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# Supply chain length estimation: A study on FMCG companies

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**Abstract**
The volatility in the distribution and supply chain issues are now the main concern to the corporate sectors. The success of any company depends on the structure and alignment of its supply chain design. The supply chain is responsible in making the products available to the right place, to the right customer, at the right price in right time. While developing the supply chain a company needs to understand the supply chain length. The length of the supply chain is very important issue to be considered by the companies. After all it is the length that determines the reach of the products and their use in the markets. Detail calculations on estimating the length of the supply chain of different FMCG brands were calculated to draw necessary comments on the supply chain length. The current study pin pointed the supply chain length on the zone of retailers. Descriptive Statistics were applied to draw meaningful insights about the supply chain length.

**Keywords:** Supply Chain, supply Chain alignments, supply chain design, supply chain length & distribution.

## 1. Introduction

The domain of business is measured by the strength of its supply chain and logistics. The supply chain is basically the links and networks of different parties like vendors, manufacturers, dealers, wholesalers and retailers. Seeing the diversity in the markets and road conditions of the country the distribution and logistics arrangement need to strengthen and designed.

There are number of factors which cause disturbances in the distribution and logistics management of the products. The FMCG range of products which are very well integrated with the day to day life style of the people, need to be available in the market without any stock out problem. The following table shows the ranking of the FMCG companies in India.

**Table 1:** FMCG Companies in India

| Rank | Name of the Company |
|------|---------------------|
| 1 | ITC Ltd |
| 2 | HUL |
| 3 | Nestle India |
| 4 | Parle Agro |
| 5 | Britannia Industries Ltd |
| 6 | Marico |
| 7 | Godrej Industries |
| 8 | Colgate Palmolive (India) Pvt Ltd |
| 9 | Procter & Gamble Co. (P&G) |
| 10 | Amul |

**Source:** http://listz.in/top-10-fmcg-companies-in-india.html

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**2. Statement of The Problem:** The FMCG products are being consumed very fast in the market. The major issue lies with the FMCG products is the manufacturing date and the expiry date written in the level of the product. The rate of use of the FMCG products offered by different companies is the main concern here so that no product should occupy the shelf life for a longer duration. Thus, the study will help in understanding supply chain

opportunities in distribution in India. Therefore it is very much essential to calculate the length of the supply chain of the products of FMCG domain.

## 3. Review of Literature

The relationship between the buyer and vendor is very vital in the supply chain performance of a company. The optimum strength should be observed for the relationship of buyer-vendor. Detailed study was carried out to explore the buyer vendor relationship. The study was carried out to by reviewing the perspectives of transaction cost theory, strategy structure theory and resource based theory of the firm (Hoyt & Hug, 2000) [4].

For gaining competitive advantage and improving the organizational performance, effective supply chain management is must. The different dimensions that matters are strategic supplier partnership, customer relationship, level of information sharing, quality of information sharing and postponement. In order to run the study data were gathered from 196 organizations. The result of the study was that the higher level of SCM practice can lead to enhance competitive advantage and improved organizational performance (Li, Nathan, Nathan & Rao, 2006) [6].

In order to achieve the zone of successful supply chain management the two factors that are essential – cross functional integration and marketing. Framework of the supply chain management was developed and case studies were conducted at several companies by involving multiple members of supply chain (Lambert & Cooper, 2000) [5].

Procurement, production and distribution the three fundamental stages of supply chain managed independently with large inventories. In course of time due to competitive pressure and market globalization firms developed supply chains that quickly respond to the customer needs. Cost minimization is the prime focus in these operations. Due to the advancements in ICT the cost in the supply chain can well be controlled (Thomas & Griffin, 1996) [10].

The market structure of today's business is highly competitive in nature due to turbulence and uncertainty. The supply chain risk is very important in business. The focus should be to minimize the supply chain risk. The end-to-end visibility may to some extent minimize the supply chain risk (Christopher & Lee, 2004) [3].

The work of Li & Lin during 2006 emphasized the impact of environmental uncertainty, intra-organizational facilitators, and inter-organizational relationships on information sharing and information quality in supply chain management.

To perform in the highly competitive and volatile market the traditional supply chain faces lot of difficulties and blockages. Thus, to manage the volatile market and also at the same time to perform well in the market it the agile supply chain practices that the companies need to practice (Christopher, 2000) [2].

The successful companies always emphasize on the collaboration part in the supply chain. It is the collaboration in the supply chain that brings the most success in the business (Barratt, 2004) [1].

Most of the businesses focused their effort to the effectiveness and efficiency of separate business functions. Planning, Controlling and Designing is the key focusing for any supply chain management. For better supply chain decision it is the synergy of inter-functional and inter-organizational integration that ensures the successful supply chain (Min & Zhou, 2002) [8].

Due to global competition and high demanding customer, there is a need for high variety, low cost, sound quality the organizations are thinking beyond their boundaries to the management of their supply chains (Scott & Westbrook, 1991) [9].

## 4. Objectives of the Study

The objectives of the study are:
➢ To estimate the length of supply chain for packed goods.
➢ To compare the supply chain lengths of the large firm vis-à-vis small firm.
➢ To compare the time taken in supply chain for fast moving products vis-à-vis slow moving products.

## 5. Hypothesis of the Study

Following are the hypothesis of the study:
➢ **H01:** There is no significance difference between the supply chain lengths of the large firms and the small firms.
➢ **H02:** There is no significance difference between the supply chain lengths of the fast moving products and the slow moving products.

## 6. Scope of the Study

The study considered the detailed analysis of the supply chain length issues for the FMCG companies in both organized and un-organized retail sectors.

## 7. Limitation of the Study

The study concentrates on the few product lines from two FMCG companies. Also due to time and cost constraints the entire study is based on the city Silchar of Assam.

## 8. Research Methodology and Data

The study is of the nature of exploratory in nature. The data were gathered from primary sources of the study. The detailed study was carried out to collect different primary data. Structured questionnaire and direct observation were applied.

Four products from different companies of FMCG sectors have been identified. Each products were targeted from three FMCG companies. Four retailers (two from organized sectors and two from un-organized sectors) were identified for the study.

Noodles, Toothpaste, Biscuits, Soap were the four FMCG products whose supply chain length estimation needs to be studied.

**Noodles** - Knorr soupy noodles (HUL), Maggi (Nestle), Yippee noodles (ITC)

**Toothpaste** – Close up (HUL), Colgate (Colgate-Palmolive), Oral-B (P&G)

**Biscuits** - Marie Light (ITC), Marie Gold (Britannia), Marie (Parle agro)

**Soap**- Vivel (ITC), Dove (HUL), Pears (P&G)

From each of the retail store following data were collected for each product line:
➢ Manufacturing date on stock held at retailer.
➢ Estimate of average sales rate (number of units sold per month).
➢ Stock available with the retailer.

Estimation of length of the chain, $T_S = T_{MS} + T_{SS}$

Where, $T_{MS}$ is the time from the manufacturing date of the product to the study initiation and $T_{SS}$ is the time from the study initiation to the estimated time of sale of the product.

**Table 1:** Stock, Sales Table

| | Data Collected from retailer | | |
|---|---|---|---|
| Item | Stock (units) | Sales (units)/ Month | Date of Manufacture on stock held |
| P1 | | | |
| P2 | | | |
| P3 | | | |

**Table 2:** Supply Chain Lengths

| Item | $T_{MS}$ (in months) | $T_{SS}$ (in months) | $T_{MS} + T_{SS}$ (in months) |
|---|---|---|---|
| P1 | | | |
| P2 | | | |
| P3 | | | |

Here in the table 2, to calculate $T_{MS}$ (months) is nothing but the time from the manufacturing date of the product to the study initiation and to calculate $T_{SS}$ (in months) it is essential to find the average time stock would spend at retailer from the time of study = (stock/ sales)/2

Since four products were chosen for the study and the study was carried in November 2015, the different data were stocks, sales rate and also the manufacturing date on stock on the shelf. The calculation procedure for length of the supply chain is also shown in the table 2.

## 9. Data Analysis and Findings
The data thus obtained were analyzed and presented as follows:

➢ **Observations on supply chain length**

| Noodles | | | |
|---|---|---|---|
| Retailer 1 | | | |
| Brand & Company | $T_{MS}$ (in months) | $T_{SS}$ (in months) | $(T_{MS} + T_{SS})$ in months |
| Knorr Soupy noodles (HUL) | 2 | 0.38 | 2.38 |
| Yippee noodles (ITC) | 3 | 0.33 | 3.33 |
| Maggi (Nestle)* | 1 | 0.25 | 1.25 |
| Retailer 2 | | | |
| Brand & Company | $T_{MS}$ (in months) | $T_{SS}$ (in months) | $(T_{MS} + T_{SS})$ in months |
| Knorr Soupy noodles (HUL) | 2 | 0.67 | 2.67 |
| Yippee noodles (ITC) | 3 | 0.75 | 3.75 |
| Maggi (Nestle)* | 1 | 0.10 | 1.10 |

(Compiled from the field study)

| Noodles | | | |
|---|---|---|---|
| Organized Retailer 1 | | | |
| Brand & Company | $T_{MS}$ (in months) | $T_{SS}$ (in months) | $(T_{MS} + T_{SS})$ in months |
| Knorr Soupy noodles (HUL) | 2 | 0.57 | 2.57 |
| Yippee noodles (ITC) | 3 | 0.58 | 3.58 |
| Maggi (Nestle)* | 1 | 0.50 | 1.50 |
| Organized Retailer 2 | | | |
| Brand & Company | $T_{MS}$ (in months) | $T_{SS}$ (in months) | $(T_{MS} + T_{SS})$ in months |
| Knorr Soupy noodles (HUL) | 2 | 0.58 | 2.58 |
| Yippee noodles (ITC) | 3 | 0.67 | 3.67 |
| Maggi (Nestle)* | 1 | 0.25 | 1.25 |

(Compiled from the field study)

| Toothpaste | | | |
|---|---|---|---|
| Retailer 1 | | | |
| Brand & Company | $T_{MS}$ (in months) | $T_{SS}$ (in months) | $(T_{MS} + T_{SS})$ in months |
| Close Up (HUL) | 2 | 0.20 | 2.20 |
| Colgate (Colgate Palmolive) | 1 | 0.17 | 1.17 |
| Oral-B (P&G) | 3 | 0.50 | 3.50 |
| Retailer 2 | | | |
| Brand & Company | $T_{MS}$ (in months) | $T_{SS}$ (in months) | $(T_{MS} + T_{SS})$ in months |
| Close Up (HUL) | 1 | 0.63 | 1.63 |
| Colgate (Colgate Palmolive) | 1 | 0.21 | 1.21 |
| Oral-B (P&G) | 4 | 0.25 | 4.25 |

(Compiled from the field study)

| Toothpaste | | | |
|---|---|---|---|
| Organized Retailer 1 | | | |
| Brand & Company | $T_{MS}$ (in months) | $T_{SS}$ (in months) | $(T_{MS} + T_{SS})$ in months |
| Close Up (HUL) | 2 | 0.17 | 2.17 |
| Colgate (Colgate Palmolive) | 1 | 0.33 | 1.33 |
| Oral-B (P&G) | 3 | 1.25 | 4.25 |
| Organized Retailer 2 | | | |
| Brand & Company | $T_{MS}$ (in months) | $T_{SS}$ (in months) | $(T_{MS} + T_{SS})$ in months |
| Close Up (HUL) | 1 | 0.50 | 1.50 |
| Colgate (Colgate Palmolive) | 1 | 0.43 | 1.43 |
| Oral-B (P&G) | 4 | 1.00 | 5.00 |

(Compiled from the field study)

| Biscuits | | | |
|---|---|---|---|
| Retailer 1 | | | |
| Brand & Company | $T_{MS}$ (in months) | $T_{SS}$ (in months) | $(T_{MS} + T_{SS})$ in months |
| Marie Light (ITC) | 1 | 0.30 | 1.30 |
| Marie Gold (Britannia) | 1 | 0.20 | 1.20 |
| Marie (Parle agro) | 3 | 1.00 | 4.00 |
| Retailer 2 | | | |
| Brand & Company | $T_{MS}$ (in months) | $T_{SS}$ (in months) | $(T_{MS} + T_{SS})$ in months |
| Marie Light (ITC) | 1 | 0.21 | 1.21 |
| Marie Gold (Britannia) | 1 | 0.20 | 1.20 |
| Marie (Parle agro) | 3 | 0.75 | 3.75 |

(Compiled from the field study)

| Biscuits | | | |
|---|---|---|---|
| Organized Retailer 1 | | | |
| Brand & Company | $T_{MS}$ (in months) | $T_{SS}$ (in months) | $(T_{MS} + T_{SS})$ in months |
| Marie Light (ITC) | 1 | 0.13 | 1.13 |
| Marie Gold (Britannia) | 1 | 0.25 | 1.25 |
| Marie (Parle agro) | 1 | 0.50 | 1.50 |
| Organized Retailer 2 | | | |
| Brand & Company | $T_{MS}$ (in months) | $T_{SS}$ (in months) | $(T_{MS} + T_{SS})$ in months |
| Marie Light (ITC) | 1 | 0.21 | 1.21 |
| Marie Gold (Britannia) | 1 | 0.25 | 1.25 |
| Marie (Parle agro) | 1 | 0.75 | 1.75 |

(Compiled from the field study)

| Soap | | | |
|---|---|---|---|
| **Retailer 1** | | | |
| **Brand & Company** | $T_{MS}$ (in months) | $T_{SS}$ (in months) | $(T_{MS} + T_{SS})$ in months |
| Vivel (ITC) | 2 | 0.31 | 2.31 |
| Dove (HUL) | 2 | 0.38 | 2.38 |
| Pears (P&G) | 3 | 0.50 | 3.50 |
| **Soap** | | | |
| **Retailer 2** | | | |
| **Brand & Company** | $T_{MS}$ (in months) | $T_{SS}$ (in months) | $(T_{MS} + T_{SS})$ in months |
| Vivel (ITC) | 2 | 0.38 | 2.38 |
| Dove (HUL) | 3 | 0.33 | 3.33 |
| Pears (P&G) | 3 | 1.00 | 4.00 |

(Compiled from the field study)

| Soap | | | |
|---|---|---|---|
| **Organized Retailer 1** | | | |
| **Brand & Company** | $T_{MS}$ (in months) | $T_{SS}$ (in months) | $(T_{MS} + T_{SS})$ in months |
| Vivel (ITC) | 1 | 0.17 | 1.17 |
| Dove (HUL) | 1 | 0.20 | 1.20 |
| Pears (P&G) | 3 | 1.25 | 4.25 |
| **Soap** | | | |
| **Organized Retailer 2** | | | |
| **Brand & Company** | $T_{MS}$ (in months) | $T_{SS}$ (in months) | $(T_{MS} + T_{SS})$ in months |
| Vivel (ITC) | 1 | 0.31 | 1.31 |
| Dove (HUL) | 1 | 0.33 | 1.33 |
| Pears (P&G) | 3 | 0.75 | 3.75 |

(Compiled from the field study)

Thus the supply chain length for the noodles as found from the study is shorter for Maggi (Nestle India) in case of all the four points (Retailer1, Retailer 2, Organized Retailer 1 and Organized Retailer 2). This indicates that the products are well distributed in the market.

For toothpaste the supply chain length for Colgate (Colgate Palmolive) is shorter in all the four points. Thus, it means that the Colgate is spending very short time length in the stores.

While, for biscuits it the Marie Gold (from Britannia) that is having shorter supply chain length followed by Marie Light and Marie.

At last, in soap segments, it is the Vivel (ITC) that is having the smallest supply chain length.

➢ *To compare the differences between the supply chain lengths of the large firms and the small firms, following derived table may be used:*

**Table 3:** Supply Chain Length (months)

| | Yippee noodles (ITC) | Knorr Soupy noodles (HUL) | Maggi (Nestle) |
|---|---|---|---|
| | 3.33 | 2.38 | 1.25 |
| | 3.75 | 2.67 | 1.1 |
| | 3.58 | 2.57 | 1.5 |
| | 3.67 | 2.58 | 1.25 |
| **Average** | 3.5825 | 2.55 | 1.275 |
| **Standard Deviation** | 0.157698288 | 0.10559356 | 0.143614066 |

(*Compiled from the field study*)

From the above table it is observed that the average supply chain length and the corresponding standard deviation of the three companies. The highest length in supply chain is for ITC and lowest for Nestle, but the Standard Deviation in the

supply chain length lower for HUL in the segment of Noodles.

**Table4:** Supply Chain Length (months)

| | Close Up (HUL) | Colgate (Colgate Palmolive) | Oral-B (P&G) |
|---|---|---|---|
| | 2.2 | 1.17 | 3.5 |
| | 1.63 | 1.21 | 4.25 |
| | 2.17 | 1.33 | 1.33 |
| | 1.5 | 1.43 | 1.43 |
| **Average** | 1.875 | 1.285 | 2.6275 |
| **Standard Deviation** | 0.313568174 | 0.102347447 | 1.275860004 |

(*Compiled from the field study*)

Thus here the average supply chain length is lower for Colgate Palmolive and higher for P&G. Also the standard deviation in the supply chain length is smaller for HUL but larger for P&G.

**Table 5:** Supply Chain Length (months)

| | Marie Light (ITC) | Marie (Parle Agro) | Marie (Britannia) |
|---|---|---|---|
| | 1.3 | 4 | 1.2 |
| | 1.21 | 3.75 | 1.2 |
| | 1.3 | 1.5 | 1.25 |
| | 1.21 | 1.75 | 1.25 |
| **Average** | 1.255 | 2.75 | 1.225 |
| **Standard Deviation** | 0.045 | 1.131923142 | 0.025 |

(*Compiled from the field study*)

Thus here the average supply chain length is lower for Marie (Britannia) and higher for Parle Agro. Also the standard deviation in the supply chain length is smaller for Britannia but larger for Parle Agro.

**Table 6:** Supply Chain Length (months)

| | Vivel (ITC) | Dove (HUL) | Pears (P&G) |
|---|---|---|---|
| | 2.31 | 2.38 | 3.5 |
| | 2.38 | 3.33 | 4 |
| | 1.17 | 1.2 | 4.25 |
| | 1.31 | 1.33 | 3.75 |
| **Average** | 1.7925 | 2.06 | 3.875 |
| **Standard Deviation** | 0.555264577 | 0.864262692 | 0.279508497 |

(*Compiled from the field study*)

Thus here the average supply chain length is lower for Vivel (ITC) and higher for Dove (HUL). Also the standard deviation in the supply chain length is smaller for P&G but larger for HUL.

Therefore the null hypothesis (H01) is rejected. Thus from the above tables it is observed that there is a significant difference between the supply chain lengths of the large firms and the small firms.

➢ *To compare the differences between the supply chain lengths of the fast moving products and the slow moving products.*

In order to process the above issue here from the study and collected data two companies along with their three product lines were taken and following table obtained.

| HUL (Supply Chain Length) in months | | | |
|---|---|---|---|
| | Noodles (Knorr Soupy noodles) | Toothpaste (Close Up) | Soap (Dove) |
| Retailer1 | 2.38 | 2.2 | 2.38 |
| Retailer2 | 2.67 | 1.63 | 3.33 |
| Organized Retailer 1 | 2.57 | 2.17 | 1.2 |
| Organized Retailer 2 | 2.58 | 1.5 | 1.33 |
| Average | 2.55 | 1.875 | 2.06 |
| SD | 0.10559356 | 0.313568174 | 0.864263 |

(*Compiled from the field study*)

It is observed from the above table that the supply chain length of the same company (HUL) is quite varying for the different product line.

| ITC (Supply Chain Length) in months | | | |
|---|---|---|---|
| | Noodles (Yippee noodles) | Biscuits (Marie Light) | Soap (Vivel) |
| Retailer1 | 3.33 | 1.3 | 2.31 |
| Retailer2 | 3.75 | 1.21 | 2.38 |
| Organized Retailer 1 | 3.58 | 1.13 | 1.17 |
| Organized Retailer 2 | 3.67 | 1.21 | 1.31 |
| Average | 3.5825 | 1.2125 | 1.7925 |
| SD | 0.157698288 | 0.060156047 | 0.555265 |

(*Compiled from the field study*)

It is observed from the above table that the supply chain length of the same company (ITC) is quite varying for the different product line.

Therefore the null hypothesis (H02) is rejected. Thus from the above tables it is observed that there is a significant difference between the supply chain lengths of the fast moving products and the slow moving products of the same company.

## 10. Conclusion

Thus any manufacturer must always understand the supply chain length for smooth operations. From the study it is clear that lot of data need to be accommodated to draw clear insights. As the operations of business is measured by the strength of its supply chain and logistics. Seeing the diversity in the markets and road conditions of the country the distribution and logistics arrangement need to strengthen and designed, so that supply chain length may be reduced.

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