Challenges in cold chain logistics management essay

The research Challenges in Cold Chain Logistics in Food Sector in India is to determine the factors responsible for slow growth of Cold Chain Logistics in India. Cold Chain has been considered the rising sector in recent past. An overview of Indian Cold Chain Logistics shows that it has been there from the beginning of 20th century but the growth has been rather slow. Also, initially the cold storage was mainly used to store potatoes but lately the concept of multi-product and multi chamber has changed the scope of cold chain logistics completely. India is an agricultural-based economy. Each year, India produces 63. 5 million tons of fruits and 125. 89 million tons of vegetables. India is also the largest producer of milk (105 million metric tons per year). India produces 6. 5 million tons of meat and poultry, as well as 6. 1 million tons of fish a year. The demand for fresh fruits and vegetables is increasing as the urban population is rising. This increasing demand is creating opportunities for cold chain logistics. Current value of Indian Cold Chain is estimated to be USD 3 Billion and is growing at an annual rate of 20-25 percent. But Indian Cold Chain is still evolving and not well organized. The instruments and technology used is outdated and stores are based on single commodity only. As per government statistics, India has 5400 cold storage facilities with a combined capacity of 25. 32 million metric tons that can store less than 10% of what is produced. The following table shows capacity distribution:

S. no	Item	Production (million MT)	Cold Capacity (million MT)
1	POTATOES	36	18. 43
2	FRUITS & VEG.	189. 39	0. 96
3	MEAT & FISH	1. 1	0. 19
4	MILK & MILK PRODUCTS		

100

0. 07

5

MULTIPURPOSE

5. 64

6

OTHERS

0. 03

Total

326. 49

25. 32

In addition to cold storages, India has about 250 Refrigerated (Reefer) transport operators (this includes independent firms) that transport perishable products. Of the estimated 25, 000 vehicles in use, 80% of them are used to transport dairy products (wet milk); only 5, 000 refrigerated transport vehicles are used for all other commodities. India need to have an effective and economically viable cold chain to accommodate all commodities from production centre to consumption centre so that the wastage of perishable commodities can be reduced to minimum.

With the advent of the technology, new materials and machines every part of cold chain is getting upgraded hence leading to maximum food

preservation and customer satisfaction. But this change is facing some challenges like huge initial investments, high operational costs, lack of government support and unskilled manpower. This research is based to find out such challenges that is affecting the growth of cold chain logistics in India.

OBJECTIVES

Objective:

To determine the challenges faced by the Cold Chain Logistics in Food Sector in India

Hypothesis

1. High Capital costs, high Operational Costs and lack of advance technology are causing the slow growth of Cold Chain logistics in Food Sector in India

CHAPTER 2: REVIEW OF LITERATURE

A research on " Indian cold chain: modelling the inhibitors" was conducted by Rohit Joshi, Devinder Kumar Banwet and Ravi Shankar of Department of Management Studies, Indian Institute of Technology, Delhi, New Delhi, India) in 2009. The purpose of this paper was to set out to identify and inter-relate the inhibitors that significantly influence the efficiency of a cold chain in developing economies like India. According to their study Human Resources, Lack of logistical support, uneven distribution of cold chains, cost structutre and power supply are the main inhibitors that influence adversely the efficiency of Cold chain in India.

A research on “ Post Harvest Losses due to Gaps in Cold Chain in India” was conducted by Chilukuri Maheswar First Class Marine Engineer, MBA, M Phil (Mgmt.) Training Superintendent Fleet Management Training Institute 122, The Great Eastern Galleria Sector 4, Nerul NAVI MUMBAI. The purpose of this study was to find a solution to the gaps in cold chain in India that are causing heavy losses to the vegetable and food production. As per his study an integrated cold chain covering major areas of production is required to reduce the wastage. Also, to uplift the growth of cold chain and reduce the operational costs the study suggested the use of Refrigerated containers than conventional cold storages. It also emphasized on the use of solar power to meet the acute shortage of power supply which is a big constraint in an efficient cold chain.

CHAPTER 3: METHODOLOGY

Methodology is the kind of research undertaken in order to procure data for research. In this research the data has been collected through both primary as well as secondary research.

Selection of Topic

Due to inadequate cold storage and cold logistics facilities about 24 to 35 percent of the 134 million metric tons of fruits and vegetables produced in India get wasted. Indian Cold Chain Logistics is in its nascent stage and facing many challenges that are hampering its growth.

Selection of sample

Sample size included professionals at junior as well as senior level working in Cold Chain logistics industry from whom data has been collected. A total of

100 professionals participated in the study. Their responses were recorded with the help of a questionnaire.

Pilot Study

This refers to an initial study of a small sample size to determine the effectiveness of the means used for to undertake the research and to make necessary changes. Pilot study included 20 respondents. The pilot study was helpful in adjusting the sample size and to design the full scale questionnaire. The results indicated the major challenges faced by Cold Chain Logistics in Food sector in India.

Data Collection

Primary data – Primary data has been collected from questionnaire. The questionnaire can be referred at page no

Secondary data – Secondary data has been collected from research journals, independent consultants reports and other sites of internet.

Data Analysis

The data collected is been analyzed and shown in the form of table and figures in the next chapter.

CHAPTER 4: RESULTS

Analysis of empirical data collected during the survey regarding challenges faced by Cold Chain Logistics in India.

Table 1: General Information

Designation

EXPERIENCE (years)

0 – 2 years

2 – 5 years

5 – 10 years

More than 10 years

Grand Total

Senior Management

Director

2

2

4

Head of functional area

5

13

4

22

Senior executive/group role

1

6

4

11

Junior Management

Junior Executive

6

1

7

Manager

1

14

4

19

Senior officer

6

9

2

17

Grand Total

13

30

27

10

80

Figure : General Information

Discussion:

From Table 1 it was found that 53. 75% of respondents surveyed were from junior management and 46. 25% of respondents were from senior management.

Table 2: Company's role in temperature controlled supply chain

S. no	Role	No of respondents	Percentage
1	Temperature Controlled Transportation	49	62%
2	Temperature Controlled Storage/Distribution	49	62%
3	Temperature Controlled Logistics (end to end solutions)	24	30%

Figure : Role in cold Chain

Discussion:

From Table 2 and Figure 2 it was found that majority of the respondents companies provided both temperature controlled transportation as well as temperature controlled storage services whereas very less companies provided temperature controlled logistics end to end solutions.

Table 3: Strict Government Rules hampering the growth of Cold Chain

No of Respondents

Percentage

Strongly Agree

2

2%

Agree

36

44%

Neutral

24

30%

Disagree

13

16%

Strongly Disagree

0

0%

Figure : Strict Government Rules hampering the growth of Cold Chain

Discussion:

From Table 3 and Fig 3 it was found that majority of respondents i. e 44% agree that strict government rules are hampering the growth of cold chain logistics. 30% of the respondents were neutral about the role of government in cold chain growth. However only 16% of the respondents were of the opinion that government rules are not responsible for slow growth of cold chain logistics in India.

Table 4 : Is your Company investing in new technology

No of Respondents

Percentage

Yes

55

68%

No

7

10%

Don’t Know

18

22%

Figure : Is your Company investing in new technology

Discussion:

From Table 4 and Figure 4 it was found that majority of respondent’s i. e 68% were going to invest in new technology in next 12 months as compared to only 10% of respondents whose companies were not going to make investments in new technologies. However, 22% of the respondents were oblivious of the knowledge of any investments.

Table 5 : Technology earmarked for investment

S. no

Technology

No. of Respondents

Percentage

1

Supply chain tracking

37

57%

2

Supply chain or cargo security

17

26%

3

Passive Packaging

33

51%

4

Active packaging

45

69%

5

Advance Reefer Transport

43

66%

6

CRM

7

11%

Figure : Technology earmarked for investment

Discussion:

From Table 5 and Fig 5 it was observed that companies are investing more in supply chain tracking, active packaging and advance reefer transport. As Indian cold chain logistics is growing slowly due to use of outdated technology. Hence investment in these areas is a positive sign for the growth of cold chain logistics in India.

Table 6 : Current Technologies in use in Indian Cold Chain

S. no

Technology

No. of respondents

Percentage

1

Machine readable or covert technologies

13

16%

2

Authenticators

21

26%

3

Track and Trace software

55

69%

4

RFID

71

89%

5

Human readable or overt technologies

15

19%

6

GPS (global positioning system)

30

38%

7

Comprehensive connectivity – 802. 11 wireless LAN technologies etc

0

0%

8

Digital imaging & Portable printing

0

0%

9

2D & other bar coding advances

0

0%

Figure : Technologies used at present

Discussion:

From Table 6 and Figure 6 it was found that Indian cold chain is not using the latest technologies like Comprehensive connectivity – 802. 11 wireless LAN

technologies, Digital imaging & Portable printing and 2D & other bar coding advances. Majority of companies are using technologies like Track and trace software, Radio frequency and identification and GPS.

Table 7: Areas under improvement

Areas Under Improvement	Score	Mean Score (between 1 to 5)	Standard Deviation	1	2	3	4	5
Reliability	21	21	15	16	7	2. 58		

1. 31

Availability

21

22

16

15

6

2. 54

1. 27

Transit

18

31

15

11

5

2. 48

1. 16

Expense

14

31

14

13

8

2. 53

1. 15

Customer Service

2

3

2

37

36

4. 27

0. 89

Supply Chain visibility

3

2

6

32

37

4. 25

0. 97

On Time delivery

2

2

2

23

51

4. 50

0. 86

Figure : Areas under improvement

Discussion:

From Table 7 and Figure 7 it was found that majority of companies are focussing on areas like customer service, supply chain visibility and on time delivery. Now these areas can be improved by adopting new technologies that can reduce operational costs, ensure on time delivery and increase supply chain visibility hence enhancing the customer service.

Statistical Analysis:

1. Correlation between supply chain visibility and on time delivery is found out to be 0. 8133 which is a strong positive correlation. Hence it clearly shows that by increasing or enhancing the supply chain visibility there will be a positive effect on on-time delivery. And supply chain visibility can be enhanced only through adopting new best in class technologies.

2. Correlation between supply chain visibility and customer service is found out to be 0. 7513 which is a positive correlation. Hence it clearly shows that by increasing or enhancing the supply chain visibility there will be a positive effect on customer service. And supply chain visibility can be enhanced only through adopting new best in class technologies.

3. Correlation between on-time delivery and customer service is found out to be 0. 7153 which is a positive correlation. Hence it clearly shows that by increasing or enhancing the on-time delivery there will be a positive effect on customer service.

Table 8: Important factors for the growth of cold chain logistics

Factors	Score	Mean Score	Standard Deviation	1	2	3	4	5
Robust Road Infrastructure	2	4	13	39	22	3. 96	0. 88	
Subsidized and Sufficient power Supply								

1

6

10

32

31

4. 10

0. 91

Sufficient Capital Subsidy Schemes

3

5

10

36

26

4. 20

0. 88

Foreign Direct Investment

4

24

30

17

5

2. 99

0. 92

Favorable Custom & Excise Duties

1

26

33

14

6

3. 57

0. 90

Proper Back end Infrastructure

1

6

20

30

23

3. 86

0. 95

Trained and Skilled Manpower

0

2

25

20

33

3. 86

0. 80

Figure : Important factors for cold chain growth

Discussion:

From Table 8 and Figure 8 it can be seen that respondents scored all factors like robust road infrastructure, subsidized power supply, capital subsidies, FDI, low custom duties, backend infra and skilled manpower as important for

the growth of the cold chain. But subsidized and sufficient power supply and sufficient capital subsidy schemes are more prominent factors than others with a mean score of 4. 10 and 4. 20 respectively.

This means that main factors that are hindering the growth of cold chain logistics in India are High capital costs and high operational costs.

Statistical Analysis:

1. Correlation between Subsidized and Sufficient power Supply and expenses is found out to be -0. 4133 which is a negative correlation. Hence it clearly shows that subsidizing and providing enough power supply will have a negative effect on the expenses of the company. Therefore would cause a decrease in operational cost of the cold chain.

2. Correlation between Capital subsidy schemes and expenses is found out to be -0. 3254 which is a negative correlation. Hence it clearly shows that providing capital subsidies will have a negative effect on expenses. Therefore it would cause a decrease in the capital expenditure of the company.

3. Correlation between FDI and Proper Backend infrastructure is found out to be 0. 6782 which is a positive correlation. Hence with the FDI there will be improvement in the infrastructure of cold chain like warehouses etc that will boost up the growth of cold chain logistics in India.

4. Correaltion between Favourable Custom and excise duties and expenses is found out to be -0. 4091 which is a negative correlation. Hence favourable

custom duties and excise duties will lead to decrease in expenses. Therefore increasing or boosting up the growth of cold chain logistics.

Table 9: Type of employee training

Type of Employee Training	No of Respondents	% of Respondents
On the job training	62	78%
Vocational Courses	25	32%
Online Classes/Modules	15	19%
Seminars/Group Exercises	57	72%

Figure : Type of employee training

Discussion: From Table 9 and Figure 9 it can be seen that majority of employee training is done by On the job training and Seminar/Group Exercises to familiarize them with latest technology and practices in cold chain logistics. Very few employees are provided training through other means like vocational training and online classes or modules.

SECONDARY DATA & ANALYSIS

Figure : Growth of cold chain logistics

Transportation grew at a 6. 03% CAGR over 2008-2010.

Storage grew at a 5. 46 CAGR over 2008-2010

Transportation is expected to grow at a 21% CAGR over 2010-15 (volume growth – 20%)

Storage is expected to grow at a 10. 7% CAGR (volume growth – 5. 4%) over 2010-15

Table 10 : Inflation rate in Food sector 2008-2010

Item

Inflation rate (%)

Average inflation rate 2008-2010 (%)

2008

2009

2010

Fruits and vegetables

5. 94

11. 77

8. 33

8. 68

Dairy products

8. 38

6. 12

12. 87

9. 12

Milk group

7. 87

8. 93

13. 99

10. 26

Egg, fish and meat

3. 75

14. 44

30. 71

16. 30

Total Average 2008-2010

11. 09

1. Food inflation in India was 11. 09% during the period 2008-2010.

2. Infrastructure industry growth rate was 7. 5% during the period 2008-2010

3. Risk free rate of return on investment in India was 8% during the period 2008-2010

From above data it can be seen that Cold Chain logistics (Transportation -6. 03%) and (Storage -5. 46%) grew at a slow rate as compared to Infrastructure industry growth rate of 7. 5% during the period 2008-2010.

An overview of capital and operational expenditure in setting up a cold chain.

Capital Expenditure

Location: Pune,

Capacity -700 tons

Table 11 : Expenditure on cold chain

Heads	No of Units	Unit Cost	Total Cost (Rs)
Land	2. 5 acres	Rs 30, 00, 000 per acre	75, 00, 000
Construction Cost	100000 sq ft	Rs 150 per sq feet	1, 50, 00, 000
Cooling Capacity	500 tons	Rs 15, 000 per ton	75, 00, 000

Backup Diesel generator

1 no

Rs. 50, 00, 000

50, 00, 000

Forklift

10 nos

Rs 7, 00, 000 per unit

70, 00, 000

Pallets

80, 000 nos

Rs 250 per unit

2, 00, 00, 000

5 ton Reefer Trucks

50 units

Rs 20 , 00, 000 per unit

10, 00, 00, 000

Office +Logistics System

1, 00, 00, 000

Working Capital

1, 00, 00, 000

TOTAL

Rs 18, 20, 00, 000

High capital cost of Rs 110 per sq feet (i. e $2) as compared to $0. 6 per sq feet in west

Power supply is 30% of total expenses against 10% in west hence high operational cost.

Risks associated

1. Electricity Fluctuation Charges

2. Rise in Fuel charges

3. Objections from Truckers Association

4. Political interference

CHAPTER 5: SUMMARY

From the study it was found that 53. 75% of respondents surveyed were from junior management and 46. 25% of respondents were from senior management. Also, it was found that majority of the respondents companies provided both temperature controlled transportation as well as temperature controlled storage services whereas very less companies provided

temperature controlled logistics end to end solutions. From study it was found that majority of respondents i. e 44% agree that strict government rules are hampering the growth of cold chain logistics. 30% of the respondents were neutral about the role of government in cold chain growth. However only 16% of the respondents were of the opinion that government rules are not responsible for slow growth of cold chain logistics in India. It was found that majority of respondent’s i. e 68% were going to invest in new technology in next 12 months as compared to only 10% of respondents whose companies were not going to make investments in new technologies. However, 22% of the respondents were oblivious of the knowledge of any investments. It was observed that companies are investing more in supply chain tracking, active packaging and advance reefer transport. As Indian cold chain logistics is growing slowly due to use of outdated technology. Hence investment in these areas is a positive sign for the growth of cold chain logistics in India. Also, it was found that Indian cold chain is not using the latest technologies like Comprehensive connectivity – 802. 11 wireless LAN technologies, Digital imaging & Portable printing and 2D & other bar coding advances. Majority of companies are using technologies like Track and trace software, Radio frequency and identification and GPS.

From the study it was found that majority of companies are focussing on areas like customer service, supply chain visibility and on time delivery. Now these areas can be improved by adopting new technologies that can reduce operational costs, ensure on time delivery and increase supply chain visibility hence enhancing the customer service. It can be seen that respondents scored all factors like robust road infrastructure, subsidized power supply,

capital subsidies, FDI, low custom duties, backend infra and skilled manpower as important for the growth of the cold chain. But subsidized and sufficient power supply and sufficient capital subsidy schemes are more prominent factors than others with a mean score of 4. 10 and 4. 20 respectively. Tt can be seen that majority of employee training is done by On the job training and Seminar/Group Exercises to familiarize them with latest technology and practices in cold chain logistics. Very few employees are provided training through other means like vocational training and online classes or modules.

CHAPTER 6: CONCLUSION

From the results of the survey and secondary research it became clear that High Capital costs, high operational costs and lack of advanced technology are the main factors that are causing the slow growth of cold chain logistics in India.

From the survey it was found that Indian cold chain is not using the latest technologies like Comprehensive connectivity – 802. 11 wireless LAN technologies, Digital imaging & Portable printing and 2D & other bar coding advances. Majority of companies are using technologies like Track and trace software, Radio frequency and identification and GPS. Also, it was seen that majority of companies are focussing on areas like customer service, supply chain visibility and on time delivery. Now these areas can be improved by adopting new technologies that can reduce operational costs, ensure on time delivery and increase supply chain visibility hence enhancing the customer service.

From the study it can be seen that respondents scored all factors like robust road infrastructure, subsidized power supply, capital subsidies, FDI, low custom duties, backend infra and skilled manpower as important for the growth of the cold chain. But subsidized and sufficient power supply and sufficient capital subsidy schemes are more prominent factors than others with a mean score of 4. 10 and 4. 20 respectively. That means main factors that are affecting the growth of cold chain logistics in India are High Capital Costs and high operational costs.

Correlation between Subsidized and Sufficient power Supply and expenses is found out to be -0. 4133 which is a negative correlation. Hence it clearly shows that subsidizing and providing enough power supply will have a negative effect on the expenses of the company. Therefore would cause a decrease in operational cost of the cold chain and hence increase revenue of the company which will lead to the growth of the cold chain industry.

Correlation between Capital subsidy schemes and expenses is found out to be -0. 3254 which is a negative correlation. Hence it clearly shows that providing capital subsidies will have a negative effect on expenses. Therefore it would cause a decrease in the capital expenditure of the company and attract more investors in this industry and thus help in the growth of it.

This means that main factors that are hindering the growth of cold chain logistics in India are High capital costs , high operational costs and lack of advanced technology.

CHAPTER 7: RECOMMENDATIONS & SUGGESTIONS

Cold Chain is mainly unorganized and consists mainly of small regional players. Small logistics players are not having the ability to invest in technology, and unless they invest in technology their profits will be very less because they will incur high operational costs. In a situation like this, incentives from the Government do go a long way in creating the right atmosphere for investment and growth. The Cold chain scenario can be changed with a greater degree of public private partnerships in the sector as well as greater involvement of railways and airports in strengthening the cold chain infrastructure.

To boost up the growth of cold chain in India government has taken some initiatives like:

Budget 2011-2012 proposed Infrastructure status to Cold Chain Logistics.

Budget 2010-2011 proposed a concessional import duty of five per cent with full exemption from service tax to set up and expand cold chains. The proposal also included duty-free import of refrigeration unit, which is required to make refrigerated vans or trucks. It also exempted trailers and semi-trailers used in agriculture from excise duty

The Budget exempted air-conditioning equipment and refrigeration panels used in cold chain infrastructure, including conveyor belts, from excise duty. It also extended excise duty exemption to conveyor belts.

Budget 2009-2010, Government of India introduced tax benefits for companies making investments in setting up cold chain facilities

Other past incentives include access to external commercial borrowings, 100 per cent FDI and provision of up to 25 per cent project costs involved in setting up cold storage facilities provided by the Government under the Capital Investment Subsidy Scheme

GOI floated for 30 mega food parks- allocated US $ 1. 02 billion by 2012. Objective of the scheme is to provide backward and forward linkages as well develop reliable and sustainable supply chain.

GOI initiating National Highway Development Program and partnering with Indian railways to establish cold chain infrastructure. Indian railway is planning to invite private parties to run refrigerated container trains for transporting agricultural products across the country. Airports in country are also setting up the cold storage facilities.

Task force on Development of cold chain established and national centre for Cold Chain Development (NCCD).

The most important factor that will decide the growth of cold chain is the flow of funds. Flow of funds can be attracted by having favourable government norms and lucrative returns on investment. Also, the government can help in land acquisition to set up cold storage facilities thus decreasing the capital investment. The government must also speed up the introduction of GST, which will help in the development of centrally located warehouses.

Agriculture sector in India is given subsidized power tariffs but cold chain is not given any subsidy in power tariffs. As 30% of total expenses account for

power supply charges in this industry therefore in order to decrease the operational costs subsidy will play a major role.

Also, huge investment in latest technologies in cold chain will help in decreasing the operational cost by increasing the supply chain visibility and thus result in improved customer service. Education and awareness of the benefits of cold chain is also recommended.

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CHAPTER 9: APPENDIX

Questionnaire

Questionnaire to elicit information on major factors influencing the Cold Chain Logistics in Indian Food Sector

Dear