Report On

"Impact of Supply Strategies of ACI Animal Health: Evaluation of Supply Chain Performance of ACI Animal Health Business"

By

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Student ID: 16304069

An internship report submitted to the BRAC Business School in partial fulfillment of the
requirements for the degree of
Bachelor of Business Administration
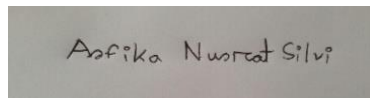
BRAC Business School
Brac University
September 2020

Declaration

It is hereby declared that

1. The internship report submitted is my own original work while completing degree at BRAC University.

2. The report does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.

3. The report does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.

4. I have acknowledged all main sources of help.

Student's Full Name & Signature:

_____
Asfika Nusrat Silvi
Student ID: 16304069

Supervisor's Full Name & Signature:

_____
Sang H Lee, PhD
Professor and Dean, BRAC Business School
BRAC University

Letter of Transmittal

Sang H Lee, PhD

Professor and Dean,

BRAC Business School
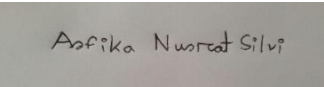
BRAC University

66 Mohakhali, Dhaka-1212

Subject: Submission of internship report on "**Impact of Supply Strategies of ACI Animal Health: Evaluation of Supply Chain Performance of ACI Animal Health Business**"

Dear Sir,

With due respect & honor, I hereby submit my internship report titled as "Impact of Supply Strategies of ACI Animal Health: Evaluation of Supply Chain Performance of ACI Animal Health Business". It is an immense pleasure for me to complete my internship report as a part of BUS400 course which is a requirement for the completion of the BBA program.

I have tried my level best to complete the report as per the requirements of the university. I tried to collect essential data, relevant information and made full use of my capabilities in making this report meaningful. I am thankful for your valuable advice, instructions and great cooperation as a supervisor which have been helpful for making this report to the point. I would be extremely grateful if you are kind enough to accept this report and provide remarks on the overall report considering my effort.
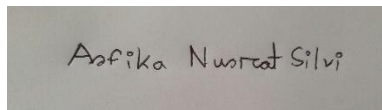
Sincerely yours,

Asfika Nusrat Silvi

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Asfika Nusrat Silvi

Student ID: 16304069

BRAC Business School

BRAC University

Date: September 27, 2020
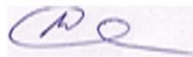
Non-Disclosure Agreement

I acknowledge that all throughout the internship period, I gained access to numerous information of ACI Animal Health which of some may contain confidential and not to be disclosed information. I undertake the internship project described in this report based on the assurance of avoiding the unapproved disclosure of any confidential data of the organization. I understand that I am always entailed to preserve the secrecy of implicit or explicit information and intentionally will not disclose any of the confidential information, both during and after my internship period.

Intern's Full Name & Signature:

Asfika Nusrat Silvi

_____

Asfika Nusrat Silvi

Organization Supervisor's Full Name & Signature:

_____

Dr. Md. A. Saleque
Chief Technical Advisor
ACI Animal Health
ACI Limited

Acknowledgement

I would like to express my profound gratitude to the Almighty for granting me with good health, continual patience and ability to complete this internship report successfully on time. I would also like to thank my parents for energizing me and keeping me motivated throughout the internship period. It was quite challenging to complete the report while doing the internship at the same time during pandemic, so without the guidance and proper instructions from some people it would have been even more difficult task to accomplish. They supported me by providing adequate information regardless of having many responsibilities.

Firstly, I would like to express my sincere gratitude towards my internship advisor, Sang H Lee Sir who is a Professor and Dean at BRAC Business School in BRAC University. From the approval of the project topic to completion of project he always made sure his fullest contribution. He provided me with the structural guidance and invested his valuable time and efforts. Special thanks to Mr. Daniel Mahbub, the teaching assistant of Dr. Sang H Lee Sir, who had been helpful and supportive during the whole period.

Secondly, I would like to put my utmost appreciation to my supervisor at ACI Animal Health, Dr. Md. A. Saleque for selecting me as an intern and providing me his endless advice and suggestions. He has been tremendously supportive and cooperative throughout the process of completing my internship period. I would like to give special thanks to Mohammad Shaheen Shah, Business Director of ACI Animal Health for introducing me to the related officials and providing his kind support regarding the collection of information. I would also like to show my cordial gratitude to Mr. Alamgir Islam, Supply Chain Manager of ACI Animal Health for providing me in-depth information regarding the whole supply chain process of ACI Animal Health which helped me to better understand the differences and similarities between the theoretical concepts and practical works. I am also thankful to Mr. Abu Sufian, Senior Planning Executive of ACI Animal Health for providing me the financial information regarding supply chain. Also, thanks to other officials of ACI Animal Health for their helpful for the collection of data. Besides, it is ought to be thankful to the safest and respectful environment that ACI Animal Health assured me during my internship period.

Last but not the least, I would like to express my utmost gratitude towards Md. Hasan Maksud Chowdhury Sir, Assistant Professor at BRAC Business School in BRAC University for encouraging me to learn Supply Chain Management and his enormous support, guidance and cooperation for the successful completion of the report. I am thankful to Sir for guiding me

regarding the data collection and providing me the method of measuring supply chain performance using financial data.

Executive Summary

The research report titled "Impact of Supply Strategies of ACI Animal Health: Evaluation of Supply Chain Performance of ACI Animal Health Business" aims at evaluating the supply chain performance of ACI Animal Health and finding out the impact of the company's supply strategies and practices on their supply chain performance. This report is based the internship experience from July 13, 2020 to September 26, 2020 at ACI Animal Health as a core requirement for the Bachelor of Business Administration (BBA) degree.

This internship report consists of three major parts. The first part provides a view on overall internship working experience at ACI Animal Health. It includes learning, contribution and internship outcome from internship experience. The second part includes the overview of the company and the supply chain functions of ACI Animal Health. Whereas the last part is the most important part of the report where the project is named "Impact of Supply Strategies of ACI Animal Health: Evaluation of Supply Chain Performance of ACI Animal Health Business". This project part focuses on the overall SCM performance analysis using financial information, portraying the methodologies as well as limitations and findings regarding the topic based on some expert views. A survey was conducted to find out the effect of supply chain practices and strategies on the SCM performance of ACI Animal Health. Based on the hypothesis test using IBM SPSS, the null hypothesis claimed that, the SCM practices and performance of ACI Animal Health are strongly significant. Based on the collected data from survey, the result of the hypothesis test showed the acceptance of the null hypothesis, which proved that SCM practices of ACI Animal Health have positive impact on the SCM performance.

Furthermore, my internship responsibilities and experience inspired me to work on this particular topic and wishing future researchers to extensively continue the research.

Keywords: Internship; Analysis; Supply Chain Management; Research

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List of Acronyms

ACI   Advanced Chemical Industries

ICI   Imperial Chemical Industries

ACI AH   ACI Animal Health

SCM   Supply Chain Management

RM   Raw Material

PM   Packaging Material

FG   Finished Good

SPSS   Statistical Package for Social Sciences

SCIR   Supply Chain Inefficiency Ratio

SCWCP   Supply Chain Working Capital Productivity

ICC   Inventory Carrying Cost

SCC   Supply Chain Management Cost

DC   Distribution Cost

TQM   Total Quality Management

CP   Production Cost

DRM   Days of Raw Materials

NS   Net Sales

MRP   Material Requirement Planning

Glossary

KPI

A Key Performance Indicator is a measurable value that demonstrates how effectively a company is achieving key business objectives. Organizations use KPIs at multiple levels to evaluate their success at reaching targets.

Lean Supply Chain

A Lean supply chain is the epitome of a good supply chain. It delivers supplies to a customer with the minimum of waste. Lean supply chain will not have any surplus, it will not need heating and lighting to store large quantities of stock and the processes used to manage stock supply will be geared up towards Lean thinking, where stock will not be surplus, but the systems used will be flexible enough to ensure that any sudden increases in demand can be met without undue delay.

Chapter 1: Overview of Internship

1.1 Student Information

I am Asfika Nusrat Silvi, ID: 16304069, a student of BRAC Business School, BRAC University. I am writing this internship report as a part of BUS400 course which is a requirement for the completion of my Bachelor of Business Administration degree. My concentration of the BBA degree is in Supply Chain Management & Finance.

1.2 Internship Information

I am doing my internship at ACI Animal Health, ACI Limited. Specifically, I am working in the supply chain management department of ACI Animal Health. My internship contract term is from July 13, 2020 to October 13, 2020. ACI Animal Health is located at Tejgaon. The address is: ACI Centre 245, Tejgaon Industrial Area, Dhaka-1208, Bangladesh.

1.2.1 Internship Company Supervisor's Information

Supervisor's Name: Dr. Md. A. Saleque
Designation: Chief Technical Advisor

1.2.2 Job Scope at ACI Animal Health

- Maintaining documents of the production process as per the production schedule
- Keeping record of different kinds of material movement (In-Out movement of all materials of RM, PM, FG etc.)
- Conducting inventory verification of materials by checking the physical and system quantity (Inbound-Outbound adjustment)
- Ensuring the process of all production stages are accurately recorded at the time of performance
- Supporting management for ensuring availability of all materials at toll unit to minimize production loss
- Ensuring on-time requisition as per reordering level (safety stock)
- Maintaining on time entry and out of all materials movement and reporting to management
- Preparing inventory report and analysis of that report
- Completing various tasks assigned by the supervisor

1.3 Internship Outcomes

Three months duration of internship program at ACI Animal Health helped me to enlarge my current skills. It added a new work experience in my career. I have worked in different tasks of supply chain management like analyzing data, keeping inventory record, supporting management and so on. These activities helped me to develop an analytical approach to tasks and the ability to work under pressure.

This internship program gave me the opportunity to work under the supervision of Chief Technical Advisor, Dr. Md. A. Saleque which helped me to learn about corporate norms, etiquettes and culture. By working under his supervision, I got the scope to observe his work, receive career related advice and suggestions from him. While working as an intern at ACI Animal Health, I also realized my strengths and weaknesses. After this successful internship period, the major outcome is my self-confidence of taking new responsibilities and adapting to new situation.

1.3.1 Contribution to the Company

As an intern, I have contributed to ACI Animal Health by assisting in the tasks assigned by my supervisor and supply chain management department. From my point of view, I believe that I have worked for the betterment of the company. The tasks I have done in the SCM department surely helped the company to maintain proper record of the inventory and production process which helped in the supply chain performance of ACI AH. I was always liable for the confidential documents which were entrusted to me and I have handled those documents carefully.

Moreover, I have supported management for preparing inventory report and analyzing it. My eagerness to learn and hard work had always been appreciated by the company. I strongly believe my works have great impact on ACI Animal Health's operation and exposure.

1.3.2 Learnings from Internship Tasks

After working at ACI AH for three months as an intern, I got to study its SCM department processes and responsibilities of SCM towards smooth operation. I got the chance to taste the real corporate world experience. I could relate my academic knowledge of supply chain management with the real-life tasks and assignments. I got in depth knowledge about the inbound and outbound logistic system of the supply chain. Over the 12 weeks, I received a

clear conception about the inventory management, materials management and supply strategies of the company. I had to organize my daily tasks and plan according to that. It helped me to enhance my organizational skill. Throughout my internship period, technology-based tasks helped me in advancing technical skill. I have also developed interpersonal and communication skills.

In ACI AH, I had to follow the rules and regulations and restrictions set for the interns by the company. It helped me to better understand the organizational discipline and etiquettes. Moreover, I learned to maintain work-life balance. I also worked on my internship report within given deadline. The lessons I have learned from ACI AH will work as a foundation for me to succeed in my future career path.

1.3.3 Difficulties Faced during the Internship Period

My internship experience was full of experimental learning which gave me better understand of my skill set. I am grateful to my supervisor for engaging me in different tasks which helped me to develop my skills and enhance my knowledge. One of the difficulties which I faced in ACI AH is that their information is not publicly available. Because of the business confidentiality, ACI AH do not publish their information. I had to talk with the employees and collect information from them directly. Moreover, internship duration was very limited which was not adequate enough to learn all the activities of the SCM department of the organization. Besides, employees of the organization did not get enough time to share additional information as they had their own task. As a result, it was little bit challenging to conduct an in-depth analysis on the SCM department. Due to business confidentiality, some information has been intentionally excluded from the report. I am grateful to every employee of ACI AH who were very cooperative and helpful to me. Without the guidance and help of them, this report was impossible to complete.

1.3.4 Recommendations

- Relevant experienced people can be recruited in the supply chain department
- Process flow should be optimized
- Use of common platform for sharing share within the internal stakeholders
- Practice of lean supply chain considering complexities of business nature
- Process can be automated for reducing workload and completing tasks in a faster way
- Too much meeting for the employees can delay the core work which may be avoided

Chapter 2: Organizational Overview

2.1 Background of ACI

Advanced Chemical Industries which is known as ACI, is one of the biggest conglomerates of Bangladesh. In 1968, ACI was established as a subsidiary of Imperial Chemical Industries (ICI), a British multinational. It was listed as a public company with Dhaka Stock Exchange (DSE) on 1976. On 5th May, 1992, Imperial Chemical Industries changed its name as Advanced Chemical Industries (ACI) and divested 70% of its share in Bangladesh to the local management. ACI's first trading of shares occurred on 1994. The company was also listed under Chittagong Stock Exchange (CSE) on 1995. **ADVANCED CHEMICAL INDUSTRIES LIMITED**, a public limited company by shares incorporated under the relevant laws of Bangladesh having its registered office at ACI Centre, 245, Tejgaon Industrial Area, Dhaka– 1208. (ACI Limited Website)

2.2 Milestones of ACI
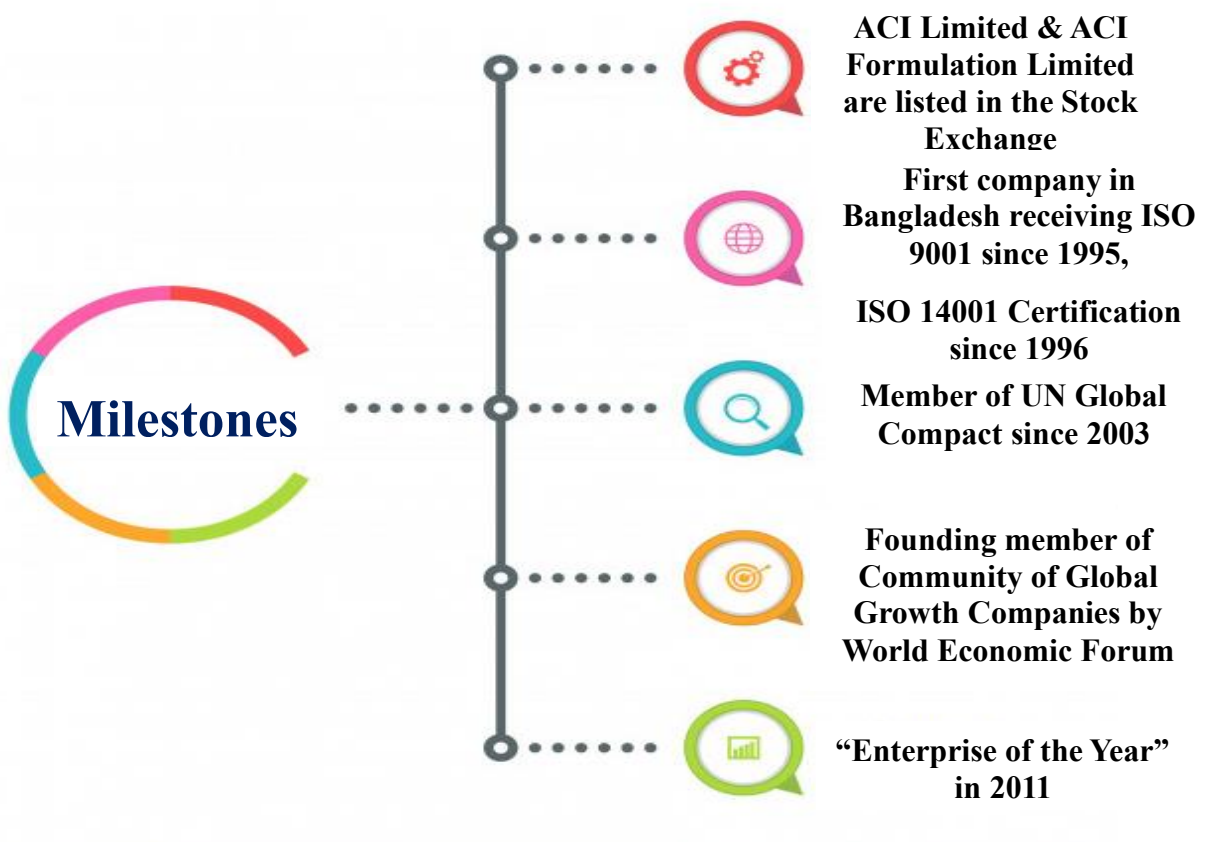
Source: ACI Animal Health, 2020

Figure 1: Milestones of ACI

2.3 ACI Limited – Business Divisions

Advanced Chemical Industries has four diversified strategic business units which are Pharmaceuticals, Consumer Brands, Agribusinesses and Retail Chain. ACI Pharmaceuticals is dedicated to introduce trustworthy pharmaceuticals products and improve people's health. Consumer Brands of ACI is providing daily needs for the people by producing daily products like foods, salt, oil, electronics, home care, toiletries etc. ACI Agribusiness is the largest agricultural value chain in Bangladesh in fisheries, agriculture, livestock etc. ACI Retail chain is one of the leading retail chains of Bangladesh which is running business through more than 100 SHWAPNO outlets.

ACI Pharmaceuticals	ACI Agribusiness
Healthcare Products	Complete Agri Value Chain
ACI Retail Chain	**ACI Consumer Brands**
SHWAPNO Outlets	Providing Daily Needs
ACI Motors	**Plastics**
Farm Mechanization & Mobility	Packaging & Consumables
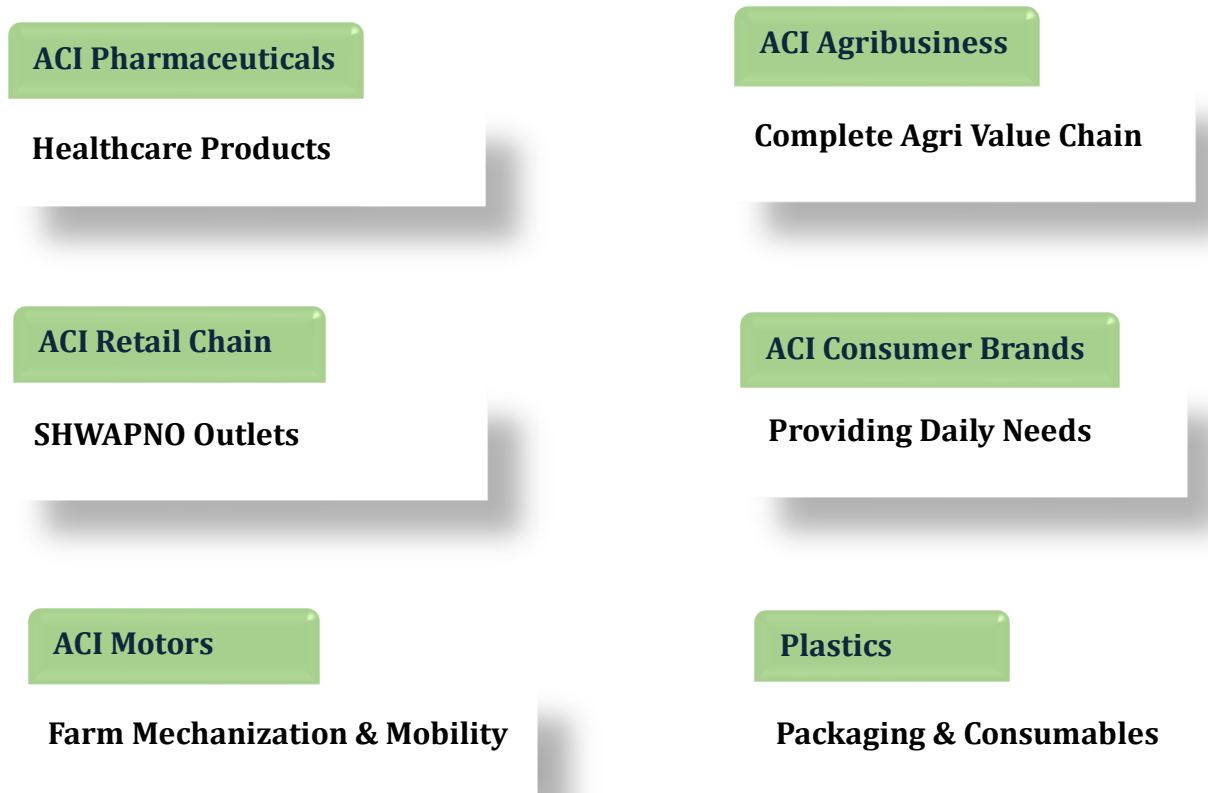
Figure 2: Business Divisions of ACI

2.4 Overview of ACI Animal Health

Animal Health business is one of the largest business under Agribusiness of ACI Limited and it is ranked 2nd in Bangladesh with its 1st position in Poultry Biologics (Vaccines) and Aqua care portfolio, 2nd position in Cattle health and Poultry Health products. ACI Animal Health Business is playing significant role in providing essential quality inputs and services to livestock and fisheries farmers for their better farming and improve their livelihood. ACI Animal Health strives to reduce the protein gap of Bangladesh through a significant growth of the animal health industry. ACI Animal Health delivers resources from veterinarians and fisheries experts and launched the wide range of products for cattle, poultry and aqua. ACI Animal Health is a diversified business with scientifically proven product portfolio which aims to create value for the customers. The company produces and supplies premium quality vaccines, preventives, nutrient vet, anti-histaminic, anti-pyretic, analgesics etc. ACI AH helps the farm-owners with modern technologies and useful information regarding domestic animals and fisheries. ACI Animal Health is highly committed to ensure protein availability with their wide range of innovations. ACI Animal Health has already made collaboration with some international suppliers in order to provide world class innovative products to customers.

2.4.1 Operations

ACI Animal Health is providing complete and ready solution to farmers through its 5 portfolios (Poultry, Vaccine, Aqua, Cattle and Animal Genetics) as well as disease diagnosis services through its animal health technical services. ACI Animal Health produces antibiotics, disinfectants, nutritional products, analgesic, and antihistamines. It has own factory at Narayangonj where products are produced with high quality. Moreover, ACI has a laboratory where different expertise like pharmacist, microbiologist, chemist is working to improve the products and maintain the quality. ACI Animal Health also markets feed additives, probiotics, farm hygiene, pond management products and other pharmaceuticals. ACI Animal Health is involved in many joint ventures for different segments. ACI Animal Health arranges training about improved farming techniques and educates farmers regarding animal health technologies for improving its business activities.

2.4.2 Products Category

- Poultry
- Cattle
- Aqua
- Vaccine
- Animal Genetics

2.4.3 Mission

ACI Animal Health's mission is to reduce protein gap through providing complete solution to farmers to increase their poultry, cattle and aqua productivity as well as improve their livelihood.

2.4.4 Vision

- Maintain a high level of productivity
- Provide best quality products and services at lower price to the customers
- Develop employees by giving reward and inspiration
- Promote an environment for learning and personal growth of its employees.
- Maintain a consistent quality of product
- Encourage and assist in the qualitative improvement of the services of its suppliers and distributors
- Promote inclusive growth by encouraging and assisting distributors and suppliers in improving efficiency

2.4.5 Values

Quality

Customer Focus

Fairness

Transparency

Continuous Improvement

Innovation

2.5 Organogram of ACI Animal Health

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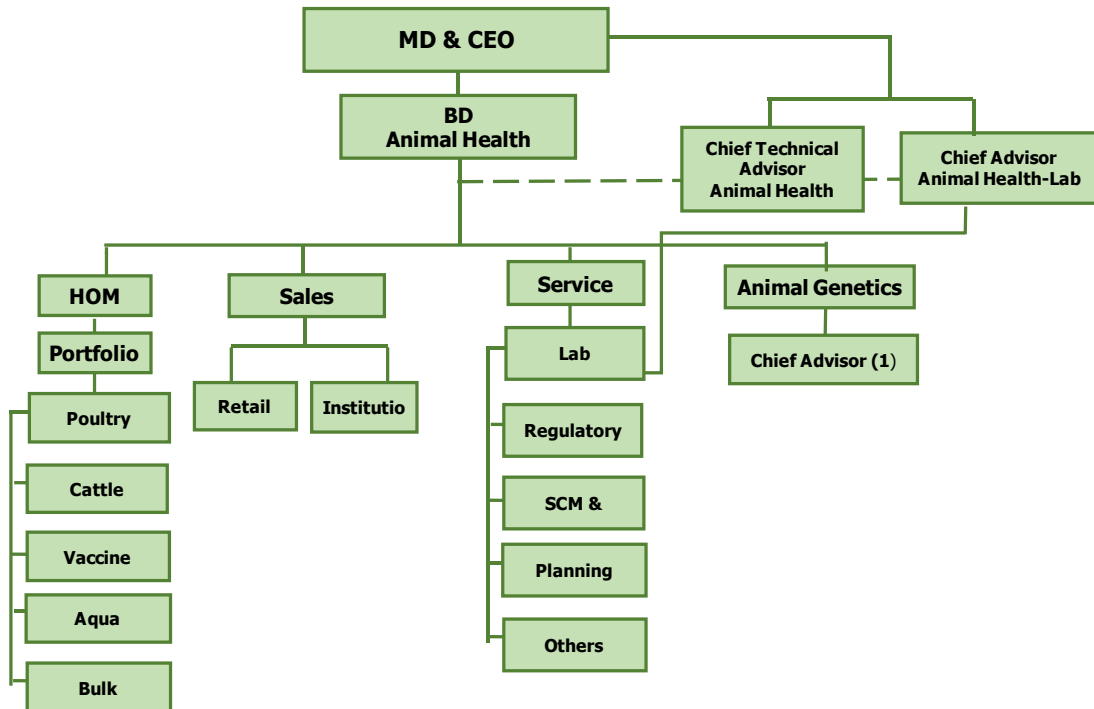
Table 1: Organizational Structure of ACI Animal Health

2.6 Major Achievement of ACI Animal Health

- 40% poultry are vaccinated by ACI
- Robotic Vaccine Injector Introduction
- Nano-tech Antibiotic Replacer- Reduced 2% mortality
- 30% of total Calf Mortality Reduced
- Increase Avg. Milk Production 3 L Per Day
- Unique Dosage Form-Licking Block
- Modern Animal Diagnostic Lab
- Automated Feeder- E Fishery
- Prevention of Corona Virus with Natural Solution
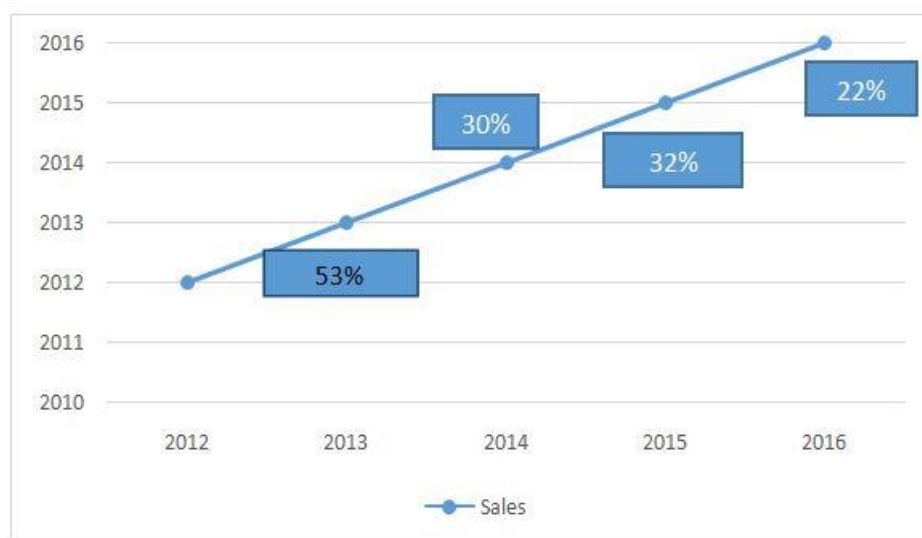
Source: Official website of ACI AH

Figure 3: Market Growth of ACI Animal Health

2.7 Supply Chain Department of ACI AH

ACI Animal Health operates their supply chain mainly in four steps which are business supply chain, commercial, production and distribution. Commercial department is mainly service department which handles raw materials. ACI Animal Health's SCM department is deals with the vital functions of the company to provide best quality product to the customers at low price.

2.7.1 Supply Chain Functions of ACI AH

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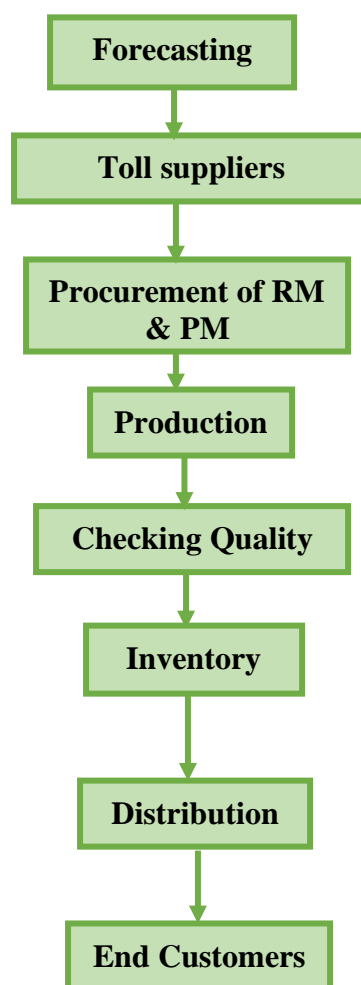
Table 2: SCM Functions of ACI Animal Health

Chapter 3: Project Part: Impact of Supply Strategies of ACI Animal Health: Evaluation of Supply Chain Performance of ACI Animal Health Business

3.1 Introduction

SCM is a procedure which operates with the procurement and conversion of raw materials into finished goods and on time delivery of the products to end users (Mabert and Venkataramanan, 1998). It is the sequence of an organization's functions, activities and facilities which are involved in manufacturing and delivering a product from suppliers to producers, after that to assemblers, then to distributors and finally to the buyers. Supply chain starts from the process of planning a product from raw material to selling the final products to the customers which includes different planning like demand, production, sales and operations and supply. It is a methodology of improving businesses, making them more agile, more flexible and as a result more competitive. Supply chain management has become a significant center of competitive benefit for the organizations. SCM focus on the process of maximizing the overall value of the firm through some channel with the proper flow of information and resources across the whole of the firm.

Recently, SCM has inaugurated much significance for numerous reasons. Many business organizations realized that decision of one employee of the chain have impact on the performance of whole business. Most of the manufacturing organizations in Bangladesh have established supply strategies and practices to ensure a sustainable supply chain. What still remains a question is to what extent have these strategies and practices been successful and how effective have their actions been in the organization's supply chain performance. Therefore, studies need to be conducted relevant to this subject of interest.

3.1.1 Background of the Research

The aim of the research is to measure the supply chain management performance of ACI Animal Health and to determine the relationship between SCM practices and performance of ACI Animal Health. For measuring the SCM performance of ACI Animal Health, financial data is used for the calculation of different parameters of supply chain. Moreover, a survey questionnaire is prepared and response from 60 employees has been used to find out the effect of supply chain practices on the SCM performance of ACI Animal Health.

3.1.2 Statement of the Problems

Supply chain management activities have been adapted in Bangladesh's business sector about four decades ago. Because of the rapid growth of supply chain management practices, it has become very critical to assume different factors which influence supply chain management and have consequences on the chain. In today's competitive business, SCM has become trending and important topic. But the practices and strategies of supply chain management used in the businesses of Bangladesh are insufficient. Inadequate market information and underdeveloped business structure are the two major reasons for poor SCM system in poultry and agriculture sectors of Bangladesh.(Nuruzzaman, 2015; Shamsuddoha, 2015). The problem statement is that this report will enable us to understand how supply chain is important and essential in the business sector, process of measuring SCM performance by using financial data and find out the relationship between supply chain management practices and performance. The employees of supply chain management will get knowledge about different issues of SCM in Bangladesh. Only a limited number of researches have been performed in Bangladesh regarding the evaluation of supply chain practices and performance in agribusinesses which makes it a matter of importance to conduct this research. This research is expected to add values in supply chain management practices of Bangladesh in both empirical and theoretical contexts.

3.1.3 Scope of the Study

This study focuses on the supply strategies and the evaluation of supply chain performance. The task of conducting this research has been simplified as an appointed intern at ACI Animal Health. The scope of this study completely depends on the collaboration, efficiency and activities of the organization. While serving at ACI Animal Health, I have been introduced to many new terms. For the simplicity and ease of conducting this research, the Chief Technical Advisor at ACI Animal Health, Dr. Md. A. Saleque has facilitated me regarding the organizational information and the collection of survey responses from 60 employees. Also, Mr. Alamgir Islam, Supply Chain Manager (who is leading ACI AH supply chain) and Mr. Abu Sufian, Senior Planning Executive at ACI Animal Health has helped regarding the in-depth information regarding supply chain management and financial costs.

3.1.4 Objective of the Report

Primary Objective:

The primary objective of this research has been rooted in evaluating the SCM performance of ACI Animal Health

Specific Objective:

Along with the primary objective, there are few other associated objectives of this report, they are as follows:

- Learning about ACI Animal Health's background, history, mission, vision and organizational structure
- Having in depth knowledge about the operations of the supply chain management department of ACI AH
- To know about the key activities of SCM
- To understand the complete operations of SCM of ACI Animal Health
- Measuring the efficacy of the ACI Animal Health's supply chain strategies and practices
- To learn about the planning and strategies to develop an integrated SCM and understand the mechanism which can drive to better performance and make the supply chain sustainable
- To evaluate supply chain performance and identify challenges and opportunities for the organization
- Conducting a hypothesis test regarding research topic
- Analyzing the findings of the study and giving appropriate recommendations

3.2 Review of Related Literature

Research focused on SCM strategies and performance is gaining increased popularity among both academics and professionals; supply chain management strategies which are used in various manufacturing companies try to gain a simultaneous improvement to the overall SCM performance. Supply chain management practices has been adopted and used frequently since the 1980s and explained by the scholars during the 1990s (Basak et al., 2014). Many definitions

and the concepts are discussed from many perspectives. SCM has various definitions over the previous years where most definition explains it as a system of numerous substances which connects data stream and materials (Lummus and Vokurka, 1999). Moreover, excellent review on supply chain management literature was provided by Sachan and Datta (2005), Cousins et al. (2006) and Storey et al. (2006). These papers explain the principals, concepts about supply chain management.

Researches are being conducted around the world in this field where they evaluated the strategies, practice and performance of supply management. Supply Chain Management plays a coordinated standard. The scope of supply chain management has been extended above management of raw material, IT to the TQM areas like organizational structure (Gunasekaran and McGaughey, 2003). Most of the available literature on supply chain management are focused in promoting supply chain management strategies and practices. Fox (1991) and Michael (1996) suggested that producers should harmonize the whole SCM as a sole business and improve the flows within the whole SCM in order to improve customer service, minimize costs and avoid unwanted risk and interruption in supply and demand in business.

Even though supply chain management has been drawing a lot of attention these days, the performance measurement of this area is a very immature field of research (Paolo Taticchi, 2013). Based on the criteria of delivery time and product quality, Koh and Tan (2006) used the principles of fuzzy logic for the analysis of the performance of suppliers in SCM. Supply chain management practices are important through strategies (Balsmeier and Voisin, 1996). Moreover, research is not only limited to data analysis and hypothesis testing but also advanced techniques like simulation, Artificial Neural Network are used for decision making and optimization in supply chain management.

3.3 Research Methodology

An exhaustive description of the research methodology will be examined including research design, sampling as well as data collection, measurement and also analysis process.

3.3.1 Research Design

This is a quantitative research to understand the SCM practices and performance of ACI Animal Health. Financial data is used for the calculation of the total chain length, SCIR as well as SCWCP. Moreover, a survey questionnaire based on SCM practices and performance is also used. It is a one-shot study, and ACI Animal Health is the unit of analysis.

3.3.2 Sampling and Data Collection

The collection of data used for this research was a few financial data of three years and a survey questionnaire which was allocated to a total sample of 60 employees who are working in different departments of ACI Animal Health like sales, purchasing, production, distribution, transportation, material, SCM, marketing and operations. The selected employees had a distinguished role in the area of SCM.

3.3.3 Measurement and Scale

For the survey analysis, employees were asked to complete a set of questionnaires consisting of 24 questions relevant to the supply chain practices and performance. Among these questions two were demographic, fifteen were related to SCM practices and seven were related to SCM performance of the company. A 5-point Likert scale was used in corresponding survey questionnaire for collecting responses from the respondents. For the analysis of survey questionnaires statistical software "Statistical Package for Social Sciences (SPSS)" version 26.0 is used.

5	• Strongly Disagree
4	• Disagree
3	• Neutral
2	• Agree
1	• Strongly Agree
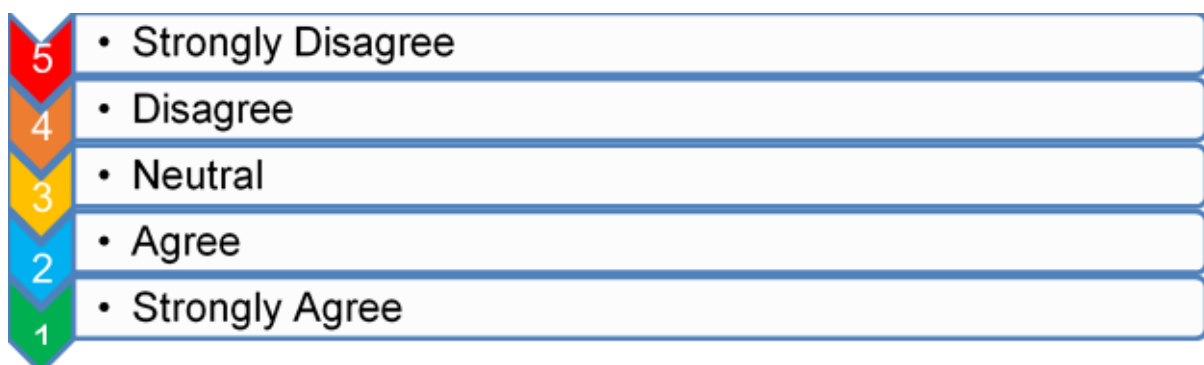
3.4 Limitations

There are few limitations which I faced while doing the analysis and writing the report. One of the difficulties which I faced in ACI AH is that their information is not publicly available. Because of the business confidentiality, ACI AH do not publish their information. I had to talk with the employees and collect financial information related to supply chain from them directly. Due to business confidentiality, some information has been intentionally excluded from the report. Besides, it was difficult to get enough time for the face to face conversation from the employees as they are busy with their works. Moreover, Because of the pandemic Coronavirus, many employees were working from home. It was difficult to travel for collecting information from the employees. Although, they shared their knowledge, views, information and thoughts related to my research but time of conversation was not enough. Also, I believe the time limit for the submission of this report was not sufficient. It was quite challenging to collect data, doing analysis and preparing the report within less than two months.

3.5 Analysis and Interpretation of Data

The first step dealt with collection of financial data corresponding to SCM and calculation of total chain length, SCIR as well as SCWCP from 2018 to 2020 of ACI Animal Health. Secondly, doing a questionnaire survey and collecting data from the samples, deriving a conclusion from the data through a hypothesis testing.

3.5.1 Measuring SCM Performance from Financial Information

SCM performance measurement from financial information has gained a lot of focus these days. A set of supply chain performance can be measured from financial statements of the companies.

1. **Chain Length:** The formulas mentioned below are used for the calculation of the SCM chain length:

$$DRM = RM \times \frac{365}{CRM}$$
$$DWIP = SFG \times \frac{365}{CP}$$
$$DFG = FG \times \frac{365}{CS}$$
Total Chain Length (Days) = DRM + DWIP + DFG

Here,

DRM= Days of raw material

DWIP= Days of work in process

DFG= Days of finished goods respectively

CRM= Cost of raw materials

CP= Cost of production

CS= Cost of sales

Particulars	2018	2019	2020
DRM (Days)	97.97	65.98	59.31
DWIP (Days)	27.88	20.60	14.96
DFG (Days)	124.00	114.33	89.31
Total chain length (Days)	249.86	200.91	163.58

Table 3: Calculation of Chain Length
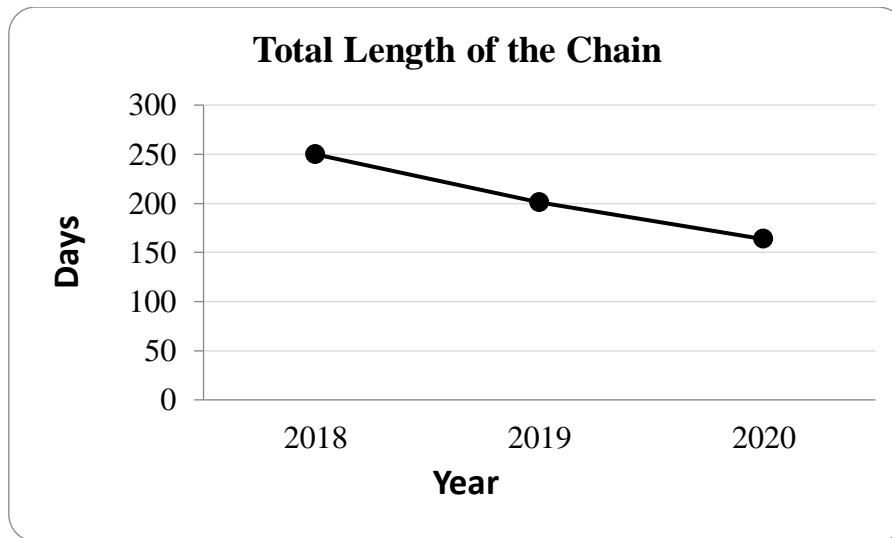
Total Length of the Chain

Figure 4: Trend of Chain Length

Analysis: The total chain length is calculated by adding up DRM, DWIP and DFG. The lower the total chain length of a company the better and have better performance in SCM. By this measure, total time taken of material flow is calculated. From the calculation of three financial year of 2018, 2019 and 2020, it is observed that in 2018 the total chain length was 249.86 days. In 2019, the total chain length of ACI AH decreased and became 200.91 days and in 2020, the SCM chain length of ACI AH decreases again and it is measured 163.58 days. It can be said that ACI Animal Health is performing very well on this dimension. As the company has been capable to minimize the total SCM chain length from 2018 to 2020, ACI Animal Health has better supply chain performance.

2. **SCIR:** The full form of SCIR is supply chain inefficiency ratio. For the calculation of SCIR, ICC and DC are considered to be part of the internal SCM costs. The internal SCIR calculation process is given below:

$$SCC = DC + INV \times ICC$$

$$SCI = \frac{SCC}{NS}$$

Here,

SCC = Supply chain management costs

INV = Inventories which includes raw materials, finished goods and semi-finished goods

DC = Cost of distribution

ICC = Inventory carrying cost

SCIR = Supply chain inefficiency ratio

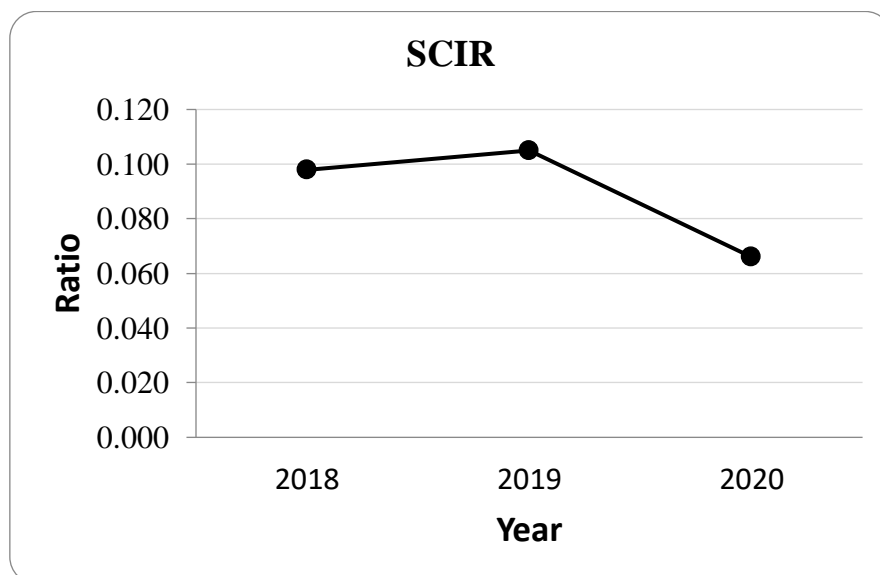| Particulars	2018	2019	2020
SCC (Tk)	352800000	325600000	241200000
SCI (Ratio)	0.098	0.105	0.066

Table 4: Calculation of SCIR

Figure 5: Trend of SCIR

Analysis: SCIR evaluates the relative performance of inner SCM. Firms with better performance will have a low ratio. From the calculation, it is noticed that in 2018, the SCIR of ACI Animal Health was 0.098 which increased to 0.105 in 2019 and in 2020, the ratio decreased to 0.066. Supply chain management cost is lowest in 2020 among three years. The insight of SCM performance of the firm can be understand from the SCIR. Since the company managed to control the supply chain management cost and maintained lower inefficiency ratio, it can be said that the company's supply chain system is efficient and satisfactory. There are lower inefficiencies in the supply chain system of ACI Animal Health.

3. **SCWCP:** SCWCP which is known as supply chain working capital productivity of firms is calculated from inventory, accounts receivable and accounts payable. The following formulas are used to calculate SCWCP:

$$SWC = INV + AR - AP$$
$$SWCP = NS/SWC$$

Here,

SWC = Supply chain working capital

SWCP = Supply chain working capital productivity

NS = Net sales

AR = Account receivables except loans and advances

AP = Account payables

Particulars	2018	2019	2020
SWC (BDT in crore)	129.2	96.4	73.2
SWCP (Ratio)	2.79	3.22	5.00

Table 5: Calculation of SWCP

Figure 6: Trend of SWCP

Analysis: High SCWCP indicates that the company has efficient supply chains. By this measure, it is observed that in 2018 ACI Animal Health had supply chain working capital productivity of 2.79 which increased to 3.22 in 2019 and it increased again to 5.00 in 2020. It can be said that ACI Animal Health is performing very well on this dimension. As the company has been capable to maintain high supply chain working capital productivity each year, ACI Animal Health is progressing and performing efficiently in supply chain management.

3.5.2 Reliability Analysis and Descriptive Analysis

Based on the survey responses, the reliability of the survey was analyzed by using coefficient alpha which is also known as Cronbach's alpha. The Cronbach's alpha is used to evaluate the reliability of the survey responses. Alpha values over 0.7 indicates that the survey responses are reliable. All scales were more than 0.7 which was suggested by Nunnally (1978).

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.774	.796	22

From Table 6: Descriptive analysis (appendix, page-42), the calculation of mean value and standard deviation indicates that selecting high quality suppliers, involving Toll suppliers in new product development processes and SCM integration are most accepted SCM practices of ACI Animal Health. Reducing time across the SCM are generally less practiced in ACI AH. Moreover, inventory cost and on-time delivery are also less preferred by the selected employees which are the indicator of SCM performance.

3.5.3 Hypothesis Test

The weighted answers of the survey questionnaire provided with the scope for calculating the mean value of the each of the sample. These data are further used as inputs to perform the hypothesis testing in IBM SPSS version 26.0. The hypothesis test is performed through a one sample t-test which showed the relationship of SCM practices and performance in ACI Animal Health.

Null and alternative hypothesis of the research are as follows:

Null Hypothesis, H0: *"The SCM practices and performance of ACI Animal Health are strongly significant."*

Hence, $\mu < 2$

Alternative Hypothesis, H1: *"The SCM practices and performance of ACI Animal Health are below average significant."*

Hence, $\mu >= 2$

We will consider that, ACI Animal Health's supply chain management practices and performance are strongly significant if the population mean, μ is less than 2. On the other hand, if the population mean score is more than or equal to 2, we will conclude that, ACI Animal Health's supply chain management practices and performance are below the average standard. Based on the hypothesis test conducted on IBM SPSS version 26.0, the results will either indicate acceptance or rejection of the null hypothesis. It will ultimately reflect the results of the calculation.

Following the steps methods of hypothesis testing, the analysis was conducted in IBM SPSS version 26.0:

Step 1: Let the null hypothesis to be analyzed where H0: $\mu < 2$ against the alternative hypothesis, H1: $\mu >= 2$
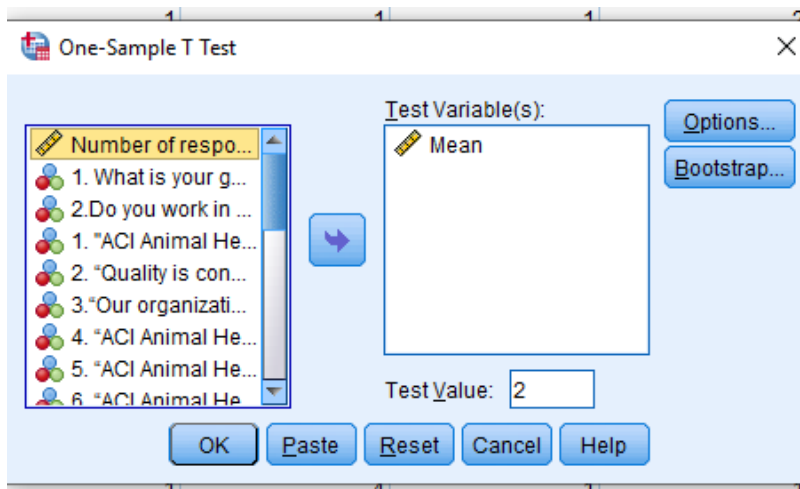
Step 2: The significance level is assumed to be at 0.05

Step 3: A one-sample t-test is to be carried out
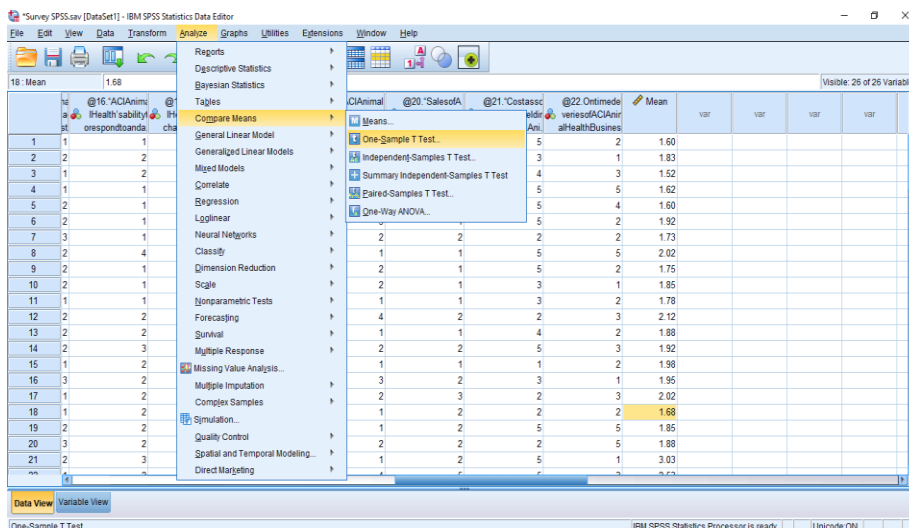
Analyze> Compare Means> One sample t-test

Figure 7: One-sample t-test (1)

Figure 8: One-sample t-test (2)

Step 4: The output is as below

T-Test

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Mean	22	2.0936	.46206	.09851

One-Sample Test

Test Value = 2

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Mean	.951	21	.353	.09364	-.1112	.2985

Figure 9: Output of t-test

According to the test output, the t-value here is .951 with the degree of freedom at 21. The Sig. (2-tailed) value is 0.353. However, as it is a one tail test the p-value here is, 0.353/2=0.177 which is greater than the significance level of 0.05. Therefore, the null hypothesis cannot be rejected.

Step 5: From the hypothesis test it is decided that the SCM practices and performance of ACI Animal Health are strongly significant.

3.6 Findings of Study

The core purpose of the research was to evaluate supply chain performance of ACI Animal Health using financial data and evaluating the co-relation between supply chain strategies/practices on supply chain performance of ACI AH from hypothesis test by analyzing survey data. From the evaluation of SCM performance using financial data, it is observed that from 2018 to 2020 ACI AH has been able to decrease the supply chain length, reduce SCIR and increase SCWCP. It indicates ACI Animal Health's SCM performance has gradually improved over the three years and the company has been following effective SCM strategies and practices.

For further analysis, a survey questionnaire based on SCM practices and performance of ACI AH is also used. Based on the survey responses from 60 employees, SPSS version 26.0 has been used for reliability and descriptive analysis and hypothesis test. All the data were found reliable and descriptive analysis showed that selecting high quality suppliers, involving Toll suppliers in new product development processes and supply chain integration are the most highly embraced SCM practices of ACI AH. Reducing time across the SCM, inventory cost and on-time delivery are less preferred by the respondents among SCM practices.

Hypothesis test was regulated to evaluate the relationship of SCM practices and SCM performance of ACI AH whether these practices have been successful or not. Hypothesis test supports strong positive relation among the SCM practices/ strategies as well as SCM performance metrics of ACI AH. From the hypothesis test there is sufficient evidence to say that, the SCM practices and performance of ACI Animal Health are strongly significant.

3.7 Recommendations

Based on the research data analysis and findings, I have made some recommendations for ACI AH regarding improving supply chain strategies and performance after consulting with my supervisor at ACI AH:

➤ Automation of purchasing, material requirement planning and production requirement is needed. ERP software with SCM functionality feature can be used for maintaining inventory levels which can help employees to concentrate on other important tasks.

➤ Increasing the supply chain's visibility of ACI AH. Company should be able to track each and every component when it moves from the suppliers' hands to them and plan ahead to fulfill future demand. Increasing internal SCM visibility is important for reducing unexplained financial and inventory losses.

➤ Building a resilient supply chain. New technologies like blockchain can be introduced to connect employees and suppliers across supply networks.

➤ Supply base should be segmented. Product grouping strategy should be followed so that different products are sourced by different channels.

➤ Establishing a KPI model for ACI Animal Health for evaluating the performance its SCM.

➤ Practice of lean supply chain considering complexities of business nature.

3.8 Conclusions

This research paper indicates that ACI AH has embraced SCM strategies at a noteworthy level. Good SCM strategies of ACI AH have been effective to lower the supply chain length, lower SCIR as well as higher working capital productivity. Empirical analysis assists that SCM practices and supply chain performance of ACI Animal Health are strongly significant. This is a prefatory study and was commenced to obtain an insight into the evaluation of supply chain performance of ACI AH. Influence of supply chain strategies/practices was also explored on the SCM performance of ACI AH which was found significant.

Even though many manufacturing companies in Bangladesh have established supply strategies and practices to ensure a sustainable supply chain; very limited number of organizations evaluate their SCM performance properly and observe whether the strategies are really effective on the performance or not.

That is why my research paper aimed at measuring the supply chain performance of ACI Animal Health whereby, I have found out that supply strategies and practices ACI AH adopted are significant throughout their supply chain. At the end of my research I can conclude, ACI Animal Health's supply chain performance has been satisfactory and the SCM strategies and practices have been effective on their supply chain the performance. I hope this report would add at least a little value to the knowledge of SCM department of ACI Animal Health, in a broader sense the whole industry.

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Appendix A.

Supply Chain Management Practices and Performance
of
ACI Animal Health (Questionnaire)

Your responses will be used for academic purpose only. Your response is very important to us and that will surely help us to conduct a research on the supply chain performance of ACI Animal Health Business. It is assured that none of your personal information would be revealed. Please respond all the questions.
* Required

Section 1: Demographic Profile

1. What is your gender? *

   Mark only one oval.

   o   Male
   o   Female

2. Do you work in ACI Animal Health? *

   Mark only one oval.

   o   Yes
   o   No

Section 2: Supply Chain Management Practices

The following questions are about how ACI Animal Health has been implementing supply chain management practices. Choose the best scale which suits your answer.

1. "ACI Animal Health depends on high-quality suppliers." *

   Mark only one oval.

   o   Strongly Agree
   o   Agree
   o   Neutral
   o   Disagree
   o   Strongly Disagree

2. "Quality is considered as number one criteria in selecting suppliers for ACI Animal Health." *

   Mark only one oval.

   o   Strongly Agree
   o   Agree
   o   Neutral
   o   Disagree
   o   Strongly Disagree

3. "Our organization has continuous quality improvement program." *

   Mark only one oval.

   o   Strongly Agree
   o   Agree
   o   Neutral
   o   Disagree
   o   Strongly Disagree

4. "ACI Animal Health improves the integration of activities across the supply chain." *

   Mark only one oval.

   o   Strongly Agree
   o   Agree
   o   Neutral
   o   Disagree
   o   Strongly Disagree

5. "ACI Animal Health actively involves its Toll suppliers in new product development processes" *

   Mark only one oval.

   o   Strongly Agree
   o   Agree
   o   Neutral
   o   Disagree
   o   Strongly Disagree

6. "ACI Animal Health supports suppliers for shorter lead times." *

   Mark only one oval.

   o   Strongly Agree
   o   Agree
   o   Neutral
   o   Disagree
   o   Strongly Disagree

7. "ACI Animal Health regularly solves problems jointly with its suppliers." *

   Mark only one oval.

   o   Strongly Agree
   o   Agree
   o   Neutral
   o   Disagree
   o   Strongly Disagree

8. "Our supply chain members have common goals for supply chain management."
   *

   Mark only one oval.

   o   Strongly Agree
   o   Agree
   o   Neutral
   o   Disagree
   o   Strongly Disagree

9. "Our supply chain members are actively involved in standardizing supply chain
   practices and operations." *

   Mark only one oval.

   o   Strongly Agree
   o   Agree
   o   Neutral
   o   Disagree
   o   Strongly Disagree

10. "Supply chain members are aware of their responsibility within the supply chain."
    *

    Mark only one oval.

    - o Strongly Agree
    - o Agree
    - o Neutral
    - o Disagree
    - o Strongly Disagree

11. "ACI Animal Health involves all members of the firm's supply chain in the product /service/ marketing plans."

    Mark only one oval.

    - o Strongly Agree
    - o Agree
    - o Neutral
    - o Disagree
    - o Strongly Disagree

12. "ACI Animal Health reduces response time across the supply chain."

    Mark only one oval.

    - o Strongly Agree
    - o Agree
    - o Neutral
    - o Disagree
    - o Strongly Disagree

13. "ACI Animal Health increases the firm's Just-In-Time (JIT) capabilities."

    Mark only one oval.

    - o Strongly Agree
    - o Agree
    - o Neutral
    - o Disagree
    - o Strongly Disagree

14. "To what level ACI Animal Health establishes more frequent contact with the members of the supply chain."

Mark only one oval.

- o Extremely Better
- o Better
- o Neutral
- o Worse
- o Extremely Worse

15. "ACI Animal Health creates a greater level of trust among the supply chain members."

Mark only one oval.

- o Strongly Agree
- o Agree
- o Neutral
- o Disagree
- o Strongly Disagree

Section 3: Supply Chain Flexibility and Output Performance

The following questions are about ACI Animal Health's supply chain performance. Choose the best scale to indicate the performance level of your organization's supply chain.

1. "ACI Animal Health's ability to respond to and accommodate demand variations, such as seasonality." *

Mark only one oval.

- o Extremely Better
- o Better
- o Neutral
- o Worse
- o Extremely Worse

2. "ACI Animal Health's supply chain creates a compatible communication and information system"

Mark only one oval.

- o Strongly Agree
- o Agree
- o Neutral
- o Disagree

o Strongly Disagree

3. "ACI Animal Health's ability to respond to and accommodate new products, new
    markets or new competitors." *

    Mark only one oval.

    o Extremely Better
    o Better
    o Neutral
    o Worse
    o Extremely Worse

4. "ACI Animal Health communicates own firm's future strategic needs to the
    suppliers."

    Mark only one oval.

    o Strongly Agree
    o Agree
    o Neutral
    o Disagree
    o Strongly Disagree

5. "Sales of ACI Animal Health Business"

    Mark only one oval.

    o Extremely Better
    o Better
    o Neutral
    o Worse
    o Extremely Worse

6. "Cost associated with held inventory of ACI Animal Health Business." *

    Mark only one oval.

    o Very Low
    o Low
    o Neutral
    o High
    o Extremely High

7. "On time deliveries of ACI Animal Health Business." *

   Mark only one oval.

   o Extremely Better
   o Better
   o Neutral
   o Worse
   o Extremely Worse

Table 6: Descriptive analysis and reliability of SCM practices and performance items

No	Scale Items	Mean	SD	Item–total correlation	Alpha if item deleted	Coeff. Alpha
	Supply Chain Management Practices					**.774**
1	ACI Animal Health depends on high-quality suppliers.	1.60	1.012	.330	.765	
2	Quality is considered as number one criteria in selecting suppliers for ACI Animal Health.	1.83	1.167	.160	.778	
3	Our organization has continuous quality improvement program.	1.52	.725	.481	.759	
4	ACI Animal Health improves the integration of activities across the supply chain.	1.62	.865	.421	.761	
5	ACI Animal Health actively involves its Toll suppliers in new product development processes.	1.60	.741	.441	.761	
6	ACI Animal Health supports suppliers for shorter lead times.	1.92	.850	.372	.763	
7	ACI Animal Health regularly solves problems jointly with its suppliers.	1.73	.954	.295	.767	
8	Our supply chain members have common goals for supply chain management.	2.02	1.017	.263	.770	
9	Our supply chain members are actively involved in standardizing supply chain practices and operations.	1.75	.795	.433	.761	
10	Supply chain members are aware of their responsibilities within the supply chain.	1.85	.799	.444	.760	
11	ACI Animal Health involves all members of the firm's supply chain in the product /service/ marketing plans.	1.78	.958	.424	.760	
12	ACI Animal Health reduces response time across the supply chain.	2.12	1.010	.281	.768	
13	ACI Animal Health increases the firm's Just-In-Time (JIT) capabilities.	1.88	.940	.338	.765	

14	To what level ACI Animal Health establishes more frequent contact with the members of the supply chain.	1.92	.979	.319	.766	
15	ACI Animal Health creates a greater level of trust among the supply chain members.	1.98	1.017	.306	.767	
	Supply Chain Management Performance					
16	ACI Animal Health's ability to respond to and accommodate demand variations, such as seasonality.	1.95	.946	.420	.760	
17	ACI Animal Health's supply chain creates a compatible communication and information system.	2.02	1.157	.394	.761	
18	ACI Animal Health's ability to respond to and accommodate new products, new markets or new competitors.	1.68	.892	.383	.763	
19	ACI Animal Health communicates own firm's future strategic needs to the suppliers.	1.85	.820	.386	.763	
20	Sales of ACI Animal Health Business.	1.88	1.121	.379	.762	
21	Cost associated with held inventory of ACI Animal Health Business.	3.03	1.288	-.041	.795	
22	On time deliveries of ACI Animal Health Business.	2.53	1.384	.268	.772	

Source: Survey result