



Impact of Supply Chain Management on Customer Satisfaction in Manufacturing Firms of Bangladesh

Md. Shariful Islam

Assistant Professor
 Department of Marketing
 Faculty of Business Studies
 Jahangirnagar University
 E-mail: sharifjunkt@juniv.edu

Abstract

This paper mainly examines the impact of supply chain management on customer satisfaction. The study was quantitative, and the research design was combined with descriptive and causal. To collect the data, the researcher used a questionnaire where the Likert scale had been used. A total of 100 samples was drawn from the population, and a stratified probability sampling technique chose this sample. Research hypotheses are developed based on magnitudes (communication, collaboration, obligation, conformity, dependency, and conviction), and also these hypotheses are tested by chi-square. After constructing the multiple linear regression equation, the researcher found that the correlation between dependent and independent variables is 0.863. The R² value is 0.745, which means that the independent variables have explained a 74.5% variation in customer satisfaction. All the independent variables such as order processing, production time, customer care service, quick response, and product availability are increased customer satisfaction per unit by 11.4%, 22.3%, 12.5%, 35.3%, and 18.5%, respectively. However, the lead time would lead to a 10.1% decrease in customer satisfaction. The researcher also found that quick response is most important to customer satisfaction. It is positively affected (Adjusted R² value 0.476) to the dependent variable rather than other supply chain management systems. Finally, the researcher tried to determine the interrelationship among exogenous variables through structural equation modeling to draw path diagrams using AMOS graphics and test the construct validity for this model.

Keywords: Supply Chain Management, Customer Satisfaction, Order Processing, Production time, Lead time, Commitment, and Product Availability.

Introduction

Supply Chain Management (SCM) refers to two or more parties linked by a flow of resources, typically material, information, and money that ultimately fulfill a customer request. The idea main of supply chains is managing

flows of product or material, flows of information, and flows of money and all of these things, all of these three flows, manage between the multiple parties and ultimately fulfill customer demand. The business organizations try to manage those three flows to minimize cost, maximize profit, and improve the level of service to customers. There are three parties involved in every supply chain system; these are suppliers, manufacturers, and customers. In other words, the first tier of the supply chain management system is suppliers; those are the companies that companies do business with directly, but the third tier of the supply chain management system is the customer that is someone normally a company does not talk to directly, but it has a great impact on customer satisfaction.

In addition, the supply chain has altered the form of relationship with the customer and suppliers, where its administration moved towards more cooperation and coordination for the formation of the supply chain, and a part of the data and information moved to exchange with customers and suppliers, and the responsibility of inventory control moved to their suppliers. The significance of the supply chain has begun after the scientific revolution, which had a big role in all saunters of life, including management. In the light of the scientific revolution, and with the pronounced technological development, the concentration in the supply chain has become an inevitability, where supply chain management processes became a vital component in the company's efficiency, effectiveness as well as customer satisfaction while customer satisfaction is the foremost objective of any firms. There is no doubt that the supply chain in the organization deals with the most elusive stages within the institution that interfere directly in the product configuration, so its role is the most prominent in the production, sale, profit maximization, and achieving continuity through customer service that keeps the market share of the institution and retains the certain level of satisfaction.

Literature Review

Drawing on existing classifications of levels of analysis in the management of supply chains (Croom et al., 2000; Harland, 1996; Moller et al., 2005; Ritter and Gemunden, 2003), researcher distinguishes between three levels of sustainability analysis pertinent

to purchasing and supply management: dyadic relationships, supply chains and industrial networks. Despite having various levels of inter-organizational analysis, this simple classification makes it possible to clearly differentiate among the levels.

Dyads refer to relationships between two actors. In the purchasing and supply context, researcher focused on the company direct supplier dyad. As companies seek to implement sustainability in their supply chains, their first natural step is to focus on direct supplier relationships. Purchasing and supply activities within dyads involve both discrete one-off exchanges (transactions) and long-term, relationship development issues, such as the adaptation of business processes to suit other parties and the institutionalization of business practices (Hakansson, 1982). Purchasing, procurement and sourcing decisions typically concern internal buying processes that relate primarily to direct suppliers, i.e. dyadic relationships, including specification, supplier selection, contracting, ordering, expediting and evaluation (Van Weele, 2010). Definitions of purchasing, procurement and sourcing vary in scope and the extent to which these functions extend to indirect suppliers is not always clear. Furthermore, the use of the terms is often industry specific, e.g. the public sector often uses the term "procurement" instead of "purchasing" (Ramsay and Croom, 2008; Rozemeijer, 2008). In addition, the role of purchasing in relation to supply chain management varies; "unionists" view purchasing as part of supply chain management, while others believe that supply chain management has replaced purchasing (Larson and Halldorsson, 2002). Supply chain management focuses on multiple customer-supplier dyads, with the supply chain ultimately spanning from original raw material extractors to final end customers (Harland, 1996).

On the other hand, according to Peter et al., (2006), logistics is the management of the flow of things between the point of origin and the point of consumption in order to meet requirements of customers or corporations. The logistics of physical items usually involve the integration of information flow, material handling, production, packaging, inventory, transportation, and warehousing. Logistics may have either an internal focus (inbound logistics) or an external focus (outbound logistics).

Inbound logistics are related to the incoming flow of resources that the company needs to produce its goods or services. These activities will include managing supplier relationships, accessing raw materials, negotiating materials pricing, and arranging quicker delivery. Outbound logistics will be focused on two issues: storage and transportation (Seuring and Mueller, 2008). The company will use warehousing techniques to keep the finished goods safe and accessible. Since the products may need to be moved out to a customer at any moment, proper organization is crucial. Having as little product stored as possible can be advantageous since stored products are not making money, so the outbound logistics manager often has to balance company cost savings with consumer demand. The transportation function is by far the most complex part of outbound logistics. (Andersen and Skjoett-Larsen, 2019). Without transport, there simply are no logistics. For that reason it's critical to be able to move the product from one location to another in the fastest, most cost-effective, and efficient way possible (Hamprecht et al., 2015).

In this context, the literature reveals a number of important gaps. Supply chain responsiveness is defined in two parts which is one part concerning time indications of both the flow of information and the flow of goods in the supply chain, and another part indicating product demand transparency in the supply chain before setting up four theoretical evaluation variables (time effectiveness, postponement strategies, the existence of the Bullwhip effect and information sharing) that were useful for analysing each of the three constructs in the SCM analysis model (supply chain structure, supply chain processes and supply chain relationships) (Catalan & Kotzab, 2017) and these variables considered as determinants of SCM. A supply chain network, which is necessary to provide quick responses to customer demands and preferences, is essential for companies to leverage their competitive edge in the ever changing marketplace (Lau et al., 2016). According to (Lau et al., 2006), apart from forming an extended enterprise to enhance cooperation, companies are seeking ways to become more responsive to the market environment by streamlining and restructuring organization structure and by adopting information technologies in order to utilize knowledge within and beyond the organization. Developing strategies for responsive supply chain is a

challenge across all sectors as it requires depth analysis of interaction among major factors responsible for responsiveness (Singh, 2019).

One definition of customer satisfaction obtained from Kotler and Armstrong (2004) states that "customer satisfaction is the extent to which a product's perceived performance matches a buyer's expectation." As the term customer satisfaction is generally dependent on the product or services, another factor determines the level of customer satisfaction. That is the customer's expectation to say that the higher the customer's expectations, the harder those expectations are satisfied through any products and services. Thus, customer satisfaction attempts to match the level of expectation and perception of customers. However, it is essential to note that any customer's degree of expectation will depend on their behaviors (Walidin, 2007; Waskita, 2007). Nevertheless, meeting customer expectations is the link with various things; one of them is supply chain management systems.

The supply chain concept is a relatively new concept since the beginning of 1980, especially for commercial and manufacturing companies, because of its benefits that improve the supply chain members' efficiency in the production of products appropriately and for a low cost. The supply chain is a process that begins and ends with the customers as all materials, products, full information and transactions flow via this circle. Supply chain management can be a very complicated task when more parties are involved in reality.

The definition of supply chain management is to evaluate planning, implement, and control the movement of materials and finished goods into the end-users. The supply chain's related activities begin with a customer order and complete when the goods are in the customer's hand. To have those goods delivered to end-users requires a network of contributions from parties involved; retailers, wholesalers, distributors, manufacturers, and raw materials suppliers (Waskita, 2007). Chopra and Meindl (2001) define that the supply chain's objective is to maximize the overall value of each of the chains. Siem (2005) has stated, SCM strives to get "the right things to the right places at the right times for maximum profits."

According to Shawki Najjar (2010), manufacturing and distribution are to be improved control and effectiveness through supply chain management and building a strong relationship with suppliers and

distributors used as a mechanism to enhance the competitiveness and achieve customer satisfaction. On the other side, Sohal & al. (2010) defined supply chain management as “the activities related to the flow and transformation of raw materials to finished products, and their delivery to the final consumer, as well as the flow of information.”

The supply chain management system helps an organization plan, implement, and control the operations of the supply chain, ensuring that the customer base’s needs and demands are met and exceeded in some circumstances. According to Jacobs, Salisbury, and Enns (2013), Ellinger et al. (2012), and Heikkilä (2012), supply chain management coordinates the flow of materials, finances, and information between and among all those participating in the business from the manufacturer to the final user of the product or service. Heikkilä (2012) further adds that customer relationship strategies and activities can generate organizational success in supply chain and distribution management efforts and overall performance.

Despite having better relationships with business partners like suppliers, customers play a significant role in ensuring the supply chain’s success because they made the final purchase. The ability of the supply chain influences customer satisfaction and shareholder value. In a study titled “The influence of supply chain management competency on customer needs and satisfaction and shareholder worth,” Ellinger et al. (2012) look at how the relationship between supply chain management and customer satisfaction can be derived from the performance of an organization.

According to H. Francis & Waiganjo, 2014, p. 139, six variables are directly influenced by customer satisfaction, and these variables are given below:

Variables	
Dependent variable	Independent Variables
Customer Satisfaction	Order Processing
	Production Time
	Lead Time
	Customer Care Service
	Quick/ Prompt Response
	Product Availability

Finally, the problems, benefits, obstacles, and possible solutions of problems of supply chain management that is found in the article (Shoghari & Abdallah, 2016, p. 51) are given below (summary):

Problem	Possible improvements	Benefits	Obstacles
Inventory size	Decrease inventory size, more demand, Incoming goods without being stored in warehouses	Reduce the cost of maintaining inventory	Increased supplier costs. Increased demand costs.
Supply periods	Cancel some intermediate stages Essential storage for product maturity	Speed of response	The possibility of futility The Probability of functions saturation
Number of parts	standard design	Keep some parts. Small-scale demand	Less degree of diversification
Cost and quality	External purchase	Cost reduction Raise the quality degree Focus on operations	Inability to control
Susceptibility to change	less supply periods better forecast Reduction of the change in the product and service.	A greater capacity to match demand and supply	Less change

However, the papers of supply chain management practices were mainly used qualitative data (Hopkins, 2010; Ward and Duray, 2012; Stock et al., 2013; Lorentz et al., 2017; and Hair et al., 2019), but in this paper, researcher tried to incorporate quantitative data with qualitative data by using mixed method research to draw a conclusion.

Scopes and Limitations of the study

The study's primary limitation was the shortage of manufacturing firms in Dhaka, and they do not maintain the supply chain management process properly. Likewise, the respondents were unwilling to respond at first, but showing them the study's importance, the study's response was accepted. Many manufacturing firms are not practicing supply chain management; they made the researcher's time into the garbage. The sample size was not large, and there are more advanced statistical tools could be applied. Besides mentioned factors, there are a lot of factors such as strategic supplier partnership, supply postponement, customer relationship and information sharing can significantly influence customer satisfaction that are not considered in this paper. However, despite having limitations of the study, there are lots of scopes researching manufacturing firms. There are many research gaps founded in this sector, and many researchers focus on the unraveled portion of supply chain management.

Rationale of the study

At present, customer satisfaction is the main objective of any organization. There are plenty of customer satisfaction factors, but supply chain management factors are vital as these variables are controllable. On the other hand, there is no alternative to start the practices of supply chain management to survive in the current competitive market. Without customer satisfaction, no companies can survive in the long run as well as make a profit. So, it is essential to find the impact of supply chain management on customer satisfaction as companies invest much money in this sector.

Objectives of the study

This paper mainly examines the impact of supply chain management on customer satisfaction. Besides the core objective, there are some specific objectives of this study; these are:

- To find out the relationship between the adoption of supply chain management practices and customer satisfaction.
- To calculate the inter-correlation among independent variables.
- To examine the impact of supply chain management on competitive advantages.

Methodology

Nature of the research

The nature of the research is quantitative, but the research design is mixed up descriptive and causal. Because here, customer satisfaction is measured by two dimensions: a testing hypothesis. Another dimension is developing a regression model so that this research is, to some extent, descriptive and, to some extent, causal. The researcher measured customer satisfaction over communication, collaboration, obligation, conformity, dependency, and conviction.

Variable Definitions

The researcher often wants to study the effect of one variable on another one. The variables in a study of a cause-and-effect relationship are called the independent and dependent variables. The independent variable is the cause. Its value is independent of other variables in the study; supply chain management factors (order processing, production time, lead time, customer care service, quick response, and product availability) are considered the independent variable. On the other hand, the dependent variable is the effect. Its value depends on changes in the independent variable. Customer satisfaction is considered a dependent variable. The researcher tries to determine the impact of supply chain factors (independent variables or exogenous variable) on customer satisfaction (dependent variable or endogenous variable).

Measurement and Scaling

The researcher used an itemized rating scale that was a structured 5 points Likert scale, and the measurement scale was ordinal in preparing questionnaires. The questionnaire containing 15 questions was formed. The questionnaire has been structured to the variables that affect customer satisfaction. Respondents were asked to what extent they agreed or disagreed with each variable on a five-point scale with descriptive anchors ranging from (1) 'strongly disagree' to (5) 'strongly agree.'

Sampling and data collection

To determine the sample size, the researcher used a sample size determinate calculator. According to the Dhaka stock exchange, 588 registered companies in Bangladesh, whose 210 companies are manufacturing companies in 2019. If an average of 10 persons works in the supply chain process (top-level) of an organization, approximately 2,000 people are related to the supply chain. To use the sample size determinate calculator, the researcher found that the sample size is around 100, where the confidence level and population sizes were 95% and 2,000, respectively. These 100 employees are picked from 20 different manufacturing firms in Bangladesh (average 4 to 6 persons from one organization) based on the probability sampling technique. The specific name of this probability sampling technique is a stratified sampling. The researcher used a stratified sampling technique to divide the manufacturing firm's employees into three strata based on their working position in the firm (employees worked in the backward linkage, employees worked in forwarding linkage, and employees worked in the production & operations department). A questionnaire was supplied to the employees at different levels involved in the supply chain management systems of an organization.

Methods of Analysis

For analyzing the collected data, there were some inferential statistics exploited. The quantitative data obtained from the questionnaires were coded, keyed, and analyzed into Microsoft Excel 2010, IBM SPSS 25.0, and Amos Graphic analysis software. Firstly, testing hypotheses and measuring the discrepancy between theory and observation, the researcher applied a chi-square test to quantify the strength of the relationship between the variables. Researchers conducted a multiple linear regression analysis and finally used structural equation modeling to test convergent validity and discriminant validity.

The regression equation was $Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \epsilon$.

Whereby,

- | | |
|---|---|
| Y = Customer Satisfaction | X1 = Order Processing |
| X2 = Production Time | X3 = Lead Time |
| X4 = Customer Care Service | X5 = Quick Response |
| X6 = Product Availability | β_0 = Constant coefficient of determination |
| $\beta_1, \beta_2, \beta_3, \beta_4$ and β_5 = coefficients of determination ϵ = error term. | |

Conceptual Framework

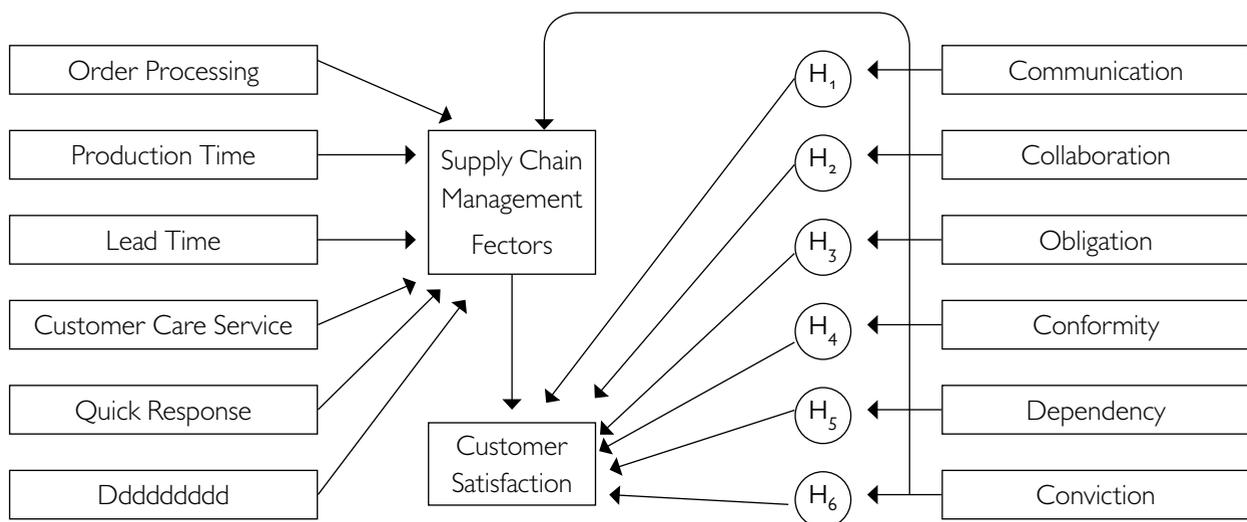


Figure 1: Conceptual model

Hypotheses Development

According to conducted research by Brian Fynes, Chris Voss, and Sean de Burca (2005), various dimensions of relationship quality with the supply chain are communication, collaboration, obligation, conformity, dependency, and conviction. To prove their effectiveness can be cited in Maboodi, Javanshir, Rashidi, and Valipour (2010), which investigated the effect of supply chain management on customer satisfaction in manufacturing firms. Regarding research, conceptual model hypothesizes are:

H₁ : Communication among members of the supply chain creates customer satisfaction.

H₂ : Collaboration among members of the supply chain creates customer satisfaction.

H₃ : Obligation among members of the supply chain creates customer satisfaction.

H₄ : Conformity among members of the supply chain creates customer satisfaction.

H₅ : Dependency among members of the supply chain creates customer satisfaction.

H₆ : Conviction among members of the supply chain creates customer satisfaction.

The researcher developed these hypotheses to experiment with the various dimensions of relationship quality of supply chain, which are capable of impacting customer satisfaction.

Analysis of the study

Chi-Square Test

A chi-square test for independence compares two variables in a contingency table to see if they are related. In a more general sense, it tests to see whether distributions of categorical variables each other. A minimal chi-square test statistic means that your observed data fits your expected data exceptionally well. In other words, there is a relationship and used for the test hypothesis. According to Gupta, 2010, p. 568, the Chi-Square (χ^2) describes the magnitude of the discrepancy between the theory and observation. With the chi-square test's help, we can know whether a given discrepancy between theory and observation facts.

Test Statistics

	Communication	Collaboration	Obligation	Conformity	Dependency	Conviction
Pearson Chi-Square	31.913a	68.197a	15.795a	57.527a	43.985a	57.337a
Likelihood Ratio	33.998	69.360	17.304	68.746	45.917	69.914
Linear-by-Linear Association	.180	1.645	.366	.035	.958	1.459
df	16	16	16	16	16	16
Asymptotic Significance	.010	.000	.467	.000	.000	.000

a. 17 cells (68.0%) have expected count less than 5. The minimum expected count is .44.

The critical value of chi-square for 16 degrees of freedom at the level of significance 0.05 is 26.30. We know that if the chi-square value is greater than a critical value, then the hypothesis is accepted, otherwise rejected. Here, chi-square values are more significant than the critical values for H₁, H₂, H₄, H₅ & H₆, and chi-square values are less than the only H₃. In other words, if the Asymptotic Significance level is more significant than 0.05, then the null hypothesis should be rejected. So, the summarized results are given below:

	Hypothesis	Result
H1:	Communication among members of the supply chain creates customer satisfaction.	Supported
H2:	Collaboration among members of the supply chain creates customer satisfaction.	Supported
H3:	Obligation among members of the supply chain creates customer satisfaction.	Not Supported
H4:	Conformity among members of the supply chain creates customer satisfaction.	Supported
H5:	Dependency among members of the supply chain creates customer satisfaction.	Supported
H6:	Conviction among members of the supply chain creates customer satisfaction.	Supported

Multiple Linear Regression Analysis

Multiple linear regression (MLR), also known simply as multiple regression, is a statistical technique that uses several explanatory variables to predict a response variable's outcome. Multiple regression is an extension of linear (OLS) regression that uses just one explanatory variable. Here, the researcher used multiple linear regression models to measure supply chain management practices on manufacturing firms' customer satisfaction. Order processing, production time, lead time, customer care services, quick response, and product availability consider as independent variables to measure the effects of these variables on customer satisfaction (dependent variable). The analyzed data are below:

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.863a	.745	.729	.477

a. Predictors: (Constant), Product Availability, Order Processing, Quick Response , Production Time, Customer Care Service, Lead Time

The model summary of regression analysis is shown that the correlation between the dependent variable and independent variables is positive, which result is 0.863, and the R square result is 0.745, with a standard error of the estimate of 0.477. The result of R square indicates that 74.5% variation in customer satisfaction has been explicated by the independent variables incorporated in this study.

ANOVAa						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	61.817	6	10.303	45.319	.000b
	Residual	21.143	93	.227		
	Total	82.960	99			

a. Dependent Variable: Customer Satisfaction

b. Predictors: (Constant), Product Availability, Order Processing, Quick Response , Production Time, Customer Care Service, Lead Time

The value of significance is 0.000, which is less than 0.05; thus, the model is statistically significant in forecasting how product availability, order processing, quick response, production time, customer care service, and lead time impact customer satisfaction. The F critical at 5% level of significance was 1.554; since F calculated (value = 45.319) is greater than the F critical (value = 1.554), it shows that the overall model was very much significant.

Coefficientsa						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.175	.220		.794	.429
	Order Processing	.114	.044	.159	2.598	.011
	Production Time	.223	.060	.272	3.701	.000
	Lead Time	-.101	.064	-.120	-1.569	.120
	Customer Care Service	.125	.058	.160	2.154	.034
	Quick Response	.353	.049	.466	7.219	.000
	Product Availability	.185	.065	.227	2.853	.005

a. Dependent Variable: Customer Satisfaction

The coefficient is significant, where the α value is 0.05 or less. If the significance level is less than 0.05, then that independent variable(s) is/are more significant or impactful on the dependent variable. It is founded that order processing (significant level 0.011), production time (significant level 0.000), customer care service (significant level 0.034), quick response (significant level 0.000), and product availability (significant level 0.005) have been higher competent to influence the dependent variable. Only lead time (significant level 0.120) is less influential on customer satisfaction due to a sizeable significant level (more than 0.05). Coefficient of determination explains the extent to which changes in the dependent variable (customer satisfaction) can be explained by the change in the independent variables (order processing, production time, lead time, customer care service, quick response, and product availability) or the percentage of variation in the dependent variable that is explained by all other independent variables.

According to the SPSS generated table above, the regression equation is $(Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \epsilon)$ be $Y = 0.175 + 0.114X_1 + 0.223X_2 + (-0.101X_3) + 0.125X_4 + 0.353X_5 + 0.185X_6 + \epsilon$.

Whereby,

Y = Customer Satisfaction

X_1 = Order Processing

X_2 = Production Time

X_3 = Lead Time

X_4 = Customer Care Service

X_5 = Quick Response

X_6 = Product Availability

According to the regression equation's reference, considering all independent variables into constant at zero, the customer satisfaction result will be 0.175 or 17.5%, which is not a satisfactory result, so that company must incorporate or consider other independent variables to increase customer satisfaction. However, the data findings show that a unit increase order processing would lead to 0.114, in production time would lead to 0.223, in customer care service would lead to 0.125, in quick response would lead to 0.353, and in product availability would lead to 0.185 increases in the customer satisfaction and, conversely, a unit increase in lead time would lead to 0.101 decreases in customer satisfaction or other words, if lead time increases, customer satisfaction will decrease.

Moreover, according to the above-developed regression equation, it is found that each of the independent variables is impactful on the dependent variable positively, excluding lead time, but it ambiguous to predict which independent variable impacts most on customer satisfaction (dependent variable) and which one impacts least. To clear this ambiguity, the researcher calculates linear regression one by one:

Independent variables	Dependent variable: Customer Satisfaction			
	R	R Square	Adjusted R Square	Std. Error of the Estimate
Order Processing	0.487	0.237	0.229	0.804
Production Time	0.599	0.359	0.352	0.737
Lead Time	0.551	0.304	0.297	0.768
Customer Care Service	0.640	0.410	0.404	0.707
Quick Response	0.694	0.482	0.476	0.662
Product Availability	0.642	0.412	0.406	0.705

Source: Primary Data (SPSS Output)

It is interpreted from the above table that the correlation between customer satisfaction and order processing is 0.487, customer satisfaction and production time is 0.599, customer satisfaction and lead is 0.551, customer satisfaction and customer care service is 0.640, customer satisfaction and quick response is 0.694 and customer satisfaction, and product availability is 0.642. The R square values are 0.237, 0.359, 0.304, 0.410, 0.482 and 0.412 respectively. Likewise, the adjusted R square (incorporate the degree of freedom) values are 0.229, 0.352, 0.297,

0.404, 0.476 and 0.406. Based on adjusted R square values, the researcher found that quick response is mostly affected (R2 value 0.476) to customer satisfaction compared to other supply chain management factors.

Path Diagram

Structural equation modeling represents relationships among observed and unobserved variables using path diagrams. This path diagram shows the relationship between an endogenous variable and exogenous variables and inter-relationship among exogenous variables. Here, the endogenous variable is customer satisfaction, and exogenous variables are order processing, production time, lead time, customer care service, quick response, and product availability. The diagram is below:

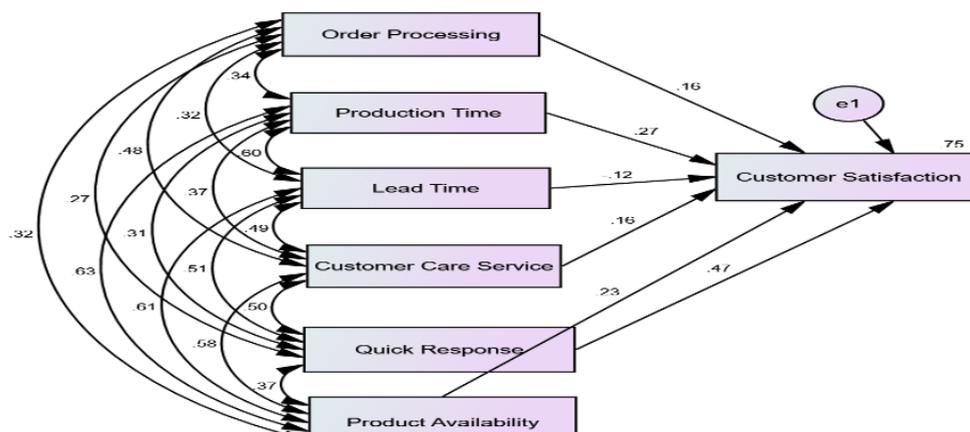


Figure 2: Path diagram: draw using AMOS

Construct validity

For testing the construct validity, it is needed to check convergent validity and discriminant validity. Convergent validity means how close the variables are there in a particular latent variable. Discriminant validity means how far the variables are there. In other words, convergent validity takes two measures that are supposed to be measuring the same construct and shows that they are related. Discriminant validity shows that two measures that are not supposed to be related are, in fact, unrelated. Both types of validity are a requirement for excellent construct validity.

Table: Construct validity test table

Indicator Variable	<--- / <-->	Latent Variables	Standardized Loading	Square of Standardized Loading	Sum of the Squared Standardized Loading	Numbers of Indicators	Average	Square Root of Average
Customer Satisfaction	<---	Order Processing	0.159	0.621351	3.158244	6	0.527	0.726
Customer Satisfaction	<---	Production Time	0.272	0.073984				
Customer Satisfaction	<---	Lead Time	-0.12	1.442121				
Customer Satisfaction	<---	Customer Care Service	0.16	0.752103				
Customer Satisfaction	<---	Quick Response	0.466	0.217156				
Customer Satisfaction	<---	Product Availability	0.227	0.051529				

If the average is more significant than 0.5, then the model is valid in convergent validity. Here, the average is 0.527, which is greater than 0.5, so it is permitted under convergent validity.

Interrelationship among Exogenous Variables

SEM gives the analyst a moderate understanding of the interrelationship among the variables and the causal framework with which the results are consistent. However, quantification of the interrelationships requires that the analyst construct an overall causal model. It is possible to evaluate such a model with statistical procedures no more complicated than those mentioned above. A simple causal modeling technique is called “path analysis,” which is already shown above; now, the below table shows the interrelationship among exogenous variables.

Regression Weights

Endogenous Variable	<---	Exogenous Variables	Estimate	S.E.	C.R.	P	Label
Customer Satisfaction	<---	Order Processing	.114	.042	2.681	.007	
Customer Satisfaction	<---	Production Time	.223	.058	3.819	***	
Customer Satisfaction	<---	Lead Time	-.101	.062	-1.619	.106	
Customer Satisfaction	<---	Customer Care Service	.125	.056	2.222	.026	
Customer Satisfaction	<---	Quick Response	.353	.047	7.449	***	
Customer Satisfaction	<---	Product Availability	.185	.063	2.944	.003	

According to regression weight, except lead time, every exogenous variable has the power to influence the endogenous variable (customer satisfaction) because the p-value is less than 0.05.

Covariances

Exogenous Variables			Correlation	Estimate	S.E.	C.R.	P	Label
Quick Response	<-->	Product Availability	.374	.502	.144	3.488	***	
Customer Care Service	<-->	Product Availability	.576	.746	.150	4.965	***	
Lead Time	<-->	Product Availability	.612	.742	.143	5.192	***	
Production Time	<-->	Product Availability	.633	.783	.147	5.322	***	
Order Processing	<-->	Product Availability	.319	.452	.150	3.023	.003	
Customer Care Service	<-->	Quick Response	.495	.693	.157	4.415	***	
Lead Time	<-->	Quick Response	.513	.672	.148	4.542	***	
Production Time	<-->	Quick Response	.306	.409	.140	2.912	.004	
Order Processing	<-->	Quick Response	.268	.411	.159	2.578	.010	
Lead Time	<-->	Customer Care Service	.494	.626	.142	4.406	***	
Production Time	<-->	Customer Care Service	.374	.482	.139	3.482	***	
Order Processing	<-->	Customer Care Service	.484	.718	.165	4.337	***	
Production Time	<-->	Lead Time	.600	.725	.142	5.122	***	
Order Processing	<-->	Lead Time	.324	.450	.146	3.070	.002	
Order Processing	<-->	Production Time	.339	.478	.150	3.190	.001	

The above table shows that every relationship among exogenous variables is meaningful as each relationship's P-value is less than 0.05, and the correlation between production time and product availability is highest, which is 0.633. On the other hand, if the average square root is more than the correlation value, it is passed under discriminant validity. Here the square root of the average is more significant than all of the correlation value.

Findings

Being tested the hypotheses, the researcher found that customer satisfaction depends on communication, collaboration, conformity, dependency, and conviction, and the only obligation does not create customer satisfaction. After developing the regression equation, the researcher found except lead time, all factors of supply

chain management affected customer satisfaction positively, and quick response affected mostly. Besides these things, Structural equation modeling gave the interrelationship among exogenous variables, and the highest correlation was found between production time and product availability. Finally, the researcher found a positive result of the construct validity test.

Recommendations

The research recommended that manufacturing firms practice supply chain management to create customer satisfaction, boost operational efficiency, increase productivity and profitability. Some suggestions are given below:

- The firms should be more careful regarding lead time because considerable lead time leads to customer dissatisfaction.
- The company should give more emphasis on downstream networks as they are directly involved with customers.
- Customer care services should be developed in every manufacturing firm to communicate directly with the producer.
- Companies should be vigilant in solving customer problems with the prompt response.
- Employees should work in a collaborative way as it minimizes the conflicts among channel members.
- Communication should be developed in such a way that every department is to be informed instantly.

Conclusion

From the above study findings and analysis, it can be concluded that there is an urgent need for organizations to adopt a pro-active approach towards customer satisfaction by adopting supply chain management practices that provide real-time and accurate responses to customer requirements. The role played by practices such as order processing, production time, lead time, customer care service, prompt response, and product availability go a long way in enhancing a cordial relationship among players in the supply chain to deliver value to the final customer. Besides, companies give emphasis equally on backward and forward linkages in order to create customer satisfaction. In the end, customer satisfaction can be achieved not only by giving importance to the

buyers but also by giving equal importance to all those involved in the supply chain management process.

Scopes of Future Research

Despite having theoretical and practical contributions, the study has many scopes of improvement, overcoming few limitations. The study concentrated on only the Dhaka division; however, it could be better for generalization to incorporate samples from other divisions, including Dhaka. It could be far better if the sample size were more extensive than the conducted sample size. Other supply chain factors could not be included in this research. Future studies can incorporate those factors for more reliable. Also, the scope of further research should be broadened to include all manufacturing firms in Bangladesh in order to provide a better picture of the extent of implementation, challenges, as well as benefits of utilizing SCM practices in production firms both qualitative and quantitative methods of data collection, are recommended for any further research on logistics and supply chain management. The study also suggests that further studies should be conducted on supply chain management's impacts on making a profit. 

References

- Andersen, M. and Skjoett-Larsen, T. (2019), "Corporate social responsibility in global supply chains", *Supply Chain Management: An International Journal*, Vol. 14 No. 2, pp. 75-86.
- Catalan, M., & Kotzab, H. (2017). Assessing the responsiveness in the Danish mobile phone supply chain. *International Journal of Physical Distribution & Logistics Management*, 33(8), 668-685. <http://doi.org/10.1108/09600030310502867>
- Chopra, Sunil and Peter Meindl (2001), *Supply Chain Management: Strategy, Planning, and Operation.*, New Jersey, USA: Prentice Hall Inc.
- Croom, S., Romano, P. and Giannakis, M. (2000), "Supply chain management: an analytical framework for critical literature review", *European Journal of Purchasing & Supply Management*, Vol. 6, pp. 67-83.
- Dhaka Stock Exchange. Retrieved October 12, 2019, from <https://www.dsebd.org/>
- Ellinger et al. (2012). The influence of supply chain management competency on customer satisfaction and shareholder value. *Supply Chain Management: An International Journal*, 17(3), 249-262.
- Fynes, B., Voss, C., and de Burca, S. (2005). "The Impact of Supply Chain Relationship Quality on Quality Performance", *International Journal of Production Economics*, Vol 96, No. 3, pp. 339-354.
- Gupta, S. P. (2010). Chi-Square Test. In M. P. Gupta (Ed.), *Business Statistics* (16th ed., pp. 543-575). Sultan Chand & Sons.

- H. Francis, G., & Waiganjo, D. E. (2014). Role of Supply Chain Practices on Customer Satisfaction in the Printing Industry in Kenya: A Case Study of Morven Kester East Africa Limited. *International Journal of Academic Research in Business and Social Sciences*, 1(5), 128–143. <https://doi.org/10.6007/IJARBSS/v4-i9/1213>
- Hair, J.F., Black, W.C., Babin, B.J. and Anderson, R.E. (2019), *Multivariate Data Analysis: A Global Perspective*, 7th ed., Pearson, Upper Saddle River, NJ.
- Hakansson, H. (1982), *International Marketing and Purchasing of Industrial Goods: An Interaction Approach*, Chichester, Wiley.
- Hamprecht, J., Corsten, D., Noll, M. and Meier, E. (2015), "Controlling the sustainability of food supply chains", *Supply Chain Management: An International Journal*, Vol. 10 No. 1, pp. 7-10.
- Harland, C. (1996), "Supply chain management: relationships, chains and networks", *British Journal of Management*, Vol. 7, pp. S63-S80.
- Heikkilä, J. (2012). From supply to demand chain management: efficiency and customer satisfaction. *Journal of operations management*, 20(6), 747-767.
- Hopkins, M.H. (2010), "Your next supply chain: interviews with David Simchi-Levi and Charles Fine", *Sloan Management Review*, Vol. 51 No. 2, pp. 17-31.
- Jacobs, M. A., Salisbury, W. D., & Enns, H. (2013). The effects of supply chain integration on customer satisfaction and financial performance: An organizational learning perspective. *International Journal of Production Economics*, 146(1), 346-358.
- Kotler, Philip and Gary Armstrong (2004), *Principles of Marketing*, 10th ed, New Jersey, USA: Prentice Hall.
- Larson, P.D. and Halldorsson, A. (2002), "What is SCM, where is it?", *Journal of Supply Chain Management*, Vol. 38 No. 4, pp. 36-44.
- Lau, H. C. W., Lee, C. K. M., Ho, G. T. S., Ip, W. H., Chan, F. T. S., & Ip, R. W. L. (2016). M-commerce to support the implementation of a responsive supply chain network. *Supply Chain Management: An International Journal*, 11(2), 169–178. <http://doi.org/10.1108/13598540610652564>
- Lorentz, H., Toivola, J., Solakivi, T., Haavio, H.-M. and Ojala, L. (2017), "Effects of geographic dispersion on intra-firm supply chain performance", *Supply Chain Management: An International Journal*, Vol. 17 No. 6, pp. 611-626.
- Maboodi, Mehdi., Javanshir, Hasan, Rashidi, Aboosaeid and Valipour, Peyman. (2010). The effect of applying supply chain management on customer satisfaction in the textile industry, *Iranian Journal of Textile Science and Technology Research*. Volume 1. pp.13.
- Moller, K., Rajala, A. and Svahn, S. (2005), "Strategic business nets – their type and management", *Journal of Business Research*, Vol. 58 No. 9, pp. 1274-84.
- Peter, T., Beat, G. and Niels, F. (2006), "Risk management in sustainable supply chain management (SSCM): lessons learnt from the case of GMO-free soybeans", *Corporate Social Responsibility and Environmental Management*, Vol. 13 No. 1, pp. 1-10.
- Ramsay, J. and Croom, S. (2008), "The impact of evolutionary and developmental metaphors on supply chain practice: a literature critique and pilot study", *Journal of Purchasing and Supply Management*, Vol. 14 No. 3, pp. 192-204.
- Ritter, T. and Gemünden, H.G. (2003), "Interorganizational relationships and networks: an overview", *Journal of Business Research*, Vol. 56, pp. 691-7.
- Rozemeijer, F. (2008), "Purchasing myopia revisited again?", *Journal of Purchasing and Supply Management*, Vol. 14 No. 3, pp. 205-7.
- Seuring, S. and Muller, M. (2008), "From a literature review to a conceptual framework for sustainable supply chain management", *Journal of Cleaner Production*, Vol. 16 No. 15, pp. 1699-710.
- Siem, Thomas F (2005), "Supply Chain Management: The Science of Better, Faster, Cheaper", *Federal Reserve Bank of Dallas, Southwest Economy* no. 2, p. 1, 7-12. Available from www.ssrn.com
- Singh, R. K. (2019). Modelling of Critical Factors for Responsiveness in Supply Chain. *Journal of Manufacturing Technology Management*, 26(6), 868–888
- Shawki Najjar, (2010): "strategic management" *Dar Al-Hamed for publication and distribution*, p. 172.
- Shoghari, R. . e. I., & Abdallah, K. (2016). The Impact of Supply Chain Management on Customer Service (A Case Study of Lebanon). *Management*, 6(2), 46–54. <https://doi.org/10.5923/j.mm.20160602.03>
- Sohal A. S. ,Power D. J., & Terziovski M.(2010): "Supply Chain Management in Australian Manufacturing - Two Case Studies", *Computers & Industrial Engineering* ,Vol. 43, Issue. 1-2 ,p.97.
- Stock, G.N., Greis, N.P. and Kasarda, J.D. (2013), "Enterprise logistics and supply chain structure: the role of fit", *Journal of Operations Management*, Vol. 18 No. 5, pp. 531-547.
- Van Weele, A. (2010), *Purchasing and Supply Chain Management*, 5th ed., Cengage Learning, London
- Walidin, Astari (2007), "A Market Study of Consumer Satisfaction with City Cars: The Link Between Consumer Behavior and Customer Satisfaction", undergraduate thesis, Faculty of Business Administration, Swiss German University, Banten, Indonesia.
- Ward, P.T. and Duray, R. (2012), "Manufacturing strategy in context: environment, competitive strategy and manufacturing strategy", *Journal of Operations Management*, Vol. 18 No. 2, pp. 123-138.
- Waskita, Egah Sari (2007), "Customer Satisfaction and Business Improvement: A Case Study of Smiley's Café", undergraduate thesis, Faculty of Business Administration, Swiss German University, Banten, Indonesia.