

# “Alternate Distribution of Perishable Items: A Case Study of Ujjain Dugdh Sangh”

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*Abstract*— Distribution channel is very important factor in supply chain management. It consists of manufacturers, suppliers, distribution, logistics, retailing, and consumers etc. In any supply chain network design of distribution is very important but for perishable items like fruits, milk, farm fresh, meat etc. It is all the more important due to various reasons, first frequent visit and supplies (may be twice or thrice a day) and limited lead time available to the distributor. Further this duly demand also fluctuates significantly due to many reasons making the decision making dynamic and no readymade solution, thus can be employed all the time. Various distribution strategies like milk run, spoke and hub, arrangement, transportation model, distribution through number of distribution centers have been suggested in literature. In this project case of UDS is consider. Two alternative network designs are suggested and cost and time calculations are presented Google map application is extremely used for these calculations. Better solutions are obtained by redesigning the milk network and recommendations are made to case organizations.

**Key words:** Perishable Items, Distribution Network, Milk-Run, Spoke and Hub Arrangement

## I. INTRODUCTION

First start by presenting general facts about distribution channels within the consumer market. After that the purpose of this thesis is provided and how we have limited our research. At the end of the chapter present the disposition of the thesis.

The main Moto of all organization is to earn profit by selling goods and services to ultimate consumers or users. In which goods are bring from producers to consumers goods follow a path or route which is term as channel of Distribution or Distribution network. This channel includes the main producer, last buyer and any middlemen -those wholesaler and retailer.

This study is done to known the procedure of working of this network in Sanchi Dugdh Sangh Ujjain M.P. During the course of study an effort is made to provide better alternatives for the distribution keeping in mind cost, time and convenience as the focal criteria. For this first complete study of Distribution network is done and then after understanding the way, a path is followed throughout the study in order to justify the objectives of the study

## II. LITERATURE REVIEW

Some related literal materials have been collected. Maximum of the literature material is consists of research papers from distinct journals, the others are from books. In this chapter 35 studies papers from one-of-a-kind journals were decided on, table 2.1 suggests the short information of these studies papers. These studies papers are discovered by way of

looking the key phrase "distribution channel for milk" or "distribution network for perishable items" on technological know-how direct, Google pupil, Emerald, Springer and many others.

The studies papers from specific sources provide various perspectives to the studies questions. It's Miles Interesting. To discover how researchers do no longer continually preserve the identical concept even on a same difficulty. Furthermore, a few books are referred to be able to get a scientific definition.

It may be determined that, if it utilizes the mixture of milk run and spoke and hub methodologies it's going to get better outcomes. The following step is to pick out that what factors affect the overall performance of the distribution channel for milk within the Sanchi Dugdh Sangh.

The study shows the connection with partners in deliver chain and the way it influences considerably Distribution channel for milk (meethet & lonatepanont, 2007). Organizing the connection is not sufficient; groups ought to construct an idea of improvement strategy. for the reason that simplicity strategy inside the dairy enterprise is aiming to reduce down the useless costs, the main goal in this work to talk about alternatives for the distribution maintaining in thoughts cost, time and convenience as the focal criteria.

## III. METHODOLOGY

### A. Introduction

Research Methodology is a way to discover the result of a given problem on a particular matter or hassle that is also referred as research trouble. In method, researcher makes use of specific standards for fixing/searching the given studies trouble. Distinctive sources use one-of-a-kind kind of strategies for solving the problem. If we think about the phrase "methodology", it is the way of looking or fixing the research hassle. (Commercial research institute, 2010)

### B. Objectives

The main Moto of all organization is to earn profit by selling goods and services to ultimate consumers or users. In which goods are bring from producers to consumers goods follow a path or route which is term as channel of Distribution or Distribution network. This channel includes the main producer, last buyer and any middlemen -those wholesaler and retailer.

### C. Problem Formulation

The present used methodology in UDS is milk-run method and it has occurred various problems such are as:

- 1) Selecting of routs for various distribution centers manage by single vehicle.

- 2) A Distribution of perishable items in time range, because of its limited life age.
- 3) Loading of milk product from plant by a small vehicle and distribute to various outlets in a ujjain city at a different routes in a limited time range is a major problem in UDS due to which decrease in the rate of time saving, saving in cost of vehicle, and also due to fulfillment of customer demand for milk product overloading of milk vehicles is occurred which increase the rate of vehicle maintainness cost and finally the overall cost is increase of ujjain Dugdh Sangh.

So we try to use an alternate distribution method for distribution of milk product in Ujjain Dugdh Sangh there are various methods used in the world for distribution of milk product but we use spoke-&-hub method for distribution of milk product.

In this case study we use two methods to distribute perishable items which are as:

- Milk-Run logistics Method
- Hub and Spoke Method

Sr. No	Author's Name	Title of Paper	Methodology Used	Results/Discussion	Gap in literature
1	Capstick (1953)	Milk distribution	Different types of distribution method	The importance of the need for strict Hygienic control is emphasized. It is strongly recommended that when bulk distribution of pasteurized milk is carried out the cans be sealed at the dairy and distribution be permitted, only from authorized and supervised distribution points.	Effect of road condition in distribution is not study in this research.
2	Jayaraman (1998)	Transportation, facility Location and inventory issues in distribution network design	FLITNET(Facility location inventory Transportation Network)	The design of an integrated distribution network encompasses decisions that are among the most critical operational and logistical management decision that face a firm. Such decisions affect costs, time, and quality of customer service that should be carefully monitored.	
3	Jiyin Liu, Chung Lun Li, and Chun-yah Chain (2001)	Mixed Truck delivery systems with both Hub and Spoke & direct shipment	Truck delivery system, Hubs & spoke, Direct Shipment mix system, Vehicle routing, Heuristic algorithm	The result of the mixed system is more effective than both pure systems. The delivery plan produced using the heuristic for the mixed system saves about 4% total distance on average compared with the best of the pure system. The saving is about 10% on an average if compared with any one of pure system.	
4	Chau, Song and Piawteo (2003)	Inventory routing problem in sea freight versus Transshipment model	Transshipment model, hub & spoke model, MIP model, TSP Problem model Transportation Heuristic	The computational results of the algorithm showed that the cost incurred in two system are investigated The utilization of the Hub & spoke system justified from the perspective of cost effectiveness when the in transit inventory cost dominate the total cost.	
5	Subtaiah, Rao, and Nookesh babu (2004)	Supply chain management in a dairy industry a case study	Supply chain management, transportation model, inventory model	In this paper supply chain network is designed for a dairy industry .the results obtained which shows the total cost of supply chain is 9.8% lesser than the existing cost.	This paper does not study on life of perishable items

6	Chau, MiaoSong and Teo (2004)	Value of Transshipment Hub in sea freight Inventory routing problem	Transshipment, Hub& spoke model, Direct service model and Inventory model	The results in this paper are derived using two vessels the strategic insights obtained on the performance comparison of the direct service and Transshipment model should carry over to the case with more than two vessels.	It does not study on type of vehicle are used
7	Beaman and Johnson (2006)	Food Distribution Channel Overview	Transportation model, Inventory model	A food product can take many paths to reach the retail customer, and these paths often include many hurdles.	It cannot study on life of product
8	Sreenivas and Srinivas (2007)	The role of Transportation System in Logistic chain	Transportation system Logistics	The integration could reduce the middle-level procedures. The producers could immediately give the products over to the terminal customers. This could reduce expenses and also administer sources more efficiently.	The time saving factor and environment pollution is not considered
9	Skintzi (2007)	Supply chain design an overview	Supply chain management, Inventory control	The result shows that supply chain design and re-design is a powerful competence in improving production efficiency, product quality and customer satisfaction.	
10	Meethet and Lonatepanont (2007)	Vehicle routing in Milk run operation a column generation based approach	Milk run, vehicle routing problem	In this paper the author address the Milk run vehicle routing problem by the introducing an optimization model for determining the effective Milk run plan with minimum transportation cost over the Network.	
11	Vander Vorst, Duineveld, Scheer and Beulens (2007)	Towards logistics orchestration in the pot plant supply chain network	Distribution network, logistics orchestration	The case of the greenery shows that a central coordination Supply chain management reduces collection costs and improves customer services.	
12	Black Burn (2008)	Supply chain strategies for perishable products the case of fresh produce	EOQ Inventory Model and MVT(marginal value of time)	An important result of this paper examines of supply chain design problem for produce an example of perishable product whose value decline exponentially post production stabilized.	
13	Nilson (2008)	Opportunities for the implementation of a milk run a case study at Haldex traction	Milk run distribution, supply chain, just in time reversed Logistics	As seen earlier in the article the prices for the Milk run system is higher than the current Transportation costs and it is hard to motivate a cost increase with 60% just to get a better delivery precision. Not even the shorter lead time will motivate the switch to a milk run system.	The life of milk product and other environment factors like temperature etc are not study in this paper.
14	Ballou (2008)	Logistics supply chain and Transport management	Business logistics, supply chain management	The contribution to revenue refers to the sales resulting from the logistics system design. Logistics operating costs are the	This paper not study on transportation of

				expenses incurred to provide the level of logistics customer service needed to generate sales.	milk product in distribution
15	Iran Ferretti Simone Zanoni Lucio Zavanella (2008)	Distribution network design under uncertain demand	Logistics distribution network, MIP	The distribution network design is a critical step within the assessment of strategic decisions for a supply chain management.	
16	Dasilva (2008)	Distribution channel Structure: an overview of determinants	Distribution Structure, Intensity of Distribution.	Field studies on channel structure we will be able to know if a firm can choose freely a channel or only adapt to it, and know what factors determine a given channel structure.	
17	Smith (2009)	Critical links supporting Vermont's bulk milk transportation a novel application of the Network Robustness Index	Trans CAD version 5.0 with an actual road Network and a realistic origin destination matrix	In this results the milk flow in North Western Vermont, link identification as critical by the NRI were not the links caring the greatest flows. Although commuter and business traffic flows were ignored in this analysis would argue for the inclusion of common freight flow when assessing the criticality of infrastructure and prioritizing improvements.	The effect of transportation vehicle on environment is not study in this research.
18	Danielis, Rotaris, and Marcucci (2010)	Urban freight policies and distribution channels	Transportation model, Transshipment model	Distribution channels comprise many actors (producers, intermediaries, producer, organizations, wholesalers, carriers, retailers, organizations, retailers, consumers etc.) who play a very different role within a channel.	Rather than other this model, other models for distribution of perishable products are not study in this paper.
19	Willem and Laurens Debo (2010)	Flexible milk-runs for stochastic vehicle routing	Stochastic vehicle routing	Our proposed solution focuses on optimizing the transportation costs there is no immediate incentive for logistics planner to put extra effort in the successful implementation of our solution.	Quality of perishable products is not considered in this research.
20	Sayin, and Nisa (2011)	The role of milk collection centers in the milk distribution channels in Turkey a case study of Antalya	Logistics model	Dairy products have special importance in the organization of healthy distribution system to the control supply chain.	Road condition is not considered in this case study.
21	Imam, Nzadeh, and Dubey (2011)	Dairy marketing strategies in the context of Globalization issue and challenges'	Dairy industry, dairy product	To increase the competitiveness of Indian dairy industry effort should be made to reduce cost production increasing productivity.	The life of perishable items and distribution of that product are not study in these strategies.
22	Gebresenbet and Bosona (2011)	Logistics and Supply Chains in Agriculture and Food	Logistics model, Supply chain management	The results shows to globalization of marketing system, it is a vital for all stakeholders to reduce Logistics	It only study on agriculture and food.

				cost in order to increase their economic competitiveness. Therefore, development of effective and efficient Agricultural and Food Logistics is necessary and essential.	
23	Yu An, Yu Zhang and Bo Zeng (2011)	The reliable Hub and spoke design problem : model and algorithms	Spoke & Hub, Langrangian relaxation and branch-&-boud	The result shows that the Hub & spoke design is more reliable in Langrangian relaxation branch-&-boud.	
24	Nicholson, Gomez, and Gao (2011)	The costs of increased localization for a multiple-product food supply chain: Dairy in the United States	Supply chain management, Transshipment model	We find that increased localization reduces assembly costs while increase processing and distribution costs.	
25	Barar and Saini (2011)	Milk-run logistics literature review and directions	Milk run logistics supply chain, Transportation model, JIT, Procurement	As a result, it is an excellent transport method in which exhaust gases from trucks can be controlled. The overall supply chain cost can be minimized by using milk run system in transportation instead of direct shipment.	
26	Segetlija, Mesarić, and Dujak (2011)	Importance of Distribution Channels - Marketing Channels- For National Economy	Supply chain, Distribution Channels, Logistics	Economic policy in a country can be used to influence the level of production and consumption, but consumption can also be developed on the basis of import. In this sense, the ownership of distribution channels can be of vital importance for the development of production in the given country.	This paper can only study on how to increase economy policy of country in supply chain management.
27	Szopa, and Pekala (2012)	Distribution Channels and other roles in the Enterprise	Logistic management distribution Channels	The growth of an electronic distribution is Strengthen by its Global reach, reduction of distribution costs and sales, reduction of time and flexibility in data processing.	
28	Dhakry, and Bangar (2013)	Minimization of Inventory & Transportation Cost of an Industry"- A Supply Chain Optimization	Supply chain, Preliminary Distribution model , Cross-Dock and Direct Shipment Models Langrangian Method	The results obtained from the transportation-inventory models show that the single DC and regional central stock strategies are more cost-efficient respectively compared to the flow-through approach. It is recommended to take the single DC and the regional central stock strategies for slow moving and demanding products respectively: Minimizing inventory & transportation cost of an industry: a supply chain optimization	

29	Alma Alicic Teoman Duman (2013)	Comparing the efficiency of distribution methods in Home appliance Industry	Distribution channel, cost effectiveness, Time effectiveness	This paper analyzed data from manager of a company in home appliance industry with respect to their views advantage and disadvantage of distribution channel. Distribution is also an important part of business strategy and manager should follow up change in this part of business strategy.	
30	Kumar, and Prabhakar (2013)	Opportunities challenges in Indian dairy industry supply chain a literature review	Supply chain management, infrastructure	Despite the increasing in production a demand supply gap has become imminent in the dairy industry due to the changing consumption habits dynamic demographic patterns and the rapid urbanization of rural India.	This literature review can not study on life of perishable items is affected by environment conditions.
31	Ma and Sun (2013)	Mutation Ant Colony Algorithm of Milk-Run Vehicle Routing Problem with Fastest Completion Time Based on Dynamic Optimization	Milk-run vehicle routing problem	The MRVRP with fastest completion time is proposed, which has many applications in fast foods distribution, express delivery, and emergency supplies. Solving the problem is more difficult than the general VRP. The key Problem to solve MRVRP with fastest completion time is to give the division method for customer array.	
32	Zhenlai and Yang Jiao (2013)	Development and application of Milk run distribution systems in express industry based on saving algorithm	Milk run	The results of this paper of Milk run schema to express delivery industry and establish a multi objective path optimization schema which has the shortest distance and the lowest cost.	
33	Rajendran, and Mohanty (2014)	Dairy Co-operatives and Milk Marketing in India: Constraints and Opportunities	Distribution network	Strengthening the infrastructure for milk collection, transportation, processing, packaging, pricing, and marketing through dairy co-operatives can also change the minds of the milk producers.	
34	Deep and Hosmani (2014)	Supply chain management scenario in India	Supply chain management, logistics	The best and cost effective method for the warehousing it or shipping it to retailer.	The transportation and road condition are not study in the scenario.
35	Amalanathan, and Jaffer (2015)	Distribution Channels of milk and the Problems Encountered by the Members of Primary Dairy Co-Operatives in Pondicherry U.T.	Distribution Channel	Strengthening the infrastructure for milk collection, transportation, processing, packaging, pricing, and marketing through dairy co-operatives can also change the minds of the milk producers.	

Table 2.1: List of Research Papers for Review of Literature

#### IV. DATA COLLECTION & ANALYSIS

Regular visits had been made to various departments (production depth, first-rate testing depth, and marketing depth, and so forth.) of Ujjain Dugdh Sangh, maxi street, Ujjain and meetings were held with key role personnel of these departments to understand the present distribution network. information collection for this work changed into very hard venture but after fifteen days it turned into made viable by means of the help of Mr. kapil rokade (advertising manager) and his crew of marketing branch. Records collected has been analyzed And evaluation is presented in following components for ease of know-how.

Case-I Calculates the full distance, average shipping time and additionally total cost by using the help of Google map software and using a present method apply in UDS given data of all routes of milk distribution community at gift of Ujjain Dugdh Sangh, Ujjain.

Case-II Calculates the whole distance, average transport time. And additionally total fee via assist of Google map utility and given statistics of re-preparations of all routes of milk distribution community of Ujjain Dugdh Sangh, Ujjain.

Case-III calculates the entire distance, common transport time and also total price with the aid of assist of Google map application and given data of new version of milk distribution network (Hub & Spoke) of Ujjain Dugdh Sangh, Ujjain.

After that a contrast chart is presented which covers numerous performance parameters of milk distribution

#### B. Results

Sr. No	Case Study	Total Volume of Milk		Total No. of Routes	Average Delivery Time (Min)	Total Distance Travelled by Vehicles(Km)	Total Cost of Travelled Distance by Vehicles (Rs)	Saving Delivery Time (Min)	Saving Distance (Km)	Saving Cost (Rs)	Saving Cost (%)	Saving Distance (%)
		Ltrs	Crts									
1	Case -I	12918	1080	10	58.1	263.5	7905	0	0	0	0	0
2	Case -II	12918	1080	09	68.8	244	7320	0	19.5	585	7.4	7.4
3	Case -III	12918	1080	08	51.62	144.8 (57.7+87.1)	6767.4 (3462+2177.5)	6.48	118.7	1137.6	15.5	48.64

Table 5.1: Comparison Chart of Performance Parameter per day of Milk distribution

S.NO.	Case	Type Of Vehicle		No. Of Routes		Salary Of Each Driver Per Day in Rupees	Distance Travel BY Each Vehicle in (K.M.) apro.	Mileage Of Each Vehicle per K.M. in Rupees		Cost Of Each Vehicle of all routes in Rupees		Cost Of Drivers per Day	Total Cost per Day
1	Case-1	Tata Magic		10		333	28	25		700*10=7000		3,330	10,330
2	Case-2	Tata Magic		09		333	29	25		725*9=6525		2,997	9,522
3	Case-3	Tata 407 DCM	Tata Magic	03	05	333	16	60	25	960*3=2880	400*5=2000	2,664	7,544

Table 5.2: Cost Associate Parameter for drivers in given

community of Ujjain Dugdh Sangh (uds), Ujjain as shown in desk 5.1. Calculations of most of these 3 elements are shown in segment 5.3.

#### A. Assumptions

The Total distance and total transport time is calculated for every route with the help of Google map software without considering pickup time from distribution facilities of Sanchi Dugdh Sangh to one-of-a-kind stores of Ujjain metropolis. The overall price of each course is calculated thinking about value mileages (in step with km) as RS 25 / km for Tata magic and rupees 60 / km for Tata 407/dcm in Ujjain metropolis. The maximum capacity of Tata magic is 3000 liters or 250 carats and that of Tata 407/dcm is 5400 liters or 450Carats.

#### B. Formula for Calculations

$$\text{Total Milk Distribution Cost (Rs)} = \text{Correction factor X Total Distance Travelled by Vehicles (Km) X}$$

#### V. RESULTS & DISCUSSIONS

##### A. Introduction

This chapter presents final results and concludes the findings from research project. In order to do so, each of the research questions posed in chapter five is related answered based on these, some overall conclusions, recommendations, limitations, future scope, and concluding remarks are presented in following subsection.

Case study of Distribution Network (Per Day)  
In this case study we use a new vehicle for distribution of perishable items that is Tata 407 DCM rather than Tata Magic vehicle on some routes due to which some amount of cost is

increase in the plant for buying of new vehicles. And that vehicle is buy by selling the old tata magic vehicle. So a difference in cost of two vehicles is occurred and this difference is shows in a table 5.3.

S.NO	Case	Type of vehicles	Overall cost of drivers per day	Cost of driver per month	cost of driver per year	Difference in cost of drivers	Price of vehicles	Price of old tata magic	Difference in price of old and new vehicles	Final amount of price to buy 3 new vehicle in plant
1	Case 1	Tata magic	10,330	3,0990	37,1880	37,18800-27,15840=1,002,960	3,50,000	1,50,000	6,000000-1,50,000=4,50,000	4,50,000*3 = 13,50,000
2	Case 2	Tata 407 dcm	7,544	2,26,320	27,15840		6,0000			

Table 5.3: Cost Associate Parameter in Difference of two Vehicles for Buying New Vehicles in UDS

From above calculations we observe that if we buy three new tata 407 dcm vehicles the cost for buying all three vehicles is 13, 50,000 rupees and the cost of drivers salary

difference of above two cases is 10, 02960 rupees per year, so all the amount for buying three new vehicle is fulfilled by only the drivers salary in only one year.

Sr. No.	Case Study	Saving Delivery Time (Min)	Saving Distance (Km)	Saving Cost (Rs)	Saving Cost (%)	Saving Distance (%)	Remarks
1	Case-I (Milk –Run)	0	0	0	0	0	Average
2	Case-II (Rearrangement Of Milk-Run)	0	19.5	585	7.4	7.4	Good
3	Case-III (Hub And Spoke)	6.48	118.7	1137.6	15.5	48.64	Better

Table 5.4: Performance Parameter of Case study of Distribution Network

### VI. CONCLUSIONS

On this bankruptcy, collected data has been analyzed through exclusive methodologies which can be explained in 3 cases. The first case provides calculation of general cost and shipping time of all routes of current network. The second case, affords calculation of general value and shipping time after rearranging all routes. In 1/3 case, combined shape of methodologies of all routes and their calculation related to general value and shipping time is presented.

Finally a assessment chart Of all 3 case of distribution community of Ujjain Dugdh Sangh Ujjain (uds) has been offered.

Table 5.1 Shows Various Objectives and How They Are Achieved

O	Objectives	C	Conclusions
O1	To examine and apprehend distribution community and its effectiveness in bringing merchandise in "right time to right customers".	C1	Complete study of distribution network of u.s.is accomplished. the effects of this example take a look at show that the transport time has been decreased and its Effectiveness in bringing products in "proper time to right customers" has be improved.
O2	To look at the existing distribution	C2	Perishable are taken into consideration and case of milk merchandise

	channel of perishable object manufacturer in Ujjain metropolis		manufacturer "Sanchi Dugdh Sangh" or "Ujjain Dugdh Sangh" (uds) has been studied to recognize distribution channel in Ujjain town.
O3	To talk about alternatives for the distribution preserving in thoughts value, time and comfort as the focal criteria.	C3	Final consequences of this Thesis show that the fee, delivery time and convenience because the focal standards were progressed as shown in desk 6.1.
O4	To evaluate and endorse higher alternatives to case organization	C4	The assessment between options of those distribution channels is shows in table 6.2 and it is also seen that options are higher than gift distribution gadget of uds.

Table 6.1: Conclusion of this Case Study

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