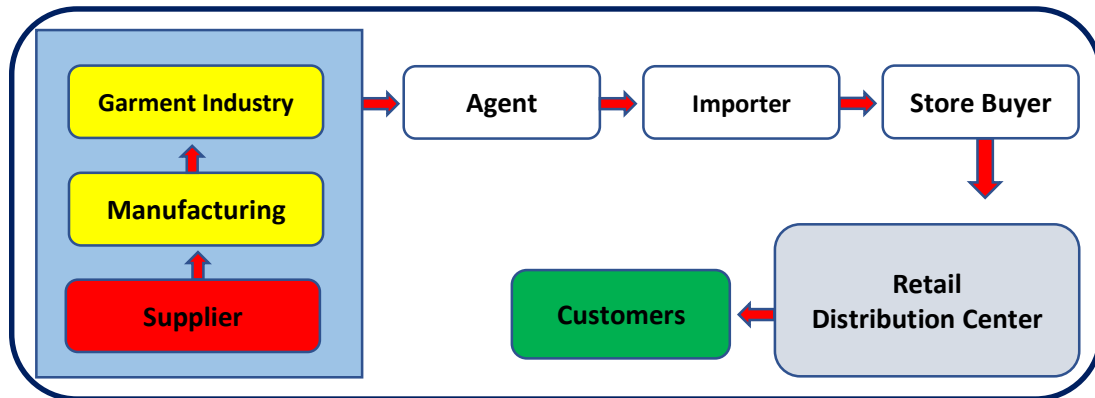


Figure 05: Related parties in delivery channel

Business value chain and the supply chain are very much corrected with each other in RMG business. Buyers basically control the whole supply chain process and play independent role. All the supply chain activities are individually related with buyers. From sourcing of raw materials supply chain process starts then follows designing and producing through to customer and creates an integrated production system. The supply chain activities in RMG industry of Bangladesh are shown as follows:



Figure 06: One stop service in the RMG supply chain (Sours: The financial Express, 2014)

3.3 Importance of the supply Chain Flow in the Growth of RMG Industry:

The most asking factors in today's highly competitive global marketplace from the customer are excellence and delivery time. Through cutting cost, improving delivery channels and increasing quality by the assist of supply chain management manufacturers try to increase their market value and try to ensure product quality and delivery time. For gaining their expected position their have to balancing between the common supply chain factors efficiency and responsiveness. In supply chain every single pieces of material is important. One small martial delayed or missing can put the whole order at stake. Schedule failure of only one single order can jeopardizes the whole plan. Line gap creates when supply of materials delayed in house. Following if the finished goods are not shipped on due time the factory has to pay the bill of back to back (BTB) L/C against bank loan at a high rate of interest. For avoiding delayed shipment factories often run overtime and use sub-contracts which increase the cost as well as violate the compliance. Proper implementation of supply chain in the RMG sector can minimize these problems. Supply chain management systems help in reducing inventories, operational cost, compress order cycle, enhance assets productivity as well as increase the companies' responsiveness to the market. Moreover, supply chain helps the manufacturing

factories to able to achieve quick response. Besides supply chain also helps to improve financial position of farm by increasing profit leverage through controlling and recuing cost, decreasing fixed assets through reducing large fixed assets and increasing cash flow through reducing delivery time. Supply chain also has some societal value also. Proper supply chain management is playing an arsenal role to improve quality of life by creating new jobs, decreasing environmental pollution, decreasing energy use and improving standard of living.

3.4 Problems of SCM Flow Towards Sustainable RMG Growth After COVID-19:

Now-a-days the RMG sector is facing many challenges that never faced earlier. Collapse of Rana Plaza or devastating fire of Tazneen fashions had raised the questions about the working environment of the factories. However, Bangladesh has successfully passed these challenges. Now the new concerning issue is how Bangladesh can overcome the post pandemic situation where many orders are canceling, losing the market and being difficult to run the small and medium farms. Many foreign investors are shifting their investment from Bangladesh. The pandemic has totally broken the supply chain flow of RMG sector. The manufacturers cannot import raw materials because they are mostly dependent on Chain for raw materials. Consequently, the unemployment is increasing because this sector provides around 3.5 million employment facilities. It can be said that Bangladesh is losing its prior position.

4.

Methodology

The information's on supply chain flow of Ready-made garments (RMG) industries in Bangladesh have been collected on primary as well as on secondary basis. The secondary data were collected from various publications i.e. books, journals, conference papers, annual and audit reports Bangladesh Garment Manufactures & Exporters Association (BGMEA), different websites etc. On the other hand, interviews of several group of industry experts, interviews of professionals and merchandisers of the garments factory were the primary data source. In this research quantitative and qualitative both methods have been used. The data collection, sampling, analysis process is highlighted in both the methods beneath:

Quantitative: In this method, data samples were collected from a total of 36 valid participants. Those who are directly connected with the garments industry. In recent times, data samples have been collected from them through Google Forms, phone calls, SMS and also WhatsApp. MS Excel, statical SPSS software has been used to analyze the collected samples in this method.

Qualitative: In this process data collected from Industry experts who are directly involved in the core management of the RMG organization and have made strategic decisions on behalf of the organization have been surveyed through group-based periodic questions. Interviewees in the survey included suppliers, planning directors, production heads, warehouse controller, communication executives. Interview data samples were collected mainly from interviewees time to time through direct phone calls, face-to-face conversation, emails. The data obtained has been analyzed by statistical software SPSS based on their independent feedback on the 5-Point Likert scale.

By using both methods how experts and Connected individuals think about the RMG production flow and whole supply chain model operated after COVID-19 pandemic are examined which are very relevant to this research.

5. Analysis and Interpretation

The analysis basically shows the data obtained in two parts separately. The collected data is divided into two sections in the analysis part. The interview and questionnaire data have been analyzed in “Survey-A” and “Survey-B” gradually.

5.1 Survey-A:

Industry experts who are directly involved in the core management of the RMG organization and have made strategic decisions on behalf of the organization have been surveyed through 16 group-based periodic questions. The seven essential components of supply chain management in the RMG sector were interviewed separately and their independent opinions were taken. They have been asked about the continuation of the impact of the COVID-19 pandemic situation on the supply chain management of the RMG sector in Bangladesh and its components. And their independent views have been accepted. The statistical analysis based on the opinions provided is shown below:

Working Experience Male and Female Crosstabulation				
		Male	Female	Total
Working Experience	01-03 Years	2	0	2
	03-06 Years	1	1	2
	06-09 Years	3	1	4
	09-12 Years	6	1	7
	12-15 Years	2	0	2
Total		14	3	17

Figure 07: Working experience of interview participants

Among the group of participants respectively, 2 males with 1-3 years' experience; 3-6 years of experience with a total of 2 males and 1 female; with 6-9 years of experience a total of 4 people, including 3 men and 1 woman, with 9-12 years of experience, there are 6 males and 1 female total of 7 participants. And in the last 12-15 years of work experience there are 2 male interviewees in the entire section including a total of seventeen peoples.

5.1.1 Reliability Statistics of Data Sample:

The internal consistency reliability for the 7-items an ordinal 5-point Likert scale from "strongly disagree" to "strongly agree" is judged based on the average inter-item correlation (AIC) analysis and calculating Cronbach's alpha are showing:

Case Processing Summary			
		N	%
Cases	Valid	17	100.0
	Excluded ^a	0	.0
	Total	17	100.0
a. Listwise deletion based on all variables in the procedure.			

Figure 08: Case processing summary of participants

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.874	.873	7

Figure 09: Reliability statistic of data set

Summary Item Statistics							
	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.227	1.941	3.824	1.882	1.970	.357	7
Inter-Item Correlations	.495	.048	.774	.727	16.252	.038	7

Figure 10: Summary statistics of variables

Here the case process summery is indicating valid participants total number 17. And the AIC for the 5-point Likert is 0.495 (minimum 0.048 to maximum 0.774) and Cronbach's alpha 0.874. Clark and Watson (1995) recommended the desired AIC range to be 0.15 to 0.20 for measuring a broad higher-order construct. Likewise, most statisticians agreed with the notion that a Cronbach alpha value of 0.70 as acceptable. Both the obtained AIC and alpha value prove the adequate internal consistency for the 7-item 5-point Likert and are consistent perfectly.

5.1.2 Analyzing of Data:

Through a number of questions and appropriate answers from industry experts, their views on various significant and revised components of supply chain management in the RMG sector due to the COVID-19 epidemic have been verified. The impact and changes of each component of supply chain management in the RMG sector as an epidemic are explained below through a statistical frequency analysis of the 5-point Likert scale 1= Strongly Disagree and 5= Strongly Agree in the entire interview approach.

Statistical Frequency Analysis of Variables							
	Q-01; Do you think that your supply channel is intact right now?	Q-02; Do you think that technology has taken over supplier management and procurement?	Q-03; Do you think that resource planning has been changed?	Q-04; Do you think that network planning is being influenced by COVID-19?	Q-05; Do you think that supply concepts will be changed after COVID-19?	Q-06; Does warehousing get affected through the pandemic situation?	Q-07; Is material flow getting changed during the COVID-19 outbreak?
N							
Valid	17	17	17	17	17	17	17
Missing	0	0	0	0	0	0	0
Mean	1.94	3.29	3.47	3.41	3.41	3.24	3.82
Std. Deviation	.659	1.160	1.007	1.064	1.064	1.091	1.074
Range	2	3	3	3	3	3	3
Minimum	1	2	2	2	2	2	2
Maximum	3	5	5	5	5	5	5

Figure 11: Frequency statistics between variables

Here are the descriptive statistical views of a total eight interview questions is developed on 5-point Likert scale “1= Strongly disagree to 5= Strongly agree”. The questions and answers based on the opinions of the interviewees showed their maximum and minimum response, Central Tendency i.e. Mean average value of their opinion, Dispersion of response Standard deviation and maximum and minimum ranges are showing as well. A total of 17 interviewees responded validly to the Frequency Analysis. And no interviews were left out of the Q&A. Thus, the missing participant value in all cases of analysis is 0 here.

In the response to the 1st Question we can see that a total of 17 peoples have responded. Among the 7 frequencies in 5-point Likert scale the mean value of 1st questions is 1.94 indicates the lowest value out of 7 frequencies. Which is showing disagree as the value of mean is nearly 2 on the scale of Likert. Dispersion of response of respondents according to Central Tendency i.e. Mean 0.659 outer side of the average mean value is close to the standard deviation approximate adoptable value 1. So, it can be said that the standard deviation state for each

response is not much poor. And the values of the maximum and minimum number of opinions in the question answer based on 5-point Likert scale are 3 and 1, respectively. The range from maximum to minimum value is 2 here.

Besides, everyone has participated in 2nd Question. In this case there are 17 valid participants. And the missing participant is 0. Here, in 5-point Likert scale the mean value of 2nd questions is 3.29 showing highly moderate value between 7 frequencies. Which is showing neutral condition of the frequency as the value of mean is more than 3 is a moderate average value on the Likert scale. Dispersion of responses according to Central Tendency i.e. Mean average value of responses 1.160. Which is more than standard deviation satisfying than adoptable value 1. So, the standard deviation state is quite higher in this frequency. on the other hand, the maximum value is 5 and the minimum value is 2. So, the maximum and minimum value range is 3.

In the 3rd question, 17 participants expressed their views. None of the participants are missing out on answers and feedback that's the reason missing value of valid participant is 0. And 3.47 is the mean value in Likert scale 5.0 pointing strong moderate value among all the frequencies. The value of mean indicate neutral condition of the frequency as the value is more than 3 and less 4 on the Likert scale.

Based on Central Tendency i.e. Mean dispersion value 1.007 order deviation of responses in this question more than standard deviation adoptable value 1 is pretty much better in this frequency. The maximum value is 5 and the minimum value is 2. So, the maximum and minimum value range is 3.

Question response 4 locate all the respondents are convey their response. Missing value of respondents is 0. In Likert scale its mean value 3.41, pretty high than other responses of supply chain components mean values. The value of mean in response four locate near Likert scale value 4. Mean value quite good in this component. And Central Tendency i.e. Mean dispersion value 1.064 order deviation of responses is an unique value can say because its more than standard deviation adoptable value 1. In the calculation, the maximum value of responses is 5 and the minimum value is 2 in Likert scale 5.0. So, the maximum and minimum value range is 3.

As all the interviewees respond in 5th question so valid participant missing value is 0 here. The mean value in this response is 3.41 a moderate value according Likert scale. Dispersion average value 1.064 denotes pretty high value of standard deviation among all the responses. And the maximum value is 5 and the minimum value is 2 in Likert scale 5.0. As well as, the maximum and minimum value range 3 is showing in this frequency.

All the interviewees participated in Question 6th, participant missing value is 0. In its continuity mean value of frequency is showing 3.24 quietly moderate value based on Likert scale from all the variance. And Deviation value from Central Tendency i.e. Mean dispersion average value is 1.091 higher than standard value of standard deviation adoptable average value 1. Standard deviation value frequency is quietly optimal in this instance. Maximum value 5 and minimum value of responses is 2, those range is 3 severally.

The participant missing value is 0 as all the interviewees participated in Question 7th. Frequency of the average response mean value is 3.82 higher than other frequency responses of supply chain components in this particular variable. The average response from Central Tendency i.e. Mean dispersion average value 1.074 of standard deviation is positively visualized according to (SD) adoptable average value 1. Standard deviation and mean value is more significant here. On outer side of variation maximum value strongly agree 5 to minimum value 3 neutral based on 5-point Likert scale and range of each value is 2.

The following summary of the average statistical variations of all graphic interview responses:

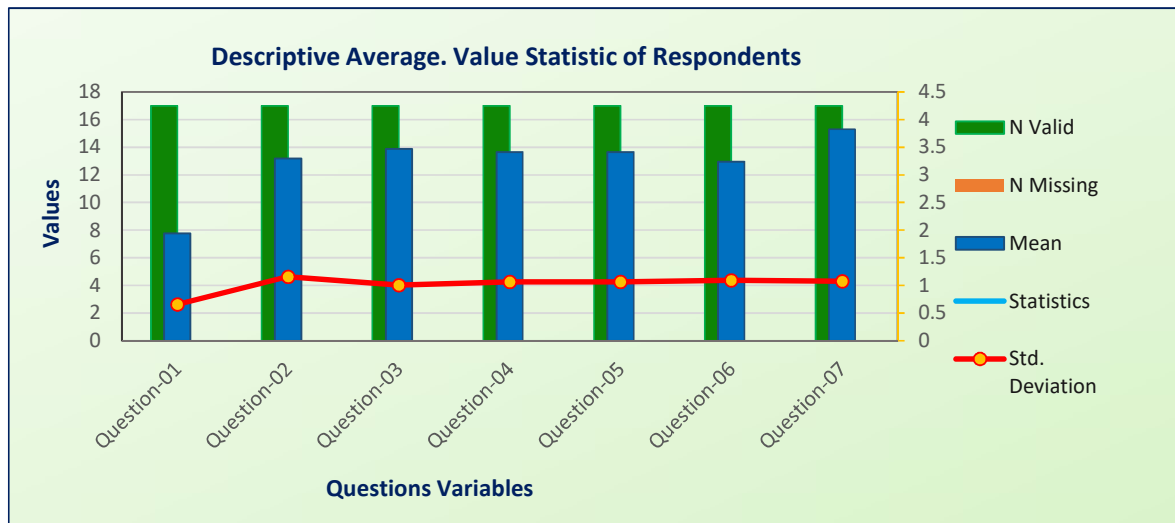


Figure 12: Average value respondents

Here in the graph, 17 valid participants are indicated by green mark without any missing value. The Central Tendency variance i.e Mean by Blue and the dispersion of response of respondent's variance Standard Deviation by the red mark. All respondents participated in each interrogation. The average mean value of question one is around 2.0 based on all the valid answers notable on the graph. Which indicates the 5-point Likert scale dissent sign. Also, since the standard division value is a little less than 0.1, the response to question one average statistical value is moderately acceptable. Exactly in this context, the experts have independently expressed their views in the interrogation from two to seven with an average mean value of around 3.50. And the latest response is showing a mean value of seven around 4.00. Even the outer side of mean which is the standard division value is denoting a positive indication as the standard deviation is greater than the standard acceptable value 1. Thus, the statical average response of mean values from two to seven are displayed positively pretty close to the value label 4.0 so, the mean value of the response to the queries on the 5-point Likert scale Indicates the 4=Agreed frequency.

5.1.3 Correlation of Valid Responses:

The valid participants of each variable are expressed by n. And each variable has all the valid

participants n = 17.
Figure 13: Correlations of respondent's variable

Correlations Between Respondents Variables								
		Question: 01	Question: 02	Question: 03	Question: 04	Question: 05	Question: 06	Question: 07
Q-01: Do you think that your supply channel is intact right now?	<i>Pearson</i>	1	.351	.421	.215	.126	.542*	.514*
	<i>Correlation</i>							
	<i>Sig. (2-tailed)</i>		.167	.092	.407	.630	.025	.035
	<i>N</i>	17	17	17	17	17	17	17
Q-02: Do you think that technology has taken over supplier management and procurement?	<i>Pearson</i>	.351	1	.623**	.605*	.048	.633**	.496*
	<i>Correlation</i>							
	<i>Sig. (2-tailed)</i>	.167		.008	.010	.856	.006	.043
	<i>N</i>	17	17	17	17	17	17	17
Q-03: Do you think that resource planning has been changed?	<i>Pearson</i>	.421	.623**	1	.683**	.333	.575*	.774**
	<i>Correlation</i>							
	<i>Sig. (2-tailed)</i>	.092	.008		.003	.192	.016	.000
	<i>N</i>	17	17	17	17	17	17	17
Q-04: Do you think that network planning is being influenced by COVID-19?	<i>Pearson</i>	.215	.605*	.683**	1	.393	.772**	.669**
	<i>Correlation</i>							
	<i>Sig. (2-tailed)</i>	.407	.010	.003		.119	.000	.003
	<i>N</i>	17	17	17	17	17	17	17
Q-05: Do you think that supply concepts will be changed after COVID-19?	<i>Pearson</i>	.126	.048	.333	.393	1	.503*	.505*
	<i>Correlation</i>							
	<i>Sig. (2-tailed)</i>	.630	.856	.192	.119		.039	.039
	<i>N</i>	17	17	17	17	17	17	17
Q-06: Does warehousing get affected through the pandemic situation?	<i>Pearson</i>	.542*	.633**	.575*	.772**	.503*	1	.624**
	<i>Correlation</i>							
	<i>Sig. (2-tailed)</i>	.025	.006	.016	.000	.039		.007
	<i>N</i>	17	17	17	17	17	17	17
Q-07: Is material flow getting changed during the Covid-19 outbreak?	<i>Pearson</i>	.514*	.496*	.774**	.669**	.505*	.624**	1
	<i>Correlation</i>							
	<i>Sig. (2-tailed)</i>	.035	.043	.000	.003	.039	.007	
	<i>N</i>	17	17	17	17	17	17	17
*. Correlation is significant at the 0.05 level (2-tailed).								
**. Correlation is significant at the 0.01 level (2-tailed).								

The internal constant rate for the 7-items the strength of a linear association between two variables is judges based on value $r = 1$ means a perfect positive correlation and the value $r = -1$ means a perfect negative correlation between two variables conversely and the Sig. (2-tailed) i.e. P value for this variable be measuring less than Sig. (2-tailed) 0.05 means particular correlation is significant and P value more than 0.05 is insignificant for the particular

correlation (Karl Pearson 1888) in that context, the internal relationship between the variables is shown:

Indicating the first variable, the correlation of question one with question one the correlation and significant value range is strongly positive and significant. Correlation and Significant Value of Question one with Question two are .351 and .167 which are moderately correlated but not Significant Variable as Significant Value is more than 0.05. Correlation with question one with question three correlation value .421 is pretty positive correlate having said that relation is not significant. Case of question one with question four and five is positively correlate still the significant value among them insignificant. Besides with question six and seven correlation range with one denotes strongly correlate and significant range of it below 0.05, so it statistically significant. In the case of variables of question two with question one consistent value .351 moderately plus and significant value .167 is higher than range 0.05. The correlation between question two with one is insignificant. Nevertheless, correlation between question two with question two is significant while its same coefficient variable. As opposite to consistency into question two with question three to seven being strongly correlate, and the P values of each of variables lower than 0.05 is quietly significant except question five, even whereas the variable five is correlated in positively still it is not significant with question two. Displaying variable three has a moderate strong relation with one. Their correlation is not significant as their P value is more than 0.05 despite having positive relationship. Also, variables three have a strong positive relation of two, but they are insignificant the same as variable one. On the other hand, the variability of variable three is neutral, because they are both the same variable. In contrast to question three, the relation value with four is 683** is strongly positive and their p value is .003, so they are statistically significant. Although its horizontal value is positively correlated with variable five, its value is insignificant as its significant value is more than 0.05. on the other side, Pearson correlation values of six and seven with variables three, are strongly positive and their P value range is less than 0.05, so the respected value of both is statistically significant. Although the correlation value of one with variable four is moderately positive and the significant value range is large, it is statistically insignificant. The next variable **strongly correlates the values of two and three with the Pearson correlation value four and their significant values are statistically significant. The value of four with variable four is neutral

because they are the same variable. Even if the value of variable five is moderately strong correlated with four, but they are insignificant due to the high P value. Variables four have strong correlate relations with variables six and seven and are statistically significant as the significant range between them is less than 0.05. In the case of variable five, coincidently variables from one to four have positively denoted its Pearson correlation range, but they are statistically insignificant because of the significant range inequality into them. However, the relation of five with variable five is neutral. Because it is the same variable. However, horizontally the variables in the chart show a strong correlation of five with six and seven. And their significant P value range being positive results in variable five with six and seven variables statistically significant. In the case of variable six the Pearson correlation value, all the values from variable one to seven are very close to +1 in the correlation value range, so strong positive correlation exists among them. In consequence all their significant value “Sig. (2-tailed) below 0.05” there is a statistically significant correlation between all variables. Alone variable six have a neutral correlation range with variable of six since they are same variable. According to the correlation data, variable seven similarly correlates strongly with all its co-variables like variable six. Also, since the significant range of all the co-variables in variable seven is below 0.05, the variables are statistically significant. And its own correlation range with variable seven is neutral whereas, it is the same variable category.

The correlation table summarizes that all the co-variables are positively and strongly correlated with each other, whereas most of the correlations have statistically significant values.

5.1.4 Particular Statistical Interpretation of Each Responses Variables:

A) Q-01: Do you think that your supply channel is intact right now?

Strongly Disagree: 8 interviewees (23.5%), Disagree: 9 interviewees (58.8%)
Neutral: 3 interviewees (17.6%)

Do you think that your supply channel is intact right now?				
		Frequency	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	4	23.5	23.5
	Disagree	10	58.8	82.4
	Neutral	3	17.6	100.0
	Total	17	100.0	

Figure 14: Percentage of participants views on supply channel

As the question to 17 respondents and deliver their opinion on 5-point Likert scale, the findings show a high percentage of 58.8% from the total number of respondents has admitted to Disagree with the intact concept of supply chain channel in RMG industries of Bangladesh. Likewise, 23.5% of them are Strongly Disagree with the concept. The cumulative percentage of Disagree and Strongly disagree participants is 82.4%. Strongly Disagree and Disagree participants note that most of their supply channels are connected to foreign buyers and suppliers. Due to the long-term isolation of international supply channels of RMG industries, the supply channels of manufacturers suppliers and buyers have been impaired. The supply channel is not intact in any way as all the related components of the supply channel including shipping, logistics, procurement, networking is not uninterrupted. In contrast to 82.4%, 17.6% of participants were neutral in responding this question. Among the reasons worth mentioning are that their industries supply channels are the most relevant among third parties. They conduct their supply activities internally with domestic manufacturers. consequently, in this new normal situation, their supply channel is quite active internally.

A) Q-02: Do you think that technology has taken over supplier management

and

procurement?

Disagree: 6 interviewees (35.3%), Neutral: 3 interviewees (17.6%)

Agree: 5 interviewees (29.4%), Strongly Agree: 3 interviewees (17.6%)

Do you think that technology has taken over supplier management and procurement?				
		Frequency	Valid Percent	Cumulative Percent
Valid	Disagree	6	35.3	35.3
	Neutral	3	17.6	52.9
	Agree	5	29.4	82.4
	Strongly Agree	3	17.6	100.0
	Total	17	100.0	

Figure 15: Percentage of participants views on supplier management and procurement

Based on the frequency table shown above, it is clear that 17 valid participants provided their opinion in this segment on 5-point Likert scale. Among every participant 35.3% are Disagree with this interrogation. Observable reasons for their disagreement are that technology only helps to maintain a balance between supplier management and procurement related practices. And provides a proper guidance through calculations and the rest of the work has to be done manually. 17.6 valid percent are neutral in this interrogation. They think that technology is actively working on supplier management and procurement process, but they also believe technology does not taken over supplier management and procurement. Conversely 29.4% are Agree and 17.6% are Strongly agree with these phenomena. Total number of agree and strongly agree participants average is 47%. They contemplate the technology is influencing every component of the supply channel, not just supplier management and procurement in this time of the Fourth Industrial Revolution. Specifically, most of them intent that technology dominates the supplier management and procurement process to a greater extent.

A) Q-03: Do you think that resource planning has been changed?

Disagree: 4 interviewees (23.5%), Neutral: 3 interviewees (17.6%)
 Agree: 8 interviewees (47.1%), Strongly Agree: 2 interviewees (11.8%)

Do you think that resource planning has been changed?				
		Frequency	Valid Percent	Cumulative Percent
Valid	Disagree	4	23.5	23.5
	Neutral	3	17.6	41.2
	Agree	8	47.1	88.2
	Strongly Agree	2	11.8	100.0
	Total	17	100.0	

Figure 16: Percentage of participants views on resource

In response to questions about resource planning changes in the RMG sector during the ongoing global epidemic Covit-19, 23.5% of all participants on the 5-point Likert scale reported Disagree. Participants opined that there was no change in the proper planning for the acquisition of resources. But in terms of resource acquisition, their lead time has increased as before. 17.6 percent of their comments are neutral. According to them, they did not face any such hurdle in resource planning. As opposed to 47.1% Agree and 11.8% Strongly Agree with this interrogation. Most industry experts have suggested that resource planning varies from organization to organization. However, large industries implement their resource planning through third parties. By virtue of the new normal situation, their third parties are impotent to deliver lead time and cost structure wise resources. Due to which the industries have to sort out the resource planning in different measures.

A) Q-4: Do you think that network planning is being influenced by COVID-19?

Disagree: 5 interviewees (29.4%), Neutral: 3 interviewees (17.6%)
 Agree: 8 interviewees (47.1%) Strongly Agree: 2 interviewees (11.8%)

Do you think that network planning is being influenced by COVID-19?				
		Frequency	Valid Percent	Cumulative Percent
Valid	Disagree	5	29.4	29.4
	Neutral	2	11.8	41.2
	Agree	8	47.1	88.2
	Strongly Agree	2	11.8	100.0
	Total	17	100.0	

Figure 17: Percentage of participants views on network planning

All participants provided independent feedback on the question of network planning in the RMG sector is affected by COVID-19. Thereby, 29.4% participants expressed dissatisfaction with their views. They think network planning is an internal process of industries. As there is no involvement of external components with network planning, it remains the same as before. In stark contrast to the 29.4%, 11.4% of the participants are Neutral in their opinion. They think that although network planning was not directly affected by COVID-19, the components connected to the network were affected by COVID-19. On the other hand, 47.1% and 11.8% of the expert participants who have given feedback about network planning influenced by COVIDt-19. Some of them have expressed strong views in favor of this interrogation. They think that networking planning is not limited to organizations. Network planning works directly at the execution level. Consequently, networking planning is not out of the execution process as it has been taken over by Covid-19.

A) Q-5: Do you think that supply concepts will be changed after COVID-19?

Disagree: 5 interviewees (29.4%), Neutral: 2 interviewees (11.8%)
Agree: 8 interviewees (47.1%) Strongly Agree: 2 interviewees (11.8%)

Do you think that supply concepts will be changed after COVID-19?				
		Frequency	Valid Percent	Cumulative Percent
Valid	Disagree	5	29.4	29.4
	Neutral	2	11.8	41.2
	Agree	8	47.1	88.2
	Strongly Agree	2	11.8	100.0
	Total	17	100.0	

Figure 18: Percentage of participants views on supply concepts

In this study 29.4% industry experts think that the supply concept will not change in the next supply system after COVID-19. If the situation returns to normal after the epidemic, then the supply concept will work as before. The procurement logistics system will be operated alike consequent upon. 11.8% of the respondents commented on the issue of changing the supply concept, saying that the supply concept may or may not change. It depends on how long the epidemic situation lasts. In the same vein, 47.1% of industry experts said that the supply concept must change in the aftermath of the epidemic, and 11.8% shared and strongly provided the same answer. Experts say that after the epidemic, industries will develop their organizational strategies to enhance industry efficiency, gain more institutional opportunities and facilitate management. To compensate for the damage caused by the epidemic, they will go to great lengths to obtain industry-related benefits such as tax rebates and others governmental support. This will automatically change the supply concept of many industries. In that situation some industries will fix up the supply concept structure according to the mode of their organization.

A) Q-6: Does warehousing get affected through the pandemic situation?

Disagree: 5 interviewees (35.3%), Neutral: 3 interviewees (17.6%)
 Agree: 6 interviewees (35.3%), Strongly Agree: 2 interviewees (11.8%)

Does warehousing get affected through the pandemic situation?				
		Frequency	Valid Percent	Cumulative Percent
Valid	Disagree	6	35.3	35.3
	Neutral	3	17.6	52.9
	Agree	6	35.3	88.2
	Strongly Agree	2	11.8	100.0
	Total	17	100.0	

Figure 19: Percentage of participants views on warehousing management

An equal groups of industry experts have responded to the question of warehouse being affected by the pandemic situation. 35.3% of expert participants think that warehouse management is not affected due to pendulum situation. According to them, since warehousing is regulated by the industry other supply channels have been affected by Pandemic, but not Warehousing. 16.8% provided neutral comments. They counsel that medium-sized RMG industries run their warehousing activities by third parties considering the cost reduction concept. In some cases, they lease warehouses when their supply is so high. And organization-wise warehousing varies. Therefore, not all industries are covered by the pandemic of warehousing in the basis of organizational warehousing structure. In contrast to the neutral opinion, 35.3% of the experts have given their opinion in a different way. At the same time, 11.8% of participants strongly agreed with them. A total of 47.1% of experts, including Agree and Strongly Agree, most of them think that no matter whatever the types of warehousing structure of an organization may be, no matter industries maintains their third parties either way to manage their extra supply, the warehousing management has been affected in both cases. In addition, as large industries maintain their own warehousing, they also suffer from pandemics due to lack of proper supply channel interaction.

A) Q-7: Is material flow getting changed during the COVID-19 outbreak?

Disagree: 3 interviewees (17.6%), Neutral: 2 interviewees (11.8%)
Agree: 7 interviewees (41.2%), Strongly Agree: 5 interviewees (29.4%)

Is material flow getting changed during the Covid-19 outbreak?				
		Frequency	Valid Percent	Cumulative Percent
Valid	Disagree	3	17.6	17.6
	Neutral	2	11.8	29.4
	Agree	7	41.2	70.6
	Strongly Agree	5	29.4	100.0
	Total	17	100.0	

Figure 20: Percentage of participants views on material flow component

Material flow is one of the biggest issues for RMG industries. Entire production planning is based on material flow. Every participant provided their backwash on whether the material flow is adequate and varied during the COVID-19 outbreak. Participant experts gave 17.6% feedback that the COVID-19 outbreak did not result in any change in the material flow. They provide feedback that a large portion of the material sources of Bangladeshi RMG industries are from abroad, but they are also agglomerate their material internally. Since they have not received large supply orders for pandemic outbreaks, the material flow has remained intact, they expressed. In this context, 11.8% of the participants gave Neutral opinion They think that the material flow varies from organization to organization. It is difficult to predict that the material flow has changed or remained intact. 41.2% and 29.4% of the industry experts provided Agree and Strongly agree counsel on this particular question. The highest number, 70.6% of experts, fell to the point that the material flow has changed due to the COVID-19 outbreak. They mostly expressed their views, saying that material flow has changed in all industries from small to large-scale. Whereas the raw materials of Bangladeshi RMG Industries maximal come from abroad. A small amount of which is supplied by local suppliers. Since there has been an outbreak in international networking, logistics, procurement strategy so it can be disclosed without a doubt that material flow has changed.

A) Q-8: In your opinion, how technology does have influenced the supplier management

and procurement operations?

Procurement functions already adopted a significant amount of technology, witnessed by the more than half of respondents who said they already implemented. The most widely implemented technologies is production management development as well as lead time reduction and spend analytics, with 77 and 76 percent of organizations already having these technologies in place, respectively. The participating industry experts added more that:

- **Greater Efficiency and Transparency:** supply chain software has been able to become faster and more efficient. With development in technology enhancing delivery and visibility for buyers, their expectations and needs have increased with regards to transparency, delivery times and response times.
- **Supplier Self-Service:** automation can improve your relationship with vendors and suppliers. The advent of technology has made it easier to manage the majority of data that teams need to use during discussions and decision making.
- **Data Analytics:** digital technologies help procurement increase their collaboration, analytics and engagement using a portfolio of tools along the entire procurement value chain, including planning, sourcing, contract management, order delivery, payment control and supplier management.
- **Meaningful Outbound Communication:** by using technology industries being able to quickly and easily contact suppliers about specific invoices or missing pieces can greatly improve internal organization.
- **Effective Onboarding Management:** software with a predetermined program for conduct new vendee, raw material management, warehousing making flexible enough for maintaining company's standard controls.
- **Performance Measurement:** technological benefit also seen in responses regarding the key performance indicators (KPIs) that procurement functions are measured by. The use of KPI software dashboard in RMG industries in the procurement process makes it possible to avoid variable costs from 14% to 18%.

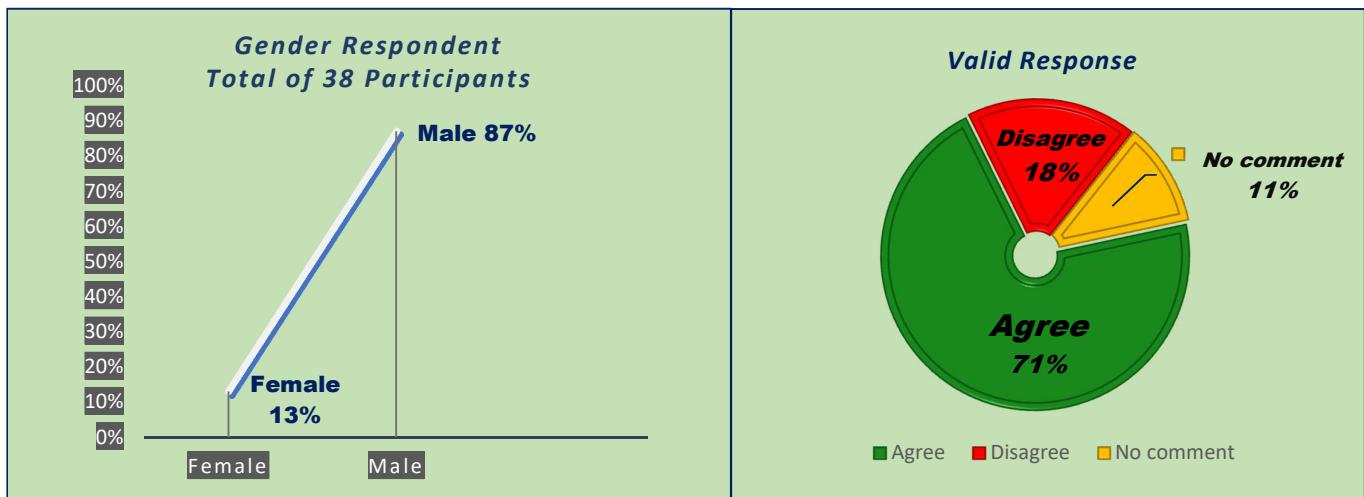
5.2

Survey-B

B) Q-1: Do you think Covid-19 has severely damaged your organization's supply management system?

A total of 38 participants participated in the “survey B”. Certainly, all of whom are directly involved with RMG Industries. A total of 38 people was connected through Google survey forms, phone calls and SMS to get feedback about their associated organization. They have independently provided their views on the survey. Their valuable views are highlighted below:

Figure 21: Total Valid response of male and female



The chart above shows that out of a total of 38 participants, 87% male and 13% are female participated in the survey. From the male and female valid participants, 71% commented that as due to COVID-19, the entire supply management system of their organization has collapsed. In contrast, 11% of participants did not expressed an opinion. On the other hand, 18% of the participants gave their opinion that COVID-19 did not damage the supply management system of their associated industry. Based on the average response of all valid participants in the survey, 71% of the respondents manifested that COVID-19 has damaged their organization's supply management system immensely. So “Survey B” concludes that COVID-19 has damaged the supply management systems of most of the RMG industries in Bangladesh.

6.

Findings

The corona epidemic has severely disrupted the supply chain management flow in the RMG

sector. This study highlights the inconsistency of supply chain during the epidemic in Bangladesh's RMG sector and the inconsistency of supply chain flow in the long term after the epidemic. Below some of the findings are shown:

- I. Supply chain process don't run properly because of lock down and unavailability of raw materials.
- II. There will be changed in the order contracts.
- III. Little change will be happened in production method.
- IV. Factories will invest more on working environment and try to ensure workers safety.
- V. Tendency of producing excessive products will reduce because of warehousing cost.
- VI. Concept of supply isn't affected widely and it will remain unchanged.

7.

Conclusion

Corona Virus pandemic is now a great concern for all over the world. It has already crashed the world economy And Bangladesh's RMG industry as well. It will be needed some years to come back to the previous normal situation for the RMG industries. Due to the epidemic, the supply chain of the entire garment industry has changed and experts believe that it may continue for a long time to come. And Bangladesh may lose its position from the leading position in the world garment industry. So, to stay in the primary stage, our policy makers have to think about how we can maintain the continuity of the supply chain flow of our garment industry in such a situation. Supply chain flow disruption is not a recent issue in our garment industry. The supply chain flow is disrupted whenever there is any kind of instability in the garment industry, and this is always happening in our garment industry. Therefore, the welfare of the garment sector needs to be strategically implemented by both the public and private partners so that they do not face any situation like supply channel inconsistency in future due to any kind of epidemic or economic crisis.

Since the data for this study has been collected by Qualitative and Quantitative analysis procedure, therefore, the next research can focus on the quantitative analysis focused on how the sudden pandemic i.e. the Rana Plaza collapse or COVID-19, creates distinguishable supply management vulnerabilities for RMG industries.

8.

Recommendation

COVID-19 pandemic attacked almost all countries of the world so far. Among all the economic sectors, the apparel industry is one of the most affected sectors. As the supply production has come to a standstill, the continuous activities of the garment industry are being hampered. The supply chain process, a key component of the management of the garment industry, has almost collapsed. The above study strongly suggests that if the necessary steps are not taken initially, the entire supply system will be severely disrupted later. In this context, the following recommendation is given:

- Planning have to be flexible to cope up any situation
- Build strong relationships between inbound and outbound logistics network.
- In order to facilitate the process of sourcing raw materials, a large number of participants gave strong views. Raw material collection should be facilitated.
- Contract methods can be changed by adding condition of loss bearing for unexpected situation
- Ensure safety for Workers and working environment should be favorable for the workers
- Digitization of supply chain management as much as possible. So that the supply system can easily deal with any subsequent adversity.

9. Research Limitation:

There is a dearth of literature on the Apparel supply chain vulnerability during the COVID-19. This study includes adequate research articles published in RMG supply chain flow for relevant helpful information including COVID-19 epidemic conditions. As detailed informational documents on the subject were not available at the time only a few reports and newspaper contain lots of information. During the Corona epidemic, it was not possible to collect data directly in many cases. In that case connected with the research participants sometimes in a virtual way. Eventually the study contains completed primary data as the time of writing this study is the peak time of COVID-19 in Bangladesh.

10.

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11.

Appendix

- 1) What are the impacts of covid-19 pandemic on supplier management and procurement process of RMG industry?
- 2) What are the impacts of covid-19 pandemic on production and assembling process of RMG

industry?