UPENG/2008/26007

ISSN 0974-4037

IMPACT OF COLLABORATION AND PROCESS INTEGRATION : A CASE OF ELECTRONICS COMPANY

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Abstract:

The objective of the proposed research is to detail out the current supply chain landscape, current network and warehousing landscape, product flow from the manufacturer to the end customer. Challenges of supply chain management may be classified as operational, infrastructural and financial, gaps have been identified and business imperative for change are being suggested. Outsourcing of the warehousing and logistics operations can be implemented with tangible benefits.

Keywords : NDC, RDC, SDC, IBT

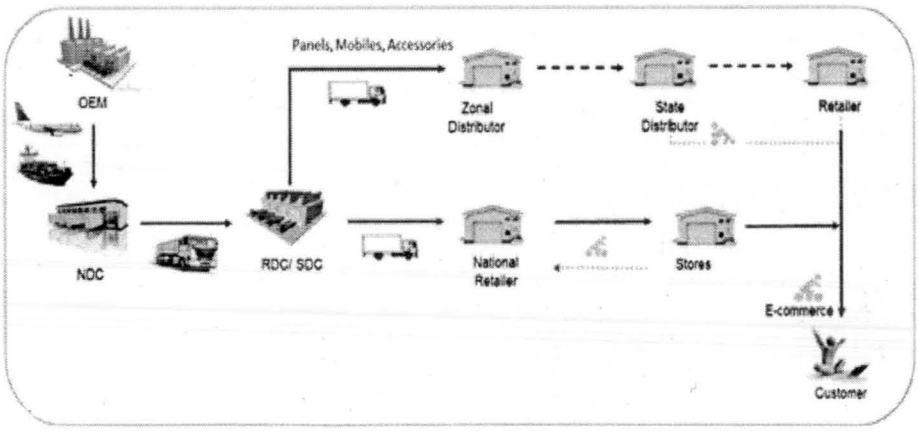
1. Introduction

1.1. Introduction to Electronics Supply Chain

The below figure gives an overview of a typical end to end supply chain of electronics organization.

The Electronics supply chain has the following touch points and product flow

a. Factory / OEM: (Where the products are manufactured) eg : TV, Mobile. They are typically outside India in this case. The TV manufacturing is primarily done in Malaysia & China. The mobile manufacturing is done primarily in China factories
b. The production is based on a firm monthly planning cycle for TV and mobiles through a structured monthly process of Seihan meetings with the factories.
c. The demand is aggregated by model and is provided to the factories for production.
d. The manufacturing is completed by the respective factories and the containerized loads of the products are then shipped either by Sea route or by Air (Typically incase of Mobile) to different sea and airports in India, basis the regional demand allocation.
e. The Import consignments (By sea or by air) arrives to the respective NDC / RDC location.
f. The entire Domestic network is divided into 4 zones (East, west, North and south).
g. Each zone has an RDC (Regional Distribution center) where the import consignments are cleared and is the first touch point for the region.
h. Basis the demand, the region has a cluster of SDC (State Distribution network) which cater to the state wise demand.
i. The network is like star network with a combination of hub and spoke in the region
j. The material from RDC is moved to the respective SDC location basis the demand push by respective branches, basis the demand.
k. The SDC are typically smaller in size units and handle multiple SKU or entire product range but in quantities proportional to the sales demand of the respective geographies
l. The sale / billing is done by product to Regional Distributors; which then internally handle the distribution of the product
m. The billing is also done to the retailers (MBC) or national retailers as well. They intern sell to the end customer by means of shop or online sales.



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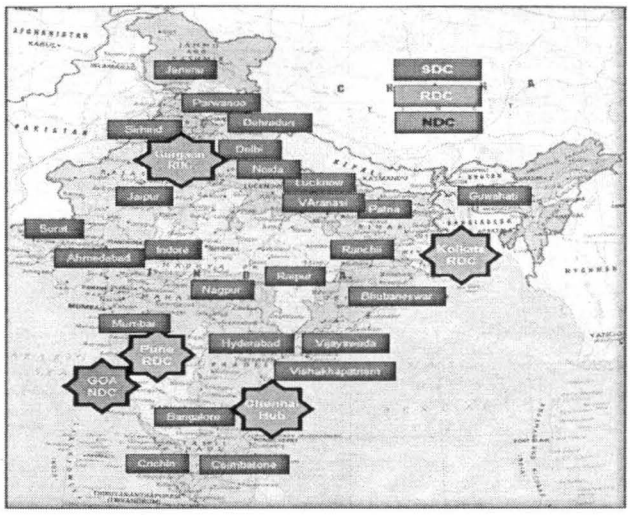
1.2. Current Supply Chain Network

Zone	Type	Number
All India	NDC	01
North	RDC	01
East	RDC	01
West	RDC	01
South	RDC	01
North	SDC	10
East	SDC	05
West	SDC	05
South	SDC	06



2. Supply Chain Challenges

2.1. Challenges in Current Supply Chain

The electronics supply chain has the following business imperatives

a. The expected turnaround time to the customer is very low, (As low as an hourly replenishment schedule)
b. Variability in demand during peak and non-peak season increasing and impacting the asset utilization.
c. Shortage of Skilled workforce, due to high level of precession in dispatch and various promotional and marketing campaign
d. High level of pilferage and damage and risk of obsolesce if the supply chain is not full proof.

Following are the key challenges in the current supply chain

- Operational Challenges

a. Infrastructure Development of Supply Chain
b. Scalability / Evolution of Supply Chain Network
c. Day to Day / Local Issue resolution
d. Vendor Management

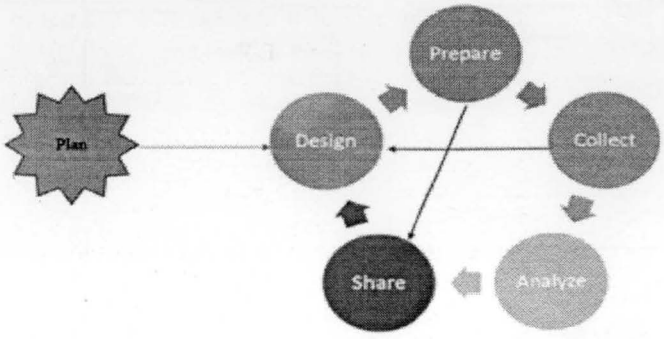
- Performance Challenges

a. Operational KPI Management (Delivery, Inventory, Productivity)
b. Vendor Performance (Warehousing, Transportation)

- Financial Challenges

a. High Operational cost to sales
b. High Capex and Maintenance cost
c. Contracting and Vendor Management

2.2. Case Study Research



The case study research is one of the several ways of doing social science research. It is not limited to experiments, surveys, histories and economic and epidemiologic research. Each method has particular advantages/Disadvantages depending upon the 3 conditions

- The type of research question
- The control over actual behavioral events
- Focus on contemporary over historic phenomena

The case study research is done when the how and why questions are being posed, the investigator has little control over the events and the focus is on the contemporary phenomena within the real life context.

In the Case study research, the richness of the phenomena and the extensiveness of the real life context require the subject to cope with the technical distinct situation.

1. Plan

a. Identifyresearchquestion, or other rationale for doing case study
b. Decide to use case study method compared to other methods
c. Understanding its strengths and limitations

2. Design

a. Define the unit of analysis and likely cases to be studied
b. Develop theory, propositions and issues underlying the anticipated study
c. Identify the case study design
d. Define the procedure to maintain case study quality

3. Prepare

a. Hone skills as an case study investigator
b. Train for specific case study
c. Develop case study protocol
d. Conduct pilot case

4. Collect

a. Follow case study protocol
b. Use multiple sources of evidence

c. Crete database
d. Maintain chain of evidence

5. Analyze

a. Rely on Theoretical propositions and other strategies
b. Use qualitative / quantitative techniques
c. Explore rival explanation
d. Display data apart from Interpretation

6. Share

a. Define audience
b. Compose textual / visual material
c. Display enough evidence for reader to reach own conclusion

3. Impact of 3PL Transition

The warehousing case study is an attempt to identify and bring about the business and supply chain imperatives to change the warehousing landscape from Company operated to a 3PL operated model.

The current landscape consists of a network of 30 warehouses spread over the entire country.

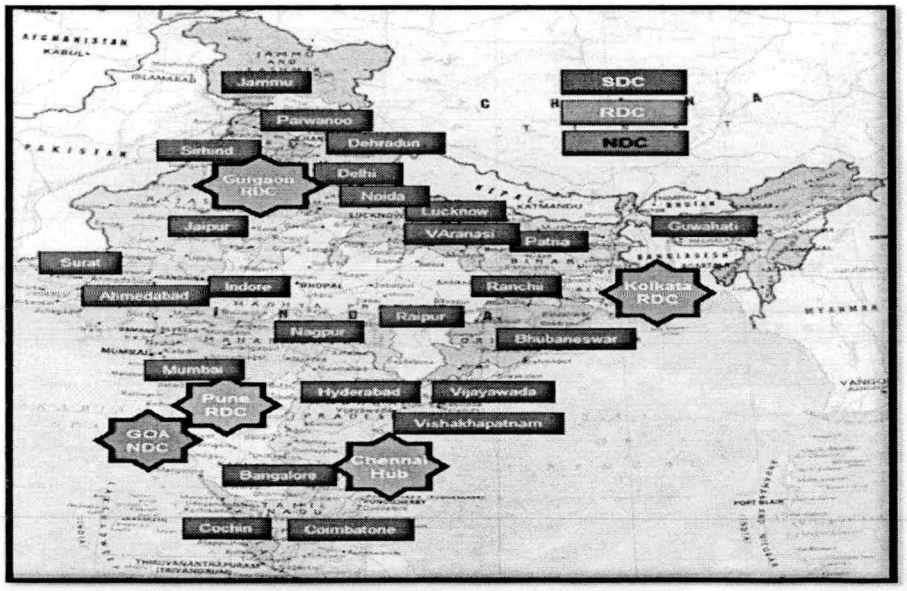
The physical warehouse network is a Hub and Spoke model; with each region having a HUB warehouses and associated spoke warehouses.

The Hub warehouse are also called an RDC (Regional distribution center) location and the Spoke warehouse is called an SDC location (State distribution center)

The number of warehouses are made keeping in mind the following key aspects

1. Responsiveness to last mile demand / sales demand by the customer (ZD, NR) etc
2. Low channel inventory by the channel partners due to high value and capital investment
3. Local taxation laws effecting the overall product cost
4. Unique / Different discounting and marketing campaigns

3.1 Current warehouse Landscape



a. The entire Domestic network is divided into 4 zones (East, west, North and south).
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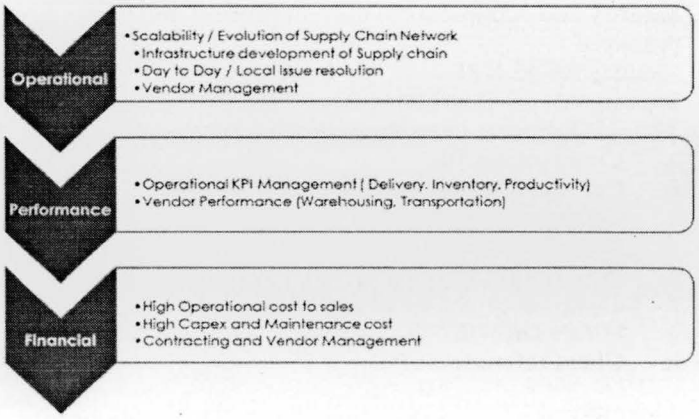
3.2 Gap Identification



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Following are the key challenges in the current supply chain

• Operational Challenges

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D. Vendor Management

□ ***Performance Challenges***

A. Operational KPI Management (Delivery, Inventory, Productivity)
B. Vendor Performance (Warehousing, Transportation)

□ ***Financial Challenges***

A. High Operational cost to sales
B. High Capex and Maintenance cost
C. Contracting and Vendor Management

With the above mentioned challenges, the focus of the supply chain group was to reorganize itself and to differentiate between the core and non-core supply chain tasks.

The key focus was into supply chain planning, customer service and implement special projects and not on day today fire fighting.

The following approach was adopted to transform the company owned operations to 3PL operations. The same was done in phases

1. Identify and document the current process and best practices
2. Identify AS-IS KPI
3. Identify AS IS Cost elements
4. 3PL RFQ process basis the following parameters
   a. Company profile
   b. Current Clientage
   c. Operational experience
   d. Global and Local reach
   e. Information systems
   f. Compliance and audit capabilities
   g. Future Growth
   h. Client references

Basis the above 8 parameters, the RFQ was done to possible and eligible participants and the choice was made amongst final 3 shortlisted players.

The 3PL conversion was done, including the last mile delivery for all HUB and spokes in phases.

3.3 Key Parameters and Enablers

Type	Validity	Description	Baseline KPI
Operational	All India	On time Delivery ratio (%)	96.34%
Operational	All India	Inventory Accuracy (%)	98.56%
Performance	All India	Warehousing efficiency (Cost / M3)	2778
Performance	All India	Distribution Efficiency (Cost / m3)	1497
Performance	All India	Shipment Accuracy (PPM)	525
Financial	All India	Warehouse cost as percent to sales	1.09%

Type	KPI	Baseline	Year 1	Year 2	Year 3
Operational	On time Delivery ratio (%)	96.34%	97.38%	98.73%	99.15%
Operational	Inventory Accuracy (%)	98.56%	99.01%	99.32%	99.67%
Performance	Warehousing efficiency (Cost / M3)	2778	3205	2956	2618
Performance	Distribution Efficiency (Cost / m3)	1497	1632	1513	1436
Performance	Shipment Accuracy (PPM)	525	634	513	493
Financial	Warehouse cost as percent to sales	1.09%	1.26%	1.09%	.99%

Regression Analysis by OLS method

Sample Model =

$$Y_t = a + bX_t + e_t$$

$$\hat{Y}_t = \hat{a} + \hat{b}X_t \qquad e_t = Y_t - \hat{Y}_t$$

$$\sum_{t=1}^{n} e_t^2 = \sum_{t=1}^{n} (Y_t - \hat{Y}_t)^2 = \sum_{t=1}^{n} (Y_t - \hat{a} - \hat{b}X_t)^2$$

$$\hat{b} = \frac{\sum_{t=1}^{n} (X_t - \bar{X})(Y_t - \bar{Y})}{\sum_{t=1}^{n} (X_t - \bar{X})^2} \qquad \hat{a}\bar{Y}\hat{b}\bar{X} - \hat{}\,\bar{}$$

Period	Sales	3PL Expense
1	1,16,58,484	41,956
2	1,10,13,666	41,989
3	1,01,88,930	37,519
4	1,00,58,312	36,400
5	1,20,00,507	39,902
6	1,30,61,652	55,347
7	1,75,84,128	84,978
8	89,49,328	25,191
9	1,06,28,605	34,377
10	97,66,099	40,364
11	93,57,926	35,022
12	1,09,14,292	41,256
Total	13,51,81,928	5,14,299

Time	X(t)	Y(t)	Xt-X(BAR)	Yt-Y(BAR)	(Xt-X(BAR))(Yt-Y(BAR))	(Xt-X(BAR)) Squre
1	0.42	116.58	-0	3.93	-0.04	0.00
2	0.42	110.14	-0	-2.51	0.02	0.00
3	0.38	101.89	-0	-10.76	0.57	0.00
4	0.36	100.58	-0	-12.07	0.78	0.00
5	0.40	120.01	-0	7.35	-0.22	0.00
6	0.55	130.62	0	17.96	2.24	0.02
7	0.85	175.84	0	63.19	26.62	0.18
8	0.25	89.49	-0	-23.16	4.09	0.03
9	0.34	106.29	-0	-6.37	0.54	0.01
10	0.40	97.66	-0	-14.99	0.37	0.00
11	0.35	93.58	-0	-19.07	1.49	0.01
12	0.41	109.14	-0	-3.51	0.06	0.00
Total	5.14	1,351.82			36.54	0.25

N=	12
X(t) =	5
Y(t) =	1,352
X(BAR)	0.43
Y(BAR)	112.65

b=	148
a=	1,288
Y =	1,437

4. Impact of Scheduling of Primary Movement

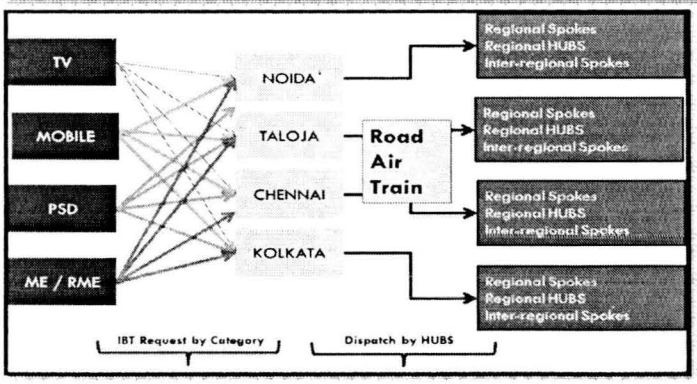
The Primary movement of material happens from the Hubs to the spoke locations. Usually the material movement is done within the zonal hub to the zonal spoke, but occasionally, inter zonal hub movement is also allowed.

The movement orders for the internal movement was done by the respective product categories of the mode of choice. Most of the time add hoc requests were made by using expedited freight which resulted in increase in cost per m3 and less optimized movement of material. Many a times expedited freight movement also resulted in loss and damage and pilferage in the route.

The attempt was made to consolidate the primary movement and also to schedule the point to point movement as well so as to eliminate the supply chain inefficiencies.

4.1 Current Network

Observation	TV	Mobile	DI	RME / ME	PlayStation
Factory Planning	By category	By category	By category	By category	By category
Sales Forecasting	Monthly KORO	Monthly KORO	Monthly KORO	Monthly KORO	Monthly KORO
Inventory Planning	Weekly / Based on sales trend. More intuitive than planned	Weekly / Based on sales trend. More intuitive than planned	Weekly / Based on sales trend. More intuitive than planned	Weekly / Based on sales trend. More intuitive than planned	Weekly / Based on sales trend. More intuitive than planned
IBT Creation	By category ; as and when	By category ; as and when	By category ; as and when	By category ; as and when	By category ; as and when
IBT allocation	Road	Air	Air	Road	Air/ Road



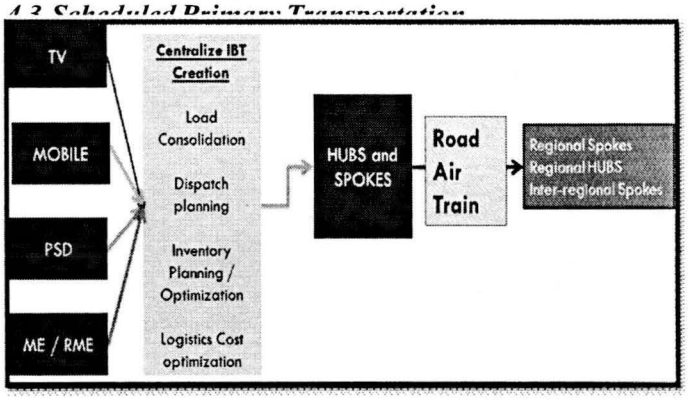
The current IBT movement was done by the respective product categories, which was primarily done on an add hoc / need basis from the hub to the respective spoke warehouses.

- Depending on the Business needs, the Primary movement was done without consolidation of requests and the orders were placed directly to the HUB warehouses.
- The orders were executed by the HUB warehouses as per the SLA and the material movement was done through expedited freight movement.

4.2. Gap Identification

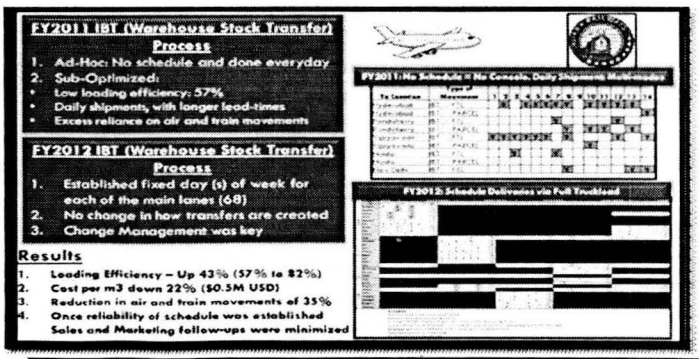
- Following Gaps were observed during the IBT movement
- Add hoc / need base IBT made by the product categories
- Sub optimized
- Loading efficiency : AS low as 57%
- Daily shipments with longer lead times
- Excessive reliability on Air movement.
- Low / No consolidation of part shipments
- Changes of Miss routing and pilferage
- Changes of Damage during courier transit
- High Transportation cost

4.3 Scheduled Primary Transportation



The process change and the change management exercise was conducted with the following changes

- All the product categories to make the IT request to the central team
- Load consolidation and dispatch planning was done by the central team as per defined TAT
- Inventory planning and Optimization was to be done by the central team
- Any Product launches and shortage material request was treated as an exception.



ISSN 0974-4037

He reduction in expedited freight was done primarily for the movement through courier and train.

- The schedule dispatch matrix was prepared from Hub to spoke and Hub to Hub
- The movement plan and dispatch matrix was made as an result of historical trends and current year peak plan and product launch schedules
- The movement plan coordination and implementation was done by the respective HUB in charge

4.5. Regression Analysis by OLS method

Sample Model =

$$\hat{Y}_t = \hat{a} + \hat{b}X_t$$

$$e_t = Y_t - \hat{Y}_t$$

$$\sum_{t=1}^{n} e_t^2 = \sum_{t=1}^{n} (Y_t - \hat{Y}_t)^2 = \sum_{t=1}^{n} (Y_t - \hat{a} - \hat{b}X_t)^2$$

$$\hat{b} = \frac{\sum_{t=1}^{n}(X_t - \bar{X})(Y_t - \bar{Y})}{\sum_{t=1}^{n}(X_t - \bar{X})^2}$$

$$\hat{a} = \bar{Y} - \hat{b}\bar{X}$$

Period	Sales	Transportation Expense	Transportation Expense
1	1,16,58,484	16,714	16,714
2	1,10,13,666	16,590	16,590
3	1,01,88,930	14,886	14,886
4	1,00,58,312	17,879	17,879
5	1,20,00,507	14,691	14,691
6	1,30,61,652	26,251	26,251
7	1,75,84,128	27,734	27,734
8	89,49,328	8,853	8,853
9	1,06,28,605	11,917	11,917
10	97,66,099	16,249	16,249
11	93,57,926	14,456	14,456
12	1,09,14,292	16,840	16,840
Total	13,51,81,928	2,03,061	2,03,061

Time	X(t)	Y(t)	X-X(BAR)		Y-Y(BAR)	(X-X(BAR))*(Y-Y(BAR))	(X-X(BAR))^2
1	0.17	116.58	-0		3.93	-0.01	0.00
2	0.17	110.14	-0		-2.51	0.01	0.00
3	0.15	101.89	-0		-10.76	0.22	0.00
4	0.18	100.58	0		-12.07	-0.12	0.00
5	0.15	120.01	-0		7.35	-0.16	0.00
6	0.26	130.62	0		17.96	1.68	0.01
7	0.28	175.84	0		63.19	6.83	0.01
8	0.09	89.49	-0		-23.16	1.87	0.01
9	0.12	106.29	-0		-6.37	0.32	0.00
10	0.16	97.66	-0		-14.99	0.10	0.00
11	0.14	93.58	-0		-19.07	0.47	0.00
12	0.17	108.14	-0		-3.51	0.00	0.00
Total	2.03	1,351.82				11.21	0.05

N=	12
X(t) =	2
Y(t) =	1,352
X(BAR)	0.17
Y(BAR)	112.65

b=	361
a=	1,291
Y =	1,651

5. Summary, Conclusion& Future scope of Work

- Improvement in Operational Efficiency after outsourcing of operations from Year 1
- Higher Operational Control on Day to Day operations
- Long term strategic plan and Monitoring of Operational control
- Short term impact and Long term improvement on the performance efficiency
- Short term increase due to duplication of fixed cost
- Variable cost model in long term to rationalize the operational parameters
- Short term Impact and Long term improvement of Financial performance

Type	KPI	Baseline	Year 1	Year 2	Year 3
Operational	On time Delivery ratio (%)	96.34%	97.38%	98.73%	99.15%
Operational	Inventory Accuracy (%)	98.56%	99.01%	99.32%	99.67%
Performance	Warehousing efficiency (Cost / M3)	2778	3205	2956	2618
Performance	Distribution Efficiency (Cost / m3)	1497	1632	1513	1436
Performance	Shipment Accuracy (PPM)	525	634	513	493
Financial	Warehouse cost as percent to sales	1.09%	1.26%	1.09%	.99%

- Loading efficiency was increased by 43% from 57% to 82%
- Cost per m3 was reduced by 22% (Saving of USD 0.5 M)
- Reduction in expedited freight by 35% (Courier and train)
- Reduction in sales and marketing follow-ups

Scope of Future Work

- The exercise is based on the outsourcing of the Warehousing and Primary transportation only.
- All other Components like Import and Primary movement is in-house
- The study can be utilized to benchmark similar exercise with competition
- The study can also used as case study for other similar outsourcing projects

Year	Volume	Issue	Topic
Emerald : Supply Chain Management			
1996	01	03	Building effective alliances in the meat supply chain: lessons from the UK
1997	02	01	Managing the linkage with primary producers: experiences in the Australian grain industry
1997	02	03	Lessons learned from the Birds Eye Wall's ECR initiative
1998	03	01	Vendor-managed inventory: fashion fad or important supply chain strategy?
1999	04	01	Efficient consumer response (ECR): a survey of the Australian grocery industry
1999	04	02	Collaborative planning: supporting automatic replenishment programs
2001	06	04	Collaborative buyer-supplier relationships in Hong Kong manufacturing firms
2002	07	05	POS and EDI in retailing: an examination of underlying benefits and barriers
2006	11	03	Collaboration planning in a supply chain
2007	12	02	Supply chain partnering: a temporal multidisciplinary approach
2007	12	03	A study of an augmented CPFR model for the 3C retail industry
2009	14	01	Collaboration intensity in the Brazilian supermarket retail chain
Supply Chain Forum – An International Journal			
2001	02	02	Creating a Model for Governance of Strategic Collaboration
2001	02	02	Efficient Replenishment Techniques: Improving Supply Chain Operations
2006	07	13	How Contextual Factors Shape CPFR Collaborations: A Theoretical Framework
International Journal of Operations Management			
2001	19	04	JIT purchasing and performance: an exploratory analysis of buyer and supplier perspectives
2001	19	08	Relationships between implementation of TQM, JIT, and TPM and manufacturing performance
2002	20	06	Demand chain management: an integrative approach in automotive retailing
2002	20	08	From supply to demand chain management: efficiency and customer satisfaction
2003	21	04	An examination of the relationships between JIT and financial performance