

CHAPTER - I

INTRODUCTION

1.1 Background of the Study

Inventory is the stock of the materials or products, which frequently occurs in the manufacturing organization especially. When the materials are purchased by an organization they have to be stored until they are in to the production process. When the production is over the finished products have to be stored again until they are sold. Thus, inventory involves high amount of cost in term of occupying the space and blocking the capital. However, we can not avoid inventories because without inventory it way effect even badly by creating obstacles on continuous production and ultimately in appropriate quantity so as to avoid both under stock and over stock, situation. For this purpose inventory management is necessary.

Inventory management is an important aspect of the firm's current assets management. The efficiency of the firm's current assets management, to a larger extent depends on the effective inventory management. The basic issues associate with inventory management are, what should be the level of investment in inventories? How much should be order each time? How frequently such order is made? A firm should maintain what should be the minimum or maximum level of stock? And so on. Inventories refer to the goods and materials used by a firm for the purpose of production and sales. It also includes the items, which are used as supportive materials to facilitate production. Inventory constitutes one of the important items of current assets, which permits smooth operation of production and sales process of an organization. Inventory management is that aspect of firm's current assets management, which is concerned with maintaining optimum investment in inventory applying effective control system of inventory so as to minimize the total inventory cost.

Profit is the ultimate goal of every business organization. They involve in business for making profit. Profit cannot be achieved easily. It should be managed well with better inventory management. So profit is the planned and controlled output of inventory

managements. By element, profit is the difference of revenue and cost (*Gautam et.al.;2007:129*).

Because of large size of inventory maintained by firm a considerable amount of funds is requiring being the committed in them. It is therefore, absolutely impasse to manage inventories effectively and effectively in order to avoid unnecessary investment in them. An under talking neglecting the management of inventories will be jeopardizing its long run profitability and may fail ultimately (*Pandey; 2002:225*).

As the study concentrates over relationship between inventory and profitability study followed in Unilever Nepal limited, it is necessary to know what is inventory, what types of inventories are used in the organization and what is the role of inventories for the smooth production and its impact over profit.

The various form of material held by an enterprise is known as inventory. These forms of materials may be as raw materials, work-in-process and finished goods.

To effective manage inventories; a firm should utilize a system approach to inventory management. System approaches consider in a single model all the factors that affect the inventory. The model called a system may have any number of subsystems tied together to achieve a single goal. In the case of inventory system the goal is to be minimizing costs. A system for effective inventory management involves three subsystems: economic order quantity, re-order points and stock level. The computer brings these subsystems together to an assist the financial manager in making inventory decisions (*Hampton; 2003: 378*).

Inventory management involves planning of the optimum level of inventory cost supported by an appropriate structure, which is staffed by trained persons and directly by top management. It involves financial dimension as well as physical dimension are interlaced and not be looked in isolation (*Agrawal; 1982:161*).

This management should pay adequate attention to the inventory management to reduce the cost of production. Therefore, inventory management is primarily concerned with minimizing cost of investment in inventory. Both the physical as well

as financial dimension of inventory should be effectively managed. Thus, the real task of top management lies in formulating the plan and policy that will lead to optimal inventory investment for the attainment of desire objectives.

1.2 Profile of Unilever Nepal Limited

1.2.1 Introduction

Due to the liberal economy policy of government, Unilever Nepal Limited was formed as a subsidiary company of Hindustan Lever Limited, India. The factory's registered office is situated at Basamadi village development committee-5 of Makwanpur District; about six kilometer far from Hetuada municipality and its corporate office is situated at Heritage Plaza, Kamaladi, Kathmandu. It was established on 1993. as a public limited company, but it started its production activities on 1994 while started, it is called Nepal Liver Ltd. it is registered according to company act, 1964 (New company Act 2053) as a joint venture company of foreign investment and technology transformation.

Hindustan Lever Ltd. was formed as subsidiary company of Unilever Group of Co. of England, with a 51% share. It was started around 1940 in India. Its head office is Mumbai, India. Its total turnover is more than 110 consumer goods. However, Unilever Nepal Ltd. current sales policy is to sale 30% in Nepal and 70% in India and its future plan is to sale as 40% in Nepal and 60% in India.

Unilever Nepal Ltd. has been manufacturing different type of qualitative products. It started production on 1994 A.D. by producing detergents, toothpaste, and toilet soap etc. now, its market becoming broader. It develops and launches various new products in market. Its main objective is to provide various kind of every day needs to consumer. At present, the current products of UNL are as follows:

Detergents	:	Wheel and Vim
Oral care	:	Pepsodent and Close Up
Toilet soaps	:	Liril, Lux, Jaya, Lifebouy
Cosmetics	:	Fair and Lovely
Hair care	:	Clinic Plus, Sunsluk, Clinic Plus
Scourers	:	Vim

The goods like Detergent and laundry soaps are produced at third party; manufacturing location. UNL exports its products to other countries. Its export trade is about 40% to 50% of total trade. Its export business was adversely affected by charges introduced in the last Indian budget; where in the advantages of countervailing duty for the company's customers in India were withdrawn.

The company continued to invest heavily in expanding the domestic business. The company has a comprehensive portfolio of products, which are of truly international standard. The company has started seen marketing of a number of products from the Unilever portfolio.

The company has maintained its contribution to the community in various ways. It is proud of its role in the income and employment generation opportunities in the country, especially in the remote areas. This company has been involved in various projects. It is involved in 'Miles of Healthy Smiles' program, the ambitious project for contacting school children throughout Nepal to impart Oral Health education, has covered more than 250000 children so far. Periodical health and Hygiene awareness programs were conducted together with health check-up programs for local people. The company also organized several dental camps, and it provides financial assistance to Mahendra Kiral High School in Basamadi. These are some examples.

The company provides employment to nearly 200 Nepalese citizen and indirect employment for over 10 times of that numbers through its network of supplier, distributors and ancillaries. These have been many innovative marketing initiatives focused on growing the domestic business. These included a home to home campaign on Fair and Lovely, which has been piloted successfully and is now being rolled out nationally, launch of a 'consumer advice service' for Fair and Lovely, a doctor contact programme for Lifebouy soap, a seminar on Hear styling for leading beauticians sponsored by Sunsilk etc. promotional activities have been focused on building long-term equity for brands.

1.2.2 Corporate Purpose of Unilever Nepal Ltd.

Every company has its own objectives. The activities of the company are devoted to achieve the targeted objectives. The main objectives of UNL is to meet the everyday

needs Nepalese people everywhere in Nepal to anticipate the aspirations of the consumers and customers and to respond creatively and competitively with branded products and services which raise the quality of life.

The deep roots of company in local cultures and markets of Nepal are unparalleled inheritance of the company and foundation for future growth of the company. The company assures that it will bring its wealth of knowledge and international expertise to the service of the Nepalese consumers.

The company believes that the long-term success required a total commitment to exceptional standards of performance and productivity, to working together effectively and to a willingness to embrace new idea and learn continuously.

The company believes that's to succeed requires the highest standards of corporate behavior towards its employees, consumers, the Nepali societies, and the world, which we live.

1.2.3 Ownership and Capital Structure

Unilever Nepal Limited is the subsidiary company of Hindustan Lever Limited outside of India with holding 80% ownership and has invested Rs.73.7 million in equity. The authorized capital of company is Rs. 3000,000,000.00 divided into 3000,000 an ordinary share of Rs. 100 each and paid up capital is Rs. 92,070000.00 divided into 920700 shares of Rs.100 each. The company is listed in Nepal stock Exchange and has a positive response from its investors. The composition and percentage of sharing on capital are as follows:

No. of shares	Amount
Authorized capital @ Rs.100 each 3,000,000	300,000,000.00
Issued, subscribed and paid up Capital @ Rs.100 each 920,700	92,070,000.00

Of the above issued, subscribed and paid up capital can be presented as follows:

Table 1.1
Shareholders of UNL

Name of Shareholders	No. Of share	% Of share	Amount
Hindustan Lever Limited, India	736,560	80.00%	73,656,000.00
Sibkrim Land and Collaborator Industrial Co. Pvt. Ltd.	46,035	5.00%	4,603,500.00
Public shareholders	138,105	15.00%	13,810,500.00
Total	920,700	100.00%	92,070,000.00

Source: UNL 16th annual Report and Account 2066

1.2.4 Market Share and Performance of Company

Unilever Nepal Limited has been manufacturing different types of detergents, scourers, soap noodles, toilet soap and personal care products. According to government record, company's products captured approximately 60% market share in total everyday needs product, but company's point of view, captured approximately 47.8% market share in financial year 2065/2066 within the country. UNL Brands constitute nearly half of top twenty brands of Nepal 2009 as per the annual survey by Ac Niesen a great testimony to confidence Nepalese people place on company brands. UNL believe that to succeed requires a total commitment to exceptional standards of performance and productivity, to working together effectively and to a willingness to embrace new ideas and learn continuously. From this commitment and due to qualitative product, it has also achieved different awards such as:

“Best Presented Account Awards – 2003” by Institute of Chartered Accountants of Nepal.

“Best Presented Account Award – 2005 Runner up” by Institute of Chartered Accountants of Nepal.

“Best Presented Account Awards –2006 Runner up” by Institute of Chartered Accountants of Nepal.

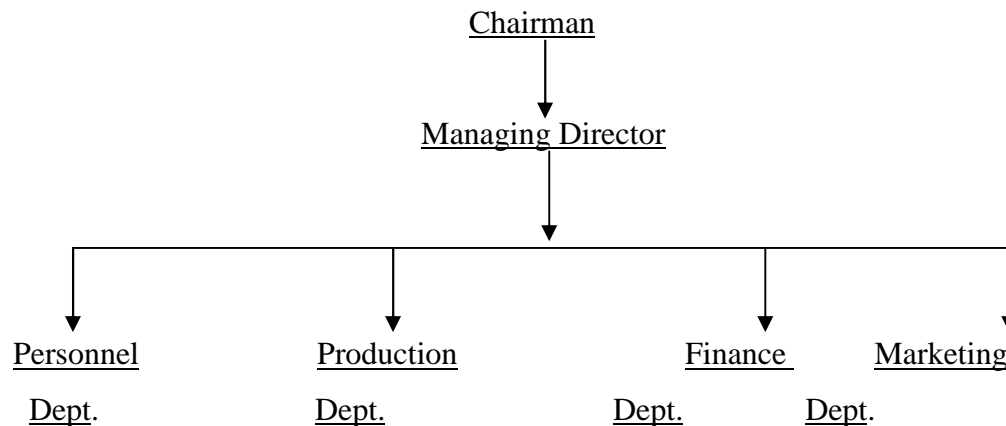
“First FNCCI National Excellence Awards –2062” for its overall performance by FNCCI.

1.2.5 Organization Structure

More than 500 personnel (administration and production) are engaged in this company. The organizational structure of the company is as follows:

Figure 1.1

Organizational Structure of Unilever Nepal Limited



1.3 Statement of the Problem

Inventory must be managed in such a way that it does not used to disadvantage of production stoppage Nepalese manufacturing companies have not applied the measurement of a inventory tools and technique in the production process. Both, excessive and inadequate inventory are not desirable is any manufacturing enterprise so, the inventory management should be determine and optimal level of inventory will be between two danger points of excessive and inadequate inventories. Effective and efficient inventory management system can only yield expected profit of corporation. Making the smooth flow of production must be the sole objective of ideal inventory policy in the context of Nepalese manufacturing enterprises.

Inventory directly affects the profitability and overall performance of an organization. So managing inventories in a proper way is a great challenge to every organization.

The problems of this study are as follows:

-) How the inventories are managed in the UNL?
-) What inventory management technique does this company use?
-) What would be the relationship between inventory and profitability the company?

-) What are the major problems of existing inventory management system in Unilever Nepal Ltd?
-) What would be the impact of inventory management the overall performance the company?

1.4 Objective of the Study

This study has been conducted to examine the existing management and control system of inventory and its impact towards Unilever`s profitability.

The ultimate objective of this study is to evaluate the inventory. The specific objectives are as follows,

-) To see the position of inventories on Unilever Nepal Ltd.
-) To explore relationship between profit and inventories level.
-) To see the practices of purchasing adopted by Unilever Nepal Ltd.
-) To see the system of inventory issue adopted by Unilever Nepal Ltd.
-) To see the inventory turnover cycle.

1.5 Significance of the Study

Nepalese business environment is the threshold of change. In this situation a firm adopts suitable strategies for its existence. The success or failure of business organization depends on strategies, which depends upon effective and efficient inventory management.

Proper inventory management helps to increase the profit of an organization. A slight change in the cost of inventories will be bringing a great change in the firm`s profitability. Reduction in the material cost any result in high profit.

Most of Nepalese manufacturing organizations are suffering form poor inventory management. Unilever Nepal Ltd. has different types of products, thus deal with diversified products group to meet every day need of domestic. It has been producing several products since last fifteen years. Being a manufacturing company, it spends a lot of time, money and effort in inventory management. Therefore, the researcher is very interested to examine its inventory management system of Unilever. So, this

topic is chosen for the study. It is hoped that the study may help to solve the problem faced by Unilever Nepal Ltd. to eliminate the obstacles presently traced in inventory management.

1.6 Limitation of the Study

This study attempts to find the problems and impact on the profitability of Unilever Nepal Ltd. therefore the following will be the major limitation of the study:

-) This study mainly based on secondary data, which provided from companies and management.
-) This study is not applicable in general situation or all types of manufacturing enterprises.
-) This study is concentrated on the area of inventory management of Unilever Nepal Ltd.
-) This study covers a span of only financial years covering from 2058-2059 to 2065-2066.
-) Unilever Nepal Ltd. produced different types of products groups. So, this study deals with the corporate products groups namely, detergent, toilet, personnel, and products.

1.7 Organization of the Study

The entire study has been organized into five main chapters.

Chapter 1; Introduction

Chapter 2: Review of literature

Chapter 3: Research methodology

Chapter 4; presentation and analysis of data

Chapter 5; Findings, conclusion and Recommendation.

Chapter – I Introduction

The first chapter is the introductory one, which deals with back group of the study, a brief review of Unilever Nepal Limited (UNL), statement of the problem, objective of the study, significance of the study and organization of the study.

Chapter – II Review of Literature

The second chapter “Review of literature” deals with the review of various studies conducted on inventory management and book and journals related with topic.

Chapter – III Research Methodology

The third chapter “Research methodology” followed to achieve the purpose of the study have been described. It consists of the research design, period covered, nature and sources of data, data gathering instructions, data collection procedure, tools to be used, research variables etc.

Chapter – IV Presentation and Analysis of Data

The fourth chapter “presentation and Analysis of data” Deals with the objectives of the study by preparing the data and analyzing them with the help of various tools. Appropriate tables, diagrams and graphs have

Also been involved and interpreted in this section.

Chapter – V Summary, Conclusion, Recommendation

The fifth chapter “findings, conclusion and Recommendation” are the last chapter of the study deals with major findings, conclusion and recommendation. It draws the conclusions and forewords the recommendation for the improvement of profitability of UNL.

At last, the bibliography, appendices and glossary have been annexed to the end of this thesis.

CHAPTER - II

REVIEW OF LITERATURE

This chapter deals with Review of the literature regarding inventory management. Only limited number of studies has been conducted in the field of inventory with showing relationship between profitability. But in the inventory aspect of Unilever Nepal Limited has not been studies since last few years.

Besides, it also presents relevant studies carried out in the Nepalese context, including the available information of Unilever Nepal Limited.

2.1 Conceptual Frameworks

2.1.1 Inventory Concept

Inventories are stock of materials, work-in-progress, finished goods and office supplies. They are inevitable to any firm whether it be small or large. Inventories are essential for production and sales as well. As long as the firm has an inventory of raw material in ordering and delivery from supplies do not affect the production process. However firms would prefer to hold little or no inventory, if it could be arranged, firms would like to time the production of their products to coincide perfectly with the arrival of demand. But it is difficult to manage like this because only if the demand is known with certainty, a firm can match its production of products with customer demand. It is a well-known truth that no firm knows its demand with perfect certainty. If we suppose that a firm can forecast its demand with perfect certainty, the firm may try to coincide its production of products with customers demand. But every production/manufacturing process takes some amount of time and it varies with the length of transportation process and value added to the original material purchased. Therefore every firm thinks it necessary to hold inventory in one or more form or another. Firms hold inventories as it not known with perfect certainty when customers will arrive, when orders will be delayed or when production problems will arises while materials and products are in inventory they do not generate a return instead the firm must finance them. Excessive inventories are costly to the firm, but insufficient inventories also are costly because customers might purchase form competitors if

products are not available when demanded. (This is called a stock out), and future business could be lost. Thus firms need to determine the appropriate level of inventory to hold.

Fundamental reason for carrying inventories is “it is physically impossible and economically impractical for each stock item to arrive exactly where it is needed”.

Others reasons of carrying/holding inventories are:

-) Return on investment and turnover.
-) Buffer stock (lead-time).
-) Decoupling (independence).
-) Production smoothing.
-) Material handling.
-) Bulk purchase (*Jain and Narang; 1995: 451*)

2.2 Types of Inventory

Manufacturing firms generally have four kinds of inventories, which are given below:

i. Raw Material Inventory

Raw material is those basic inputs, which are converted into finished goods through the different manufacturing process. Raw material inventories are those units, which have been purchased and stored for future production.

Raw material inventories are hold by manufacturing firm for smooth running of production operation. Materials used in factory are traditionally classified as direct and indirect material. Direct material generally includes all materials and parts that can be the finished goods. Indirect material is generally defined as the material used in the manufacturing process, which cannot be identified. They are only the supporting material of the products. The level of raw material inventories is influenced by anticipated production, reasonability of production, reliability of sources of supply and efficiency of scheduling, purchasing and production operations.

Unilever Nepal Limited is a manufacturing company so for the production of goods, different kinds of material are used in the production process.

ii. Work-in-process Inventories

Work-in-process inventories represent the semi-finished goods. They include those materials that have gone committed to the production process but have not been converted into fully finished goods yet. It is very difficult to separate which materials is work in process and which are not. Because the same material may be a raw material in one industry and the same material may be a work-in-process as well as finished goods in other industry. It depends on the nature of production. The levels of work in process inventories are strangely influenced by the length of production period or production cycle.

iii. Finished Goods Inventories

Finished good inventories are those completely manufactured products, which are ready for sale. In a manufacturing firm, they are the final output of production process stocks of finished goods are held by manufacturing and non-manufacturing company for market operation.

Unilever Nepal Limited produces different types of products and holds inventory of different types of goods for smooth market operation and sales.

iv. Spare-parts and Supplies Inventories

Spare- parts are those materials that are used in maintenance and repairing functions and supplies are those materials, which are used in operating functions. Bolt, wheels, oil, lubricant, and grease etc. represent the spare parts and supplies. Usually those supplies are small part of total inventory and don't involve significant investment (*Jain and Narang; 1995: 495*).

2.2.1 Motive of Holding Inventory

The question of managing inventories arises only when the company holds inventories. Maintaining inventories involves store keeping of required material and supplies. Why does a company hold inventories? It is the main question raised by different persons. A company held inventories for three general motives:

i. Transaction Motives

Without inventories, a firm's production, sales and day-to-day transaction is not impossible but very difficult. So transaction motive ensure smooth production, sales and day-to-day operation.

ii. Precautionary Motive

It necessitates holding of inventories to guard against the risk of unpredictable changes in demand and supply forces and other factors.

iii. Speculative Motive

Influences the decision to increase or decrease inventory level to take advantages of price fluctuation.

2.3 Advantages of Holding Inventory

By holding inventories, firms incur carrying costs and idle investment. Behind this, firms expect some advantages of holding inventories. The major advantages of holding inventories are;

i. The de-coupling (Independence) Function

During various manufacturing processes of a product, there may occur breakdown of one or many disturbance. It may affect entire system stocking points and inventories are created between adjacent stages of production process so as to achieve a certain degree of independence in operating stages. Decoupling of raw materials and component parts are needed to avoid the effect of short supply, price hike etc.

Decoupling of work-in-process is made to continuous operation different production processes despite break down of one or many production processes. It helps regularly meet customer demand on time. Decoupling of finished goods depends upon market, firm's ability to sell its products in the market, ability to meet customer demand on time, self-life of product and storage capacity. For scarce parts of plant and machineries. It depends on average life of such parts.

ii. Meet Irregular Supply and Demand

Some times market supply of raw materials and parts will be irregular which will result short supply, price rise, as long as raw materials inventory exists, production process will not be interrupted. Similarly sometimes there may be peak demand of firms product, finished goods inventory is helps to meet such demand.

iii. Quantity Discount

Suppliers offer trade discounts on bulk purchase. Firm's policy of holding sufficient inventory eases to take quantity discounts, which will contribute to reduce material cost.

iv. Avoiding Stocks- Outs (Shortages)

If there are not inventories when they are needed, such situation is known as stock-outs. Raw materials stock outs interrupts production process where as finished goods stock outs causes the liability of firm to meet customer demand on time and result in the loss of customers and goodwill as well. A hence stock out is very harmful to the survival of a firm.

Optimum level of inventories ensures avoidance level of stock outs (*Jain and Narang; 1995: 379*).

2.4 Meaning of Inventory Management

Inventory management involves planning of optimal level of the material and cost control of material cost supported by an appropriate organization structure, which is staffed by trained person and directed by the top-level management. It involves both financial dimensions as well as physical dimension and these dimensions are interrelated and can't be looked in isolation. Inventory in the form of raw materials, work-in-progress and semi-finished goods are of great significance for the success of and enterprise. These can directly affect the efficiency of the system. It is observed that irrespective of the size of an enterprise.

The expenditure of materials is a major item of the budget. In many cases materials consumption varies from 25% to 75% of sales turnover. The expenditure made on materials is money invested in inventories, transportation cost, cost of storage, wastage, and insurance etc. because of the magnitude of expenditures required acquiring on controlling inventory and their impact on profit. A great deal of attention is required towards the management of operation associated with materials. Materials management is one of the aspects of production management. Production management is developed and handled by production engineer its specialist becomes a separated and significant management for the development of industries.

The inventory management is assumed to maintain an adequate supply of current materials at the lowest total cost. The responsibility of determining the material requirement implied by the marketing forecast and liaising with the purchasing department for their acquisition, receiving and storing the material safely and in good condition for its subsequent issue and identifying surplus stock and taking action to reduce it. Under the inventory management there is not only an essential production approach but also a need for marketing management but actually inventory management is purely a subject of production management (*Chary; 1994:356*).

Inventory is working capital and therefore the control of inventories is an important aspect of operation management. The basic questions in the management of inventory are:

- a. How much inventory to keep?
- b. When?

Before getting to a mathematical treatment of the above questions, let's understand the function of inventory management:

- i. There are inventories for normal consumption requirement rates and average lead times for procurement/manufacture of the materials, inventories are kept at the appropriate time.
- ii. A production process however continuous it may be is bound to have imbalance in the consumption and production rates of the materials at different stages at the production process. These interruptions and imbalance make it necessary to keep stocks of inventories between the different stages of the operation.

Every enterprise needs inventory for smooth running of its activities. It serves as a link between production and distribution process. There is a time lag between the reorganizations of and its fulfillment. The greater the time lag the higher the requirement for inventory.

The unforeseen fluctuations in demand and supply of goods also necessitate the need for inventory. It also provides a cushion for future price fluctuations. About 90% part of working capital is invested in inventories; it is necessary for every

management to give proper attention to inventory management. A proper planning of purchasing, storing, handling and accounting should form a part of inventory management.

An efficient system inventory management will determine What to Purchase?

- i. How much to purchase?
- ii. From where to purchase?

Inventory management is one of the aspects of production management. Production management is developed and handled by production engineer procurement is handled by its specialist. Therefore later inventory management becomes a separate and significant management for the development of industries. Under the inventory management there is not only essential production approach but also need marketing management but actually inventory management is purely subject of production management (*Sharma and Gupta 1998: 22- 23*).

Executive in production, purchasing and marketing departments, takes decisions relating to inventories primary usually raw material policies are shaped by purchasing and production executive. Work –in-process inventory is influenced by the decision of production executives and finished goods inventory policy is evolved by production and marketing executive. Yet as inventory management has an important financial implication. It has the responsibility to ensure that inventories are properly monitored and controlled. It has to emphasize the financial point of view and instate programmed with the participating and involvement of other for effective management of inventory (*Chandra; 1998:328*).

Thus inventory management means not only branch of production management, it is an integrated view of management.” Companies devoted a great deal of attention to the efficiency of their materials and inventory management operation. A brief look at the historical evolution of materials management will give us a fuller appreciation of the current situation. Up until the time F.W. Taylor, the production foreman was focal intent and purposes in complete control of production activity. He hired, fired and promoted, he purchased the necessary raw materials scheduled production and handled individuals almost all of the other aspects of production.”

Every business operation how ever big or small has to maintain some inventory, inventories serve us cushions to observe the stock of errors in demand forecast and provides more efficient use of resources. Inventory for any organization is necessary and required careful planning and formulation of policies keeping in view the best interest of the organization. Depending upon the nature of the industry and firm, inventories may be durable and non durable.

2.5 Objective of the Inventory Management

Inventory is the most important to all manufacturing organization in today's industrial world. So, it is necessary to manage it properly because both situation of inventories i.e. either excessive or in adequate are not desirable to the industry. The excessive level of inventories consumes funds of the firm, which cannot be used for another purpose and thus it involves on opportunity cost. The carrying cost such as the cost of storage, insurance, handling, recording and inspection also increase in proportion of volume of inventory. These costs will impair the firm's profitability further.

On the other hand maintaining an inadequate level of inventory is also dangerous. Inadequate level of inventory means under investment of industry inadequate raw materials and work-in process inventories will result in frequent production interruption. Similarly, if finished goods inventories are not sufficient to meet the demand of consumer regularly consumers may shift to competitors, which will amount to permanent loss to the firm.

Therefore, to maintain the proper inventory or optimal level of inventory in industry is quite significant. But, it is difficult task the management, because the optimal level of inventory always between two dangerous points of excessive and inadequate inventories. The following are the objective of inventories management.

- J To ensure continuous supply of materials spears and finished goods so the production should not suffer at time and the customers demand should also be meet.
- J To maximize profitability with minimum wastage, risks of spoilage and obsolescence of inventories must be avoided.
- J To avoid both over-stocking and under stocking of inventory.

- J To keep material cost under control and providing flexibility in production plans.
- J To make possible economics in transportation clearing and forwarding charges.
- J To maintained sufficient finished good inventory for smooth sales operation and efficient customer service.

Therefore, the objectives of inventory management should be to avoid excessive and inadequate levels of inventories and maintained sufficient inventory for the smooth production and sales operations. Efforts should be made to place an order at the right time with the right sources to acquire the right quantity at the right place (*Gupta; 1992:144*).

2.6 Need and Importance of Inventory Management in Overall Profit Planning of the Organization

Profit planning and control, (PPC) is important approach developed for effective management system mainly in profit oriented organization. Simply planning is the process of forecasting for future time period. It shows the direction for the organization where to go and how to go to accomplish the certain objective made by the organization without making appropriate plan. The organization can't reach its destination. A profit plan or budget is comprehensive and coordinated plan, express in financial terms for the operation and resources of and enterprises for some specific period in future. Profit planning is the part of overall planning. Profit planning and control included comprehensive, coordinated, financial terms, resource, time etc.

Inventory management is any organizations are of pivotal role. If the organization is not paying attention to inventory management, it will affect the efficiency and profitability of the organizations. Buffa observes a “inventories serve the vital function of developing the various operation in sequence beginning with raw materials extending through all the manufacturing operations and into warehouse and retail stores” (*Buffa; 1998: 474*).

For appropriate profit planning of the organization it has to prepare different budget like sales budget, production budget, materials purchase budget, material usage/consumption budget (manufacturing as well as non manufacturing overhead),

flexible expenses budget, capital expenditure budget, cash budget (cash receipt and cash disbursement budget), budget income statement, budgeted balance sheet, activity based budget, cost volume profit analysis (CVPA), etc.

2.6.1 Inventory and Production Budget

Production management deals with inventory because first thing for production is the material. A firm can't achieve its goal unless inventories are controlled efficiently and capital is allocated efficiently. Therefore study on inventory is the necessary thing of the co-ordinary.

Simply production means the creation of utilities in goods and services. The organization has to produce different goods and services mainly for production and sales. Inventory budget is one of the importance components of production budget. Future is uncertain so production has to be made inventory also. Inventory has direct relationship with production budget. Without making appropriate inventory policies, the organization can't prepare production budget because, Production budget.

Table 2.1
Inventory and Production Budget
A Company Budgeted Production in Units Detail by Product & Time
For ending...

Product Time	Budgeted Sales	Budgeted Ending Inventory	Budgeted Total	Beginning Inventory	Production Budget
Reference	1.	2.	1+2=3	4	3-4=5
Jan					
Feb					
March					
Total	XXXX				XXXX

Source: Jain & Narang; 1995: 196

2.6.2 Inventory and Purchase Budget

In order to maintain coordination between material usages, inventory level of raw material and material / parts purchase the organization has to plan and control material. For this the organization has to prepare material usage budget or material

consumption budget and material the organization can't purchase material wherever it is need. So organization has kept material usage/consumption has kept material usage/consumption budget = production budget x standard usage rate.

Table 2.2
Inventory and Purchase Budget
A Company Budgeted Material Purchase in units & Rs.
Detail by product & time
For the ending...

Material Time	Usage budget	Ending inventory of material	Total need of R.M	Beginning inventory of R.M.	Purchase		
					Units	Rate	Amount
Reference	1.	2.	1+2=3	4	3-4=5	6	5x6=7
Jan							
Feb							
March							
Total	xxxx						

Before prepare to material purchase budget, the organization has to consider the following points:

- i. Units to Purchase: $\text{Material Usage} \pm \text{Inventory}$.
- ii. Liming for purchase: or recorder level (ROL):
 $\text{Replacement Stock} + \text{Safety Stock or Lead-Time} + \text{Safety Stock}$

Or $\text{ROL} = (\text{Lead Time} \times \text{Daily Consumption}) + \text{Safety Stock}$

Where, $\text{Lead-Time} = \text{Time Gap between Order and Receive}$

- i. Economic Order Quantity (EOQ)
It is determines optimum quantity to be purchased.

Similarly for non-manufacturing organization, it has to prepare material purchase budget and open to buy budget.

$\text{Purchase budget} = \text{Sales} + \text{Stock at the end} + \text{Reductions discount, mark up, loss on surge, damage, demurrage, water, paste, mice, obsolesces, shoplifting, etc} - \text{Stock at the Beginning}$.

Open to Buy Budget = Stock Needed – Stock Available

Where,

Stock need = planned sales for the period + planned ending stock of the period + planned reduction for the period – actual reduction to date – actual sales to date.

Stock available = beginning stock of the period + merchandise receipt to date + stock on order for delivery – actual reduction to date – actual sales to date (*Jain & Narang; 1995: 196*).

2.6.3 Relationship between Sales, Production and Inventory

The manager must plan an optimum co-ordination between production, inventory and sales. An efficient co-ordination production plan is necessary for optimum production and sales. There may be high pressure from both sales and manufacturing for high inventory level. The production budget and inventory policies provide the basis for obtaining this co-ordination. Production budget and inventory policies provided the basis for obtaining this co-ordination.

Production manager must translate the quantity in the sales budget into unit production requirement for the budget period for each product while considering the management of inventory policies. No efficient plan should represent the optimum co-ordination between sales budget, essential inventory levels and productions levels.

2.6.4 Responsibility of Production Manager

In the present day of cut throat competition at various stages of production and enterprises should produce goods and services keeping into consideration for the requirement and to satisfaction of potential customer. The objective should be to produce goods at least cost and to maximize satisfaction of the buyer. The production manager assembles appropriate resources and direct use of those resources which may be man, machine, material, capital processes, etc. thus, “manager has to buy more attention not only to what their customers might buy also to increasing government regulation and behavior of customer and environment protections group” (*Goel; 1992*).

The main responsibilities of the production manager are as follows:

-) Use of proper inventory model.
-) Producing high quality of material right time.
-) Should concern with production planning.
-) Fully responsible product and quality control.
-) Capable to select the most efficient and economical method to perform the operations.
-) Plant layout and material handling.
-) To find the relationship between outputs and input etc. (Goel; 1992:235).

2.7 Method of Inventory Computation

We can calculate inventory by different methods. Mainly the organization can compute inventory by following method.

(A) Simple Average of Budget Sales Methods

This method of inventory divided two categories:

i. Average Sales Method

Under this method inventory is calculated with average sales of certain time period.

$$\text{Inventory} \times \frac{\text{Total Budgeted Sales}}{\text{Total No. of Budgeted Period}}$$

It is stable and suitable and to basis product but it can't be used in big organization.

ii. Moving Average Method

It is based on uneven no of period under this method inventory can be calculated as:

$$\text{Inventory} \times \frac{\text{Sales (Pervious Month } \Gamma \text{ Current Month } \Gamma \text{ Next Month)} \mid \text{Month of Supply.}}{\text{Total No. of Time Period}}$$

Under this method, both inventory and production are fluctuating. It is appropriate in those organizations, whose sales are highly seasonal.

B. Sales to Turn Over Ratio Method

This method is also two types:

(i) Historical Sales to Inventory Turnover Ratio (HSTR) Method

This method is also called HSTR, turnover method or withdrawn method. In this method inventory is calculated on the basis of historical ratio of sales to inventory.

Inventory = sales for the period x HSTR or multiplier.

$$\text{HSTR} \times \frac{\text{No of Month in year or 12 (N)}}{\text{Turnover Time (TT)}}$$

$$\text{Where, Turnover Time TT} = \frac{\text{Historical Total Sales Units}}{\text{Historical Average Inventory}}$$

It is stable and shows the relationship between sales and inventory.

ii. Turnover Time Method

Under this method, inventory can be calculated as,

$$\text{Inventory} = \frac{\text{Total Budget Sales}}{\text{Turn Over Time (TT)}}$$

Mostly it is used for stable inventory policies.

C. Proportional Sales Method

It is widely used. Mostly it is used in small industry or basic product, commodity or monopoly market, which has certain sales. Under this method inventory can be calculated as,

$$\text{Inventory} = \text{Sales for the Month} \times \text{Given Ratio.}$$

2.8 Costs Associated With Inventory

The goal of the inventory management is to provide the inventories for sustaining operation at the lowest possible cost. The first step in inventory management is to identify all the costs involved purchasing and maintaining inventories typical costs associated with the inventories are describes below:

A. Carrying/ Holding Costs

Total carrying costs generally increase in direct production to the average amount of inventory carried. Inventory carried in turn depended upon the frequency with orders

are placed. The cost associated with having inventories, which includes storage cost, insurance costs, and depreciation cost so on. These costs generally increase in production to the average amount of inventory held. To illustrate, if a firm sales units per years and if it places equal order N times per year then $Q = S/N$ unit will be purchased with each order.

If the inventory is used annually over the year and if no safety stock is carried then the average inventory A will be:

$$\begin{aligned} \text{Average Inventory (A)} &= \frac{\text{Units Per Order}}{2} \\ &= (S/N/2) = \frac{Q}{2} \end{aligned}$$

Defining the annual percentage carrying cost as C, annual total carrying cost as (TTC), as the percentage carrying cost C times, price per unit PP times the average inventory in units A.

$$\begin{aligned} \text{Total Carrying Costs (TCC)} &= CPP \times A \\ &= CPP \times \frac{Q}{2} \end{aligned}$$

The inventory carrying costs are further explained as:

a. Capital Opportunity Costs

This consists of expenses of rising funds (interest on capital) to finance the acquisition of the inventory. If funds were not locked up in inventory. They would have earned a return. This is opportunity cost of the funds or financial cost of components of the cost.

Funds associated with inventory are not available for other uses. Therefore, an opportunity cost determined by alternative used to which could be put. For example, for the alternative uses if firm can earn 10% then the capital cost of the inventory is 10%.

b. Holding Cost

The size of consignment and material handling facilities in the store determines these costs up to a certain level of inventory size of holding costs decrease with that level per unit holding costs increasing.

c. Storage Cost

The storage cost associated with maintenance of inventory. These include expenditure made on inventory staff, expenditure to provide various facilities like heating, floor space, shelves, lighting and racks bins and containers, materials handling equipments and other provision for safe and proper storage of items. These costs generally depend upon the volume to value ratio of an item.

d. Spoilage and Shortage Cost

Many products deteriorate over time in storage. The precise nature deteriorates various from of product to product but whatever the causes, it represents reduction in the company's assets and such in a cost of holding inventories. This is term as a spoilage cost sometimes because of shrinkage and pilferage of inventory.

e. Depreciation Cost

In every organization, the values of the capital investment decrease with time. Thus, there is tendency among organization to reduce its capital investment on machines and other equipments. The depreciation costs are thus reduced. Naturally the desired among of production with running the machines in stock period with running the machines in stock period thus increasing the size of inventory.

f. Insurance and Taxes

Many of the goods in inventory required and it should be included in inventory holding cost, whether the year. The inventory a firm has on hand those details the higher their tax bill will be. Where such taxes are in effect prudent inventory management may dictate periodic reduction inventory to coincide with the data on which the assessment are made.

One final of inventory holding cost remains to be discussed those associated the administration of the inventory system in use such as information gathering costs, supervision costs, physical stock checking costs and record keeping equipment cost. It is difficult to determine whether there expenses will be high or low expect by making a comparison among actual inventory system (*Hadley and Whiten; 1999*).

B. Ordering Cost

It is assured that carrying costs are entirely variable and increase in direct proportion to the average size of inventory, ordering cost usually are fixed regard less of average size of inventory for example the cost of placing and increasing in an order generally inter office memos, using fax transmission or long distance telephone calls and taking delivery-essentially are fixed regardless of average size of an inventory.

In practices the cost per order generally contains both fixed and variable components, since zero proportion of cost such as that of receiving and inspecting the order normally varies with the quantity order. Ordering cost may differ in the sense of inventories nature. In case of raw materials ordering costs involves the clerical cost in placing an order as well as certain cost of receiving and checking the goods once they arrive for finished goods, ordering cost involves scheduling a production run and for work in progress ordering costs likely to involves nothing more than record keeping further more, ordering costs are the cost involved in placing and receiving an order or purchase items.

The expenses involved in this cost are:

- i. Cost of placing an order
- ii. Requisition cost.
- iii. Transportation/shipping cost.
- iv. Receiving, inspecting and storing cost.
- v. Cost incurred when raw material in transit.
- vi. Insurance of raw material
- vii. Telephone /fax/postage/expenses
- viii. Sales tax, customs
- ix. Clearing and forwarding cost
- x. Bank commission/ LC charges
- xi. Stationary cost etc.

Ordering cost increases with the number of order, thus more frequency in inventory acquired, higher the firm ordering cost. On the other hands if the firm maintains large inventories level there will be few orders placed and ordering cost will be relatively small. Thus, ordering costs decrease with the increasing size of inventory (*Khan & Jain; 1994: 272*).

The fixed costs associated with ordering inventories as 0 (zero) and we placed N order per year,

The total ordering cost is given as:

$$\text{Total Ordering Cost (TOC)} = O (S/Q)$$

Where,

TOC = Total Ordering Cost

O = Fixed Cost Per Order

N = Number of Order Placed Per Year

Q = Inventory Quantity for Each Order

C. Stock Outs Costs

Stock out cost is associated with demand. The depletion in stock results in loss in sales or back order costs. When the sales are lost due to stock out the firm losses both the profit margin on unmade sales and the firms goodwill. If the customer uses another business elsewhere, future profit margin may also be lost and backs order cost needed to convince customer to use again after inventories have been replenished. Back order cost includes, loss of goodwill money paid to re-order goods and notification to customers when goods arrived (*Khan & Jain;1994: 273*).

Stock Out Costs = Inventory Cycle Per Year \times Stock Output Units \times Probability of Possible Stock Out \times Units Stock Out Cost

$$\text{Inventory Cycle Per Year} = \frac{\text{Annual Sales}}{\text{Quantity Order Size}}$$

2.9 Technique of Inventory Management

In managing inventories the firm's objectives should be in consonance with the wealth Maximization principle. To achieve this, the firm should determine the optimum level of inventory. Efficiency controlled inventories make the firm flexible. An inefficient inventory control result is unbalanced inventory and inflexibility. The firm may be sometimes may pile unnecessary stocks. Such situation increases the level of investment and makes the firm unprofitable.

To manage inventories efficiently answer to the following two questions should be sought:

- a. How much should be ordered?

- b. When should be ordered?

The first question how much to order, related to the problems of determining economic order quantity (EOQ) and is answered by analyzing inventories. The second question when to order arises because of uncertainty with replenishing time and is a problem of determining the order point.

Following are the inventory control techniques:

A. Economic Order Quantity

The problem of inventory arises by two questions, i.e. how much of it should be ordered? When it should be ordered? As far, the case of first question, the economical order quantity balances between the ordering costs and carrying costs. The most economic point as regards total inventory cost is the point where ordering costs is the same in amount as carrying costs.

This is because of the large volume of order and it reduces the ordering cost as well as per unit of cost due to volume discount, but it increase the optimal ordering quantity is calculated by following formula:

$$EOQ = \sqrt{\frac{2AO}{C}}$$

Where,

EOQ = Economic Order Quantity

A = Annual requirement or annual demand

O = Ordering cost per order.

C = carrying cost per unit for a given period

EOQ can determine by three methods:

- a. Formula method
- b. Trial and error method (Table method)
- c. Graphic method

Illustration of EOQ under various methods

Let, Annual requirement (A) = 100 units

Ordering cost (O) = Rs.25 per order

Carrying cost (C) = Rs. 20 per units

(a) For Using Formula Method

$$\text{EOQ} \times \sqrt{\frac{2AO}{C}} \times \sqrt{\frac{2 | 100 | 25}{20}} \times \sqrt{500}$$

= 50 units.

(b) Trial and Error Method

Under this method, the total cost is minimized when the ordering cost is equal to carrying cost.

Table 2.3
Economic Order Quantity

Order size	1000	500	250	100	50	25
Average inventory	500	250	125	50	25	12.5
No of order	1	2	4	10	20	40
Carrying cost	10000	5000	2500	1200	500	250
Ordering cost	25	50	100	250	500	100
Total cost.	10025	5050	2600	1450	1000	1250

On the table 50 units is the economic order quantity both ordering and carrying cost is Rs 500 and total cost is Rs. 1000. This is minimized than other level.

$$\text{Where, No. of Order} = \frac{A}{\text{EOQ}}$$

$$\text{Order Size} = \frac{A}{\text{No. of order}}$$

$$\text{Average Inventory} = \frac{\text{Order size}}{2} \times \frac{Q}{2}$$

Carrying Cost = CCPU × Average Inventory

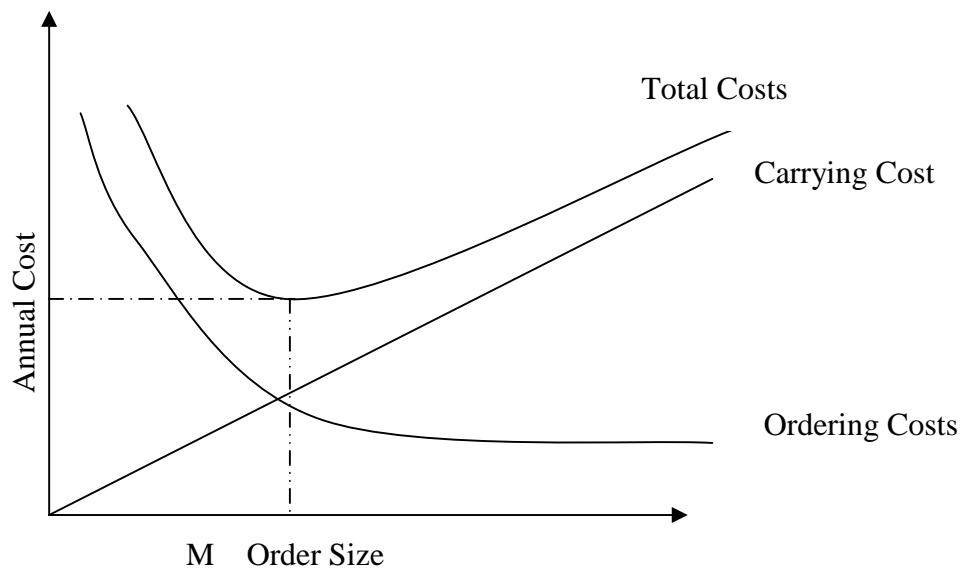
Ordering Cost = No. of Order × Ordering Cost Per Order

Total Cost = Ordering Cost + Carrying Cost

c. Graphic Method

Total ordering cost curve is increasing with the no of order but it reduces the carrying cost and vice versa .addition of ordering cost curve and carrying cost curve represent the total cost. The point, where the total cost curve is minimized represents EOQ.

Figure 2.1
Economic Order Quantity



On the above figure ordering cost is decrease with increasing carrying cost. Total cost is summation of carrying cost and ordering cost. Total cost is minimized at point (Khan & Jain; 1994: 273).

Limitation of Economic Order Quantity Model

There are some limitations of EOQ method, which are as follows:

1. Uniformity of demand or use rate:
EOQ method assumes that the demand or use rate is uniform over each period:
2. Instantaneous supply: it is assumed that the material is received immediately when it is ordered.
3. No consideration over discount factor: usually supplier provides certain discount on bulk purchasing, but EOQ model assumes that there is no existence of discount.
4. Suitable market: in reality, market i.e. price of material fluctuate time to time, however, the EOQ method assumes that price of materials is constant in each period.

B. Selective Inventory Control ABC Analysis

Manufacturing organization finds it useful to divided material into three categories for the purpose of exercising selective control on materials. An analysis of the materials costs will show that a smaller percentage of items of materials in the store may contribute to a large percentage of the value of consumption and the other hand a large percentage of items may represent a smaller percentage of value items consumed between these two extremes will fall those items the percentage number of which is more or less equal to their value of consumption items falling in the first category are treated as 'A' items of the second category as 'B' items and items of the third category are taken as 'C' items such as, analysis of material is as ABC analysis. This technique of stock control is also known as stock control according to the value method or always better control method or proportional parts value analysis method. Thus, under this technique of material controls, material are listed in 'A', 'B' and 'C' categories in descending order based on money value of consumption. ABC analysis measures the cost significant of each item of material. It concentrates on important items, so it also known as "control by importance and exception".

Classifying inventory according to some importance and allocating control efforts accordingly.

- A – Very important
- B- Mod important
- C- Least important

The report of Indian productivity term on report of "stores and inventory control in U.S.A. Japan and West Germany" gives the following examples of ABC analysis.

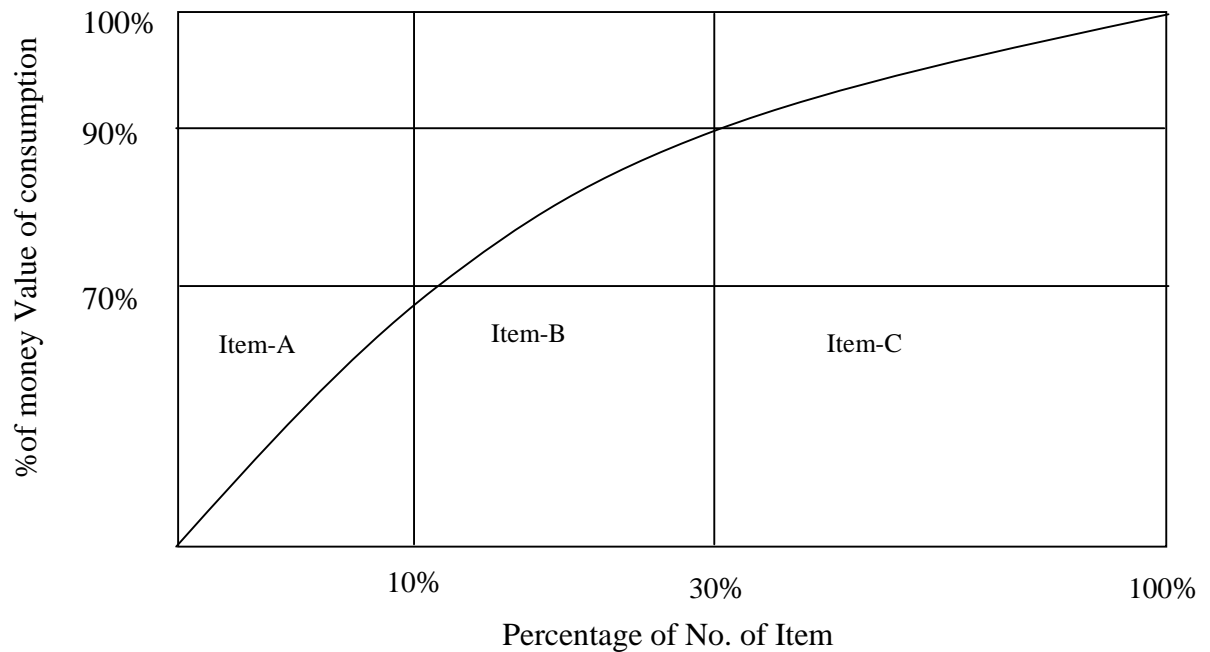
Group	percentage of items	percentage of costs
A	8%	75%
B	25%	20%
C	67%	5%

The significance of this analysis is that a very close control is exercised over the items of 'A' group which is account for a high percentage of costs while less stringent control is adequate for categories 'B' and very little control would sufficient for category 'C' item.

The graphical representation of ABC analysis may be as given below.

Figure 2.2

Graphical Presentation of ABC Analysis Procedure



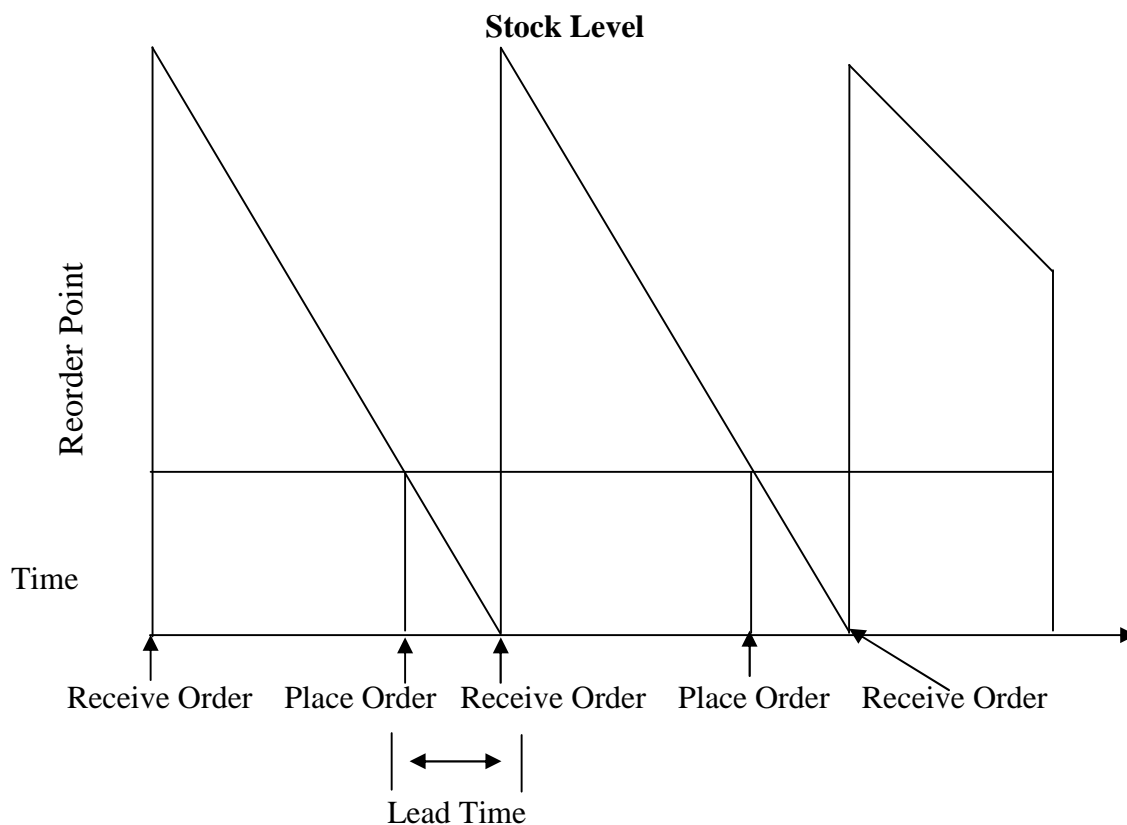
The steps computing analysis is:

- a. First we calculated annual usage, multiplying the quantity (number of the units) of the item consume in one year by its units price.
- b. Average all inventory items, first –items will show maximum annual usage in rupees, the second item the second maximum. The third items the third maximum and so on. After having done this, total of annual usage in rupees is put at the bottom of the last.
- c. Inventory items are categorized on the basis of annual usage and its price, which item has more annual usage and higher its price these item is categorized as “An “item, which contributed lesser than categories. This should be kept in categories ‘B’ and the rest contribution of the total percentage of annual usage is called ‘C’ categories. Placing of the orders on the basis the classification (*Khan & Jain; 1994: 257*).

C. Stock Level

The problem how much to be ordered is solved by determining the economic order quantity (EOQ). The second problem is when to be order. This question is when to be order. This question is related to known as order point or optimal reorder point. It is also known as order point or optimal reorder point or reordering level of ordering level. it is the point which if stock of material falls down then the store keeper initiates the purchase requisition up to time the fresh supply of the materials. This level is fixed somewhere between the maximum and minimum level in such a way that the difference recording level and maximum will sufficient to meet the requirement of production of to time the fresh supply of the material received.

Figure 2.3



Inventory Cycle

“The reorder point is the level of inventory at which the firm places an order in the amount of the economic order quantity. If the firm places the order when the inventory reaches the reorder point, the new goods will arise before the firm runs out of goods to sell. As long as delivery is not instantaneous an order must be placed so that inventory is not depleted till new shipment arrives. This required inventory level is termed transit stock and represents the amount of inventory that would be used

(unsold) between the times of an order is placed an order is placed and time delivered.

Transit stock is determined by using the following formula:

$$\text{Transit Stock} = \text{Stock Used Per Time Period} \times \text{Transit Time}$$

To confirm the validity of this formula, the following example has been requested.

Major motors used 400 tires per day (based on 250 working days in a year $100000/250$) and that five days, are required for delivery of new orders. The orders points vouched when inventory is reduced to the transit stock level of 2000 tires.

$$\begin{aligned}\text{Transit Stock} &= 400 \times 5 \text{ Days} \\ &= 2000 \text{ tires.}\end{aligned}$$

Uncertainty in demand can be accommodated by adding safety stock for the transit stock level refers to extra inventory held as a hedge or protection against the possibility of a stock-out. Safety stock reduces or eliminates the costs incurred by a stock out but it adds to carrying costs.

The reorder point then is determined by adding transit stock to the safety stock level that the company determines to be cost effective.

$$\text{Optimal Reorder Point} = \text{Transit Stock} + \text{Safety Stock}$$

If major motors decide that safety stock of 800 tires is optimal, it will place a new order for the EOQ of 6000 tires when inventory falls to 2800 units.

$$\text{Optimal Reorder Point} = 2000 + 800 = 2800 \text{ Units.}$$

Thus, basically these items of information are needed as inputs to design the reorder point.

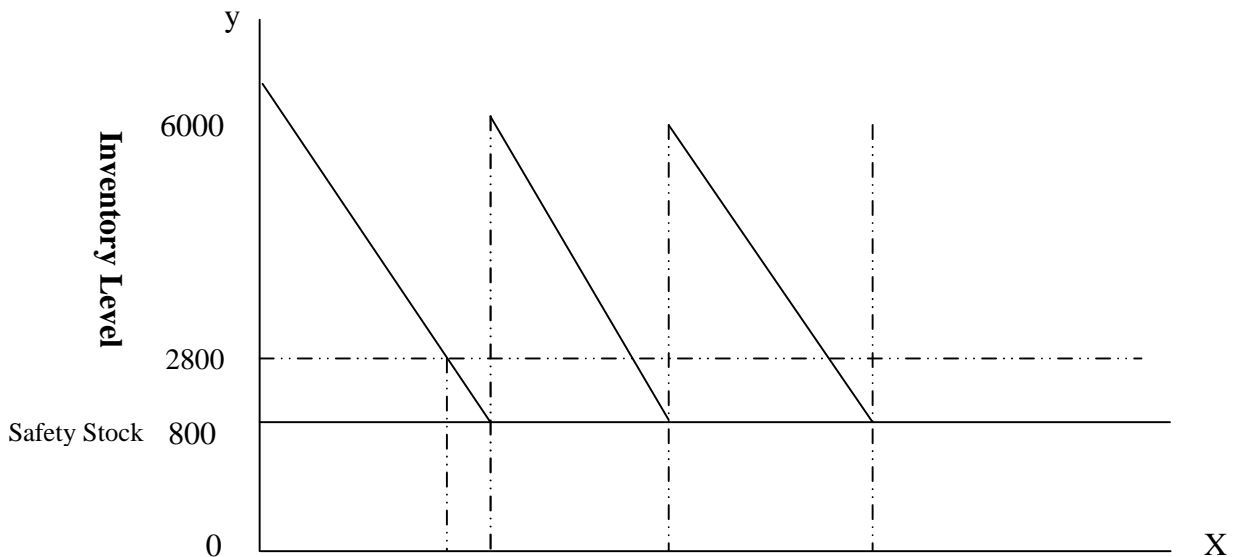
The safety stock involves two types of cost (i) stock out cost and (ii) carrying cost. Safety stock is necessary under the condition of uncertainty in such situation the demand and supply of goods may fluctuate day to day. If the actual usage or sales increases and delivery from the supplies are delayed the firm would face a stock-out problem. The firm would therefore be advised to keep a sufficient safety margin by having additional inventory to guard against stock out situation. Such stocks are called safety stock.

Following figure depicts the inventory levels overtime when transit and safety stock are taken into account (*Khan & Jain; 1994: 259*).

Time, Lead Time (5 days)

Figure 2.4

Inventory Level with Transit Stock & Safety Stock



D. Stock Level Subsystem

Carrying too much and too little of inventories is detrimental to the firms. If the inventory is too little, the firm will face frequent stock-outs involving high re-ordering costs and if the inventory level is too high, it will be unnecessary ties of capital. Therefore, an efficient inventory management requires that a firm should maintain the optimal level of inventory where inventory costs are the minimum and at the same time there is no stock out which may result in loss of sale or stoppage of production. Various stock levels are (*Nair, Banerjee and Agrawal; 1998*).

a. Minimum Stock Level

This represents the minimum quantity of the material, which must be maintained in hand at all times. The quantity is fixed so that production may not be held up due to shortage of the material. In fixing this level, the following factors are taken into consideration:

- J Lead-time i.e. time lag between indenting and receiving of the inventory. It is the time required to replenishing the supply.
- J Rate of consumption of the inventory during the lead-time.
- J Nature of inventory, minimum level is not required in case of a special inventory, which is required against customers' specific orders.
- J Formula for calculation of minimum stock level is given by.

$$\text{Minimum Stock Level} = \text{Reordering Level} - (\text{Normal Consumption} \times \text{Normal Reorder period})$$

b. Maximum Stock Level

Maximum stock level represents the maximum quantity of an item of material, which can be held in stock at any time. Stock should not exceed this quantity. The quantity is fixed so there may be no overstocking. The maximum stock level is fixed by taking into account the following factors:

- J Go down space available.
- J Maximum requirement of the stores for production purpose at any point of time.
- J Rate of consumption of the material during the lead-time.
- J The time lag between indenting and receiving of the inventory.
- J Possibility of loss in stores by deterioration evaporation etc.
- J Cost of maintaining stores.
- J Fluctuation in price.
- J The seasonal nature of supply of material.
- J Restrictions imposed by the government or local authority in regard to material in which there are inherent risks e.g. fire and explosion.
- J Possibility of change in fashion and habit.

The formula for the calculation of Maximum Stock Level

$$\text{Maximum Stock Level} = \text{Reordering Level} + \text{Reordering Quantity} - (\text{minimum consumption} \times \text{minimum reordering period}).$$

c. Re-order Level

It is the point at which if stock of material in store approaches the storekeeper should start the process of purchase for fresh supplies of materials. This level is fixed somewhere between the maximum and minimum level in such a way that the differences of quantity of the materials between reordering level and the maximum level will be sufficient to meet the requirement of production up to the time the fresh supply of the material is received.

Re-order point model answers the important questions in any organization about inventory management. The question is when an order should be placed so that the firm doesn't run out of stock.

Three items of information are needed input to design the re-order point subsystem. They are given below.

-) Usage rate – this is the rate per day at which the items are consumed, production or they are sold to customers.
-) Lead-time: this is length of time between placing an order and receiving the goods.
-) Safety stock level: this minimum level of inventory may be expressed in terms of several days' production and sales.

Safety stock is necessary for an uncertain demand of the customers. The demand for goods may fluctuate day by day or from week to week, if the actual usage or sales go up and delivery of goods is delayed. The provision of safety stock marks the organization able to face the problem of stock out.

E. Just in Time System (JIT)

Just in time inventory system is one of the recently developed inventory management concept, which assumes the purchase of inventory just in time of use. JIT refers to acquiring materials (inventory) as needed time only. JIT is maintaining inventory as low as possible. Sometimes it may also be zero level. Thus, JIT means that inventories are receipt in time or inventories are purchased in time of use. It is only possible when suppliers are reliable and there is confident for making delivery goods on time. Since in JIT goods just order when required, rather no time to check the

quality and others. So there should be guarantee for supplying quantity goods in 100%.

Generally develop country where communication and transportation system are developed used JIT.

It is manufacturing philosophy, which leads to producing the necessary units, in the necessary at the quintiles at the time with the required quantity. It is an approach to achieving excellence in the reduction or total elimination of waste according to JIT (*Hendrickson; 2000*).

Advantages of just-in-time management

- a. Just in time inventory system reduces the amount of money tied up in inventory of raw materials and finished goods.
- b. This is system creates saving of area (space)
- c. It does not required maintaining large inventory storage facilities.
- d. Just in time inventory system minimizes wastage.
- e. It helps to improve the labor efficiency (*Khan & Jain; 1994: 262*)

F. VED Analysis

Vital, essential and desirable analysis is used primary for control of spare parts can be divided into three categories- vital, essential or desirable. Keeping in view the critically to production. The spares, the stock out of which even for a short time will stop production for quite some time and where the cost of stock out is very high are known as vital spares. The spares, the absence of this cannot be tolerated for more than a few hours or a day and costs of lost production are high and which are essential for the production to continue are known as essential spares.

The desirable spares are those spares, which are needed, but their absence for even a week or so will not lead to stoppage of production to continue and require constant attention. Such spares may not receive the attention they deserve if they are maintained according to the ABC analysis because their value of consumption is small. So in their cases, VED analysis is made to get the effective results (*Khan and Jain; 1994: 262*).

2.10 Review of Previous Studies

Inventory management is wide subject but no one-pay attention in this field. Many modern techniques to control inventory management have been realized; still many problem/difficulties have faced by the manufacturing company. In Nepal there are many public enterprises and private Limited companies have been established. Any analysis has been made but only the aspect of financial performance. A few researchers made the research in inventory management of manufacturing company.

From the various studies of thesis, dissertations business reports and other sources, it is found that no public enterprises are apply modern methods or techniques to manage as per the requirement so for the related studies, some studies made on inventory management are considered relevant to their major findings.

2.10.1 Review Related to Books & Articles

Rao and Tagmohan (1981), entitled “*Need of staff skills in inventory management*” observed that for the efficient management of inventory. There are the needs of tackling the human element in the third world country like Nepal. They have suggested to ordering the attitude of the staffs towards material cost because lack of knowledge and carelessness which were the responsible of this management of the inventory.

Agrawal (1983), entitled “*Weakness in Inventory management*” expert’s climes the inventory management in Nepal is probably the weakest aspect of management the tools and techniques for controlling inventory has been applies in Nepalese enterprises for financial dimension.

Dongol (1984), entitled “*The Inventory System in Manufacturing Company in Nepal*” study suggested that if the top management should introduce the best policy regarding the inventory control which helps to reduce the lead time, regulate usage and maintain safety stock, ultimately investment and increases the firm’s future prospects by making more profit.

Shrestha observed that agricultural input corporation often finding difficult to supply fertilizer and seeds to farmers due to lack of inventory policy to be followed by it.

Bajrachrya (1983), entitled “*Management Problem in Public Sector Manufacture Enterprises in Nepal*”. One of the important findings was the inventory. there management suffer from lack of planning high carrying cost, poor recording and stores management and virtual absences of controlling system.

Pradhan, “*Impact of Inventory Management in public enterprises of Nepal*” explains in this article various controversies in the economics of scale in inventory holding, rates of inventory demand for utilization capacity and actual inventory adjusted in manufacturing public enterprises of Nepal.

Inventory management is to discover and maintain the optimal level of inventory investment and minimizing the cost of inventory. So, physical and financial dimension of inventory should be effectively managed. If the top management cannot be managed efficiently, these will be an adverse effect upon profits, which is main goal for maximizing the profit of a modern company.

Raw and N.V.S. Tagmohan Rao “*The efficient management of inventory*” these are the needs of tackling the human element the third world country like Nepal. They have suggestion to orienting the attitude of the staffs towards material cost because lack of knowledge and carelessness, which were the responsible of this management of inventory.

2.10.2 Review of Related Previous Thesis

Inventory management is a wide subject but no one pays attention in this field many modern techniques to control inventory management have been realized still many problems and difficulties have faced by the manufacturing company. In Nepal there are number of public enterprises have been established and analysis has been made but only the aspect of financial performance. A few researches made the research in inventory management of manufacturing company. Among them some selected are reviewed.

Pant (1999) entitled “*Impact of Inventory The Profit; A Case Study of Gorkhapatra Corporation*”. The researcher has reflected some problems as due to the application of unscientific planning and control techniques. Corporation is bound to bear

unnecessary inventory holding and procurement cost. The procurement procedure of required inputs looks not reliable because in casual circumstances the corporation has taken the bases of local purchase which is nearly double costly than the L/C purchase. Not any tools and techniques have been used to improve as well as prevent causes of wastage and leakage of cost. But these costs are the economic parameter for corporation's decision models. Moreover, lack of transit home facility dissatisfaction among employees, biasness in performance appraisal, lack of accountability, towards the work and the poor vision of top authority are also the major problems.

The objective his studies were to explore the underlying constraints in exiting management and control system of inventory and their impact towards the Gorkhapatra Corporation's profitability. To examine the existing inventory system applied by GPC.

To determine optimal inventory level of major raw material i.e. Newsprint, ink, film sheets and Aluminum sheets in GPC, assets the relevant financial ratios, analyze the relationship between inventory, material cost and profit and to provide appropriate suggestion based on the major findings.

The major findings of this study were that the corporation did not use any tools and techniques to manage inventory. Inventory turnover ratio is flexible, net profit margin is in constant, return on total assets is more flexible, return on net worth is also in constant. Regression and correlation analysis have shown the positive relationship between the inventory materials costs and profit and variance analysis is highly significant as indicated by F value 17.3 and 17.41 respectively.

Gaire (1999), entitled "*Inventory Management: A Case Study of Royal Drug Ltd.*" the main objective of the study is to identify the problem underlying in inventory management and control system of RDL. Other objective of the study is;

-) To assess of type of inventory maintained in RDL.
-) To examine the techniques being employed to manage the inventory in RDL.
-) To suggest proper inventory model to RDL based on analysis.
-) To find out inventory position of RDL.

- J On the basis of study conducted by Gaire the following suggestions have been recommended.
- J The company should define its objectives and goals clearly.
- J The company should follow all the quantitative technique and models such as EOQ model, ABC analysis model so that total inventory can be reduced.
- J Ledger cards can also be used to manage inventory in a simple way.
- J General Manager should be professional one due to political interference.

Pathak (2000), carried out a research study on “*Inventory Management of Hetuda Cement Industry Limited*” to examine the profitability and efficiency of HCIL regarding Inventory management. To find out the efficiency level, she has investigated various inventory related factor. Such as raw materials consumption and collection procedure, store and warehousing techniques, production and supply techniques and its schedules etc.

Researcher used both secondary and primary data for analysis of the inventory management system of HCIL. She has applied all accounting; financing and statistical tools to evaluate and analyze the gathered data, some of her remarkable findings were,

- J HCIL is not running even in its average capacity due to lack of raw materials.
- J The company could not keep by proper balance between yearly demanded and supply trend so the inventory stock is fluctuating every year.
- J The company could not apply even basic inventory management system, so it needs to apply the inventory control system to strengthen the organization.

Joshi (2001), research on the topic of “*inventory management of Herbs processing and production co.*” found the following problems in the area of inventory management in the HPPCI, like;

- J What types of inventory problems do they face?
- J Do they have any plan for inventory management?
- J What are the bases for such plan?

Are there any plans and policies to increase profit, reduce expenditures through improving size of inventory in future, if yes, what, if no, why?

Researcher sets some objectives, which are given below:

-) To identify present position of inventory in HPPCL
-) What types of problems faced by HPPCL in the management cost and profit that should be identifies.
-) Provide the appropriate recommendation and suggestion improvement of inventory management in HPPCL on the basis of above study and findings.

Researcher conducted after study, if the company want to be success, it was necessary to apply the theoretical and practical methods in collection, production, distribution management, marketing, proper remuneration and rewards and punishment etc. The company had given extra facilities and inspiration to the farmer to produce the raw materials to reduce the loss of inventory expenses. Transportation high charge and loss of company would reduce if the company were able to fulfill derived raw materials from private resources.

Dahal (2002), entitled “*A Comparative Study on Inventory Management of Daber Nepal Pvt. Ltd and Nepal Lever Ltd.*” the study was to examine and find out the present position of inventory management of both the companies.

The researcher has used both primary and secondary sources of data along with previous studies, articles and published, unpublished official records of both organization for the sake of examination and analysis. He used various accounting, financial and statistical tool to analyze the data. His findings were:

-) The organization use raw materials from local, India and third countries where they are unable to practice inventory management.
-) Purchasing of raw material in NLL is fluctuated whereas DNPL has increasing trend of raw materials procurements because of sound management of demand and supply.
-) They both have invested huge amount in inventories but do not apply dynamic inventory management system.
-) The researcher has suggested that the both companies should apply the control of stock level to get better performance.

Pokherel (2005), entitled “*A Study on Inventory Management in Janakpur Cigarette Factory*” was carried out by to examine the performance of Janakpur Cigarette factory, collection procedures of raw materials, materials consumption, comparison between profit and production and present inventory position of the factory.

The researcher has used both primary and secondary data for analysis of JCF. He applied accounting and financial records, published and unpublished information and direct contract with the concern officials for data collection. He concludes that Janakpur cigarette factory has no proper target for material purchase in the factory. For material purchase of JFC is highly dependent upon India, selling and cost prices of cigarette are increasing from year to year.

Dhungana (2006), entitled “*Inventory Management and Its Impact on Profitability, a Case Study of Udayapur Cement Industry Limited (UCIL)*” to identify the applied techniques used to acquire and to manage the inventories, to examine the profitability & efficiency of Udayapur Cement Industry Ltd. due to inventory management and to analyze the different aspects of inventory management in Udayapur cement Industry Ltd. with the help of statistical & financial tools to provide logical suggestion for improvement on the basis of the study diagnosis. The study has been carried out with in a range of latest fiscal year data starting from 2053/054to 2062/063.

Major findings of the study were as follows:

1. The company has not been adopting appropriate inventory policy.
2. The inventory turnover ratio of UCIL is a satisfactory level.
3. Net profit margin of UCIL is also in satisfactory level.
4. The average inventory fluctuation rate is high in UCIL.

Baral (2007), entitled “*Inventory Management, A Case Study of Gandaki Noodles Pvt Ltd*”, was introduced by to highlight the inventory management and their consequences on the cost and profit, inventory management system.

In this study researcher has used primary and secondary data and nature of data used are descriptive and analytical. To collect data and related information, he uses personal observation, interview, reports, published and unpublished data and financial statement i.e. balance sheet P/L account.

The major findings of this research are follows:

-) The highest degree of correlation between selling and cost price.
-) The inventory management was not sound.
-) Weak inventory control in the production department. Factory does not follow economic order quantity and ABC analysis.

Gyanwali (2009), on the topic of “*Impact of profitability Nepal Balaju Limited*” found the following finding;

-) BNL has not followed proper method of inventory management technique like porches order, EOR, Re order part act.
-) Store control device practice; in BNL the store control device adopted No Bin Cord & store ledger. The company has not applied ABC analysis techniques to control various types of inventories in the store.
-) There is no any special department for inventory management and control. Management accounting and finance control department which carry out the process of inventory control.

But also holding minimum amount creates the problem of shortage. For this forecasting and proper planning is necessary. Again it suggests that the procurement department with the co-operation of production and marketing department should analyze and annual required materials following an appropriate purchasing polices. For this, if possible maximum stock level, minimum stock level and re-order level as well as economic lot size should be fixed. This helps the management to strike balance between liquidity and profitability in the company.

Thapa (2009), entitled “*Inventory Management, A Case Study of Nepal Oil Cooperation Limited*”, the main objectives of this study were to high light the NOC`s key elements, which reduce and control the cost and increase profitability of NOC. The trend of sales and distributions (demand & supply⁰ of NOC and finding the pricing mechanism of petroleum products in NOC.

On the basis of sets of objectives, the researcher recommended some suggestion. In the present situation, NOC is not properly managing its inventory analysis; time, trend

analysis, regression analysis, time series etc. should apply to forecast purchase and sales. Similarly to reduce the cost price petroleum products NOC should follow according to the agreement between IOC and NOC i.e. purchase of crude oil and IOC is cheaper than the existing practice on which NOC is purchasing refined oil.

The major findings are as follows:

1. NOC is not properly managing its inventory.
2. There is no scientific & systematic carrying and ordering cost policy.
3. Due to political instability and strikes, there are problems faced by NOC in its operations.

2.11 Research Gap

These days, the new inventory management tools and techniques have been increased dramatically. Progress in computer application and software development has made to the point that powerful and advanced computer software available in the market to control the inventories. Besides it, there are many inventory control tools and techniques that have been developed to optimize to reduce the inventory costs.

Research has reported that, implementation of scientific inventory management is essential in business organizations. However, there is not strong research on the topic of inventory management of Unilever Nepal Limited. Initiation of this researcher is to explore the effectiveness of scientific inventory management and its impact on profitability. The purpose of the present study is therefore to ascertain effective use of scientific inventory management tools to reduce costs and increase profitability of organization.

So, this study will be fruitful to those interested person, teacher, scholars, students, civil-society, stakeholders, businessman and government for academically as well as policy perspectives.

CHAPTER – III

RESEARCH METHODOLOGY

3.1 Introduction

Research methodology describes the method and process applied in the entire aspect of the study. Research methodology is a way to systematically solve the research problem. It refers to the various steps that are generally adopted by a researcher in studying his problem along with logic behind them. In other words research methodology describes the method and process to be followed during the research work aiming at the solution of problem through the planned and systematic dealing with collection, analysis and interpretation of fact and figures.

For this purpose of achieving the objectives, the following methodology has been adopted:

- i. Research design
- ii. Nature and sources of data
- iii. Data collection and analysis.
- iv. Period covered.
- v. population and sample
- vi. Period covered.
- vii. Method of analysis

3.2 Research Design

The research design refers to the entire process of planning and carrying out a research study. It describes the general frame work for collecting, analysis and evaluating data after identifying: (i) what the researcher want to know and (ii) what has to be dealt with in order to obtain required information for conducting this study, descriptive cum analytical research design have been adopted. Descriptive research design has been utilized mainly for conceptualization of the problem. Analytical research design has been followed mainly to analyze the inventory and its impact on profitability and other variables.

3.3 Natures and Source of Data

Secondary data have been used in this study. These data have been collected from the following sources.

-) Published unpublished documents related to UNL
-) Books, articles, magazine and official records of UNL
-) Studying and analyzing the annual reports of UNL.
-) Financial statements (i.e. accounting & financial reports) of UNL.
-) Annual report published in the website of the respective Industry.

3.4 Data collections Procedure

Data collection and analysis is important function of research work.

Collecting data is the connecting link to the word of reality for the researcher (*Wolff and Pant; 2005*). Financial data required to achieve the set objective of the study have been directly extracted from the balance sheet and income statement of the company. The collected financial statements and necessary data have been tabulated as per the need of this study. In order to process the data financial statement and other available information were reviewed. Those data have been grouped in different tables and chart according to their nature. The main purpose of analyzing the data is the change it from an unprocessed from to an understandable presentation.

The analysis of data consists of organizing, tabulating and performing statistical analysis.

3.5 Period Covered

The present study covers eight years time period from FY 2058/059 to 2065/066. Data are taken from secondary sources and analysis is based upon eight years data.

3.6 Populations and Sample

There are 40 Nepalese manufacturing and processing enterprises listed in the NEPSE Ltd, by the end of year 2058/59-2065/66. Which regarded as size of population for the study? This study doesn't cover all the Nepalese manufacturing enterprises. The study period begins from 2058/59 only. The earlier years are not considered, as these makes the study tedious. Due to various limitations, the company selected for the study does

not provide the homogenous of observation. The data among the manufacturing enterprise, the study has been confined to only one enterprise.

3.7 Methods of Analysis

Secondary data collected in raw form are classified and tabulated in the required form. The following accounting/ financing tools and statistical tools have been used for analysis and interpolation data.

A. Accounting/ Financing Tools

Analysis is the careful study of variables facts, so that one can understand and draw conclusion from them on the basis of established principles and sound logic. The analysis of data consists of organizing, tabulating and performing statistical analysis Ratio analysis has been used as a financial tool.

B. Statistical Tools

Many kinds of statistical tool can be applied to examine the relationship between financial data of a company. Statistical tools have been considered as statistical tools i.e. percentage, index, standard deviation, correlation, regression analysis and test of hypothesis etc.

3.7.1 Ratio Analysis

Ratio analysis is a technique of analyzing and interpreting financial statement through mathematical expression. In order words, ratio analysis is one of the important techniques of financial analysis, which analyze the financial statement with the help of ratios. It is powerful tool to identify the financial strength and weakness of the company. The relevant ratios used in this study are as follows.

i. Inventory Turnover Ratio

The inventory turnover ratio indicates the efficiency of the firm's inventory management. This ratio explains the relationship between sales and inventory. It shows the number of items inventory replaced during the year. Higher inventory turnover indicates the good inventory level has not been used efficiently. The inventory turnover ratio indicates whether the inventory has been properly managed of not an organization.

Mathematically,

$$\text{Inventory Turnover} = \frac{\text{Cost of Goods Sold or Sales}}{\text{Average Inventory}} \text{ or } \frac{\text{Sales}}{\text{Inventory}} \times (\text{Times})$$

ii. Inventory to Current Assets Ratio

This ratio explains the relationship between the current assets and the inventory. It shows the actual percentage of current in the form of inventory. The increase in the ratio is an indication of liberal investment policy followed by company. If the percentage of ratio increases, it means greater parts is occupied by inventory. The ratio of inventory to current assets of manufacturing company should be 45-50%.

Mathematically,

$$\text{Inventory to Current Assets Ratio} = \frac{\text{Inventory}}{\text{Current Assets}} \times (\%)$$

iii. Inventory to Total Assets Ratio

This ratio explains the relationship between the total assets and the inventory. It shows the actual percentage of total assets in the form of the inventories. The increase in the ratio is an indication liberal policy and demonstrates that the firm is willing to increase its working capital in order to have sufficient material in stock. According to Weston and Bringham, a company should hold 15-30% inventory to total assets.

Mathematically,

$$\text{Inventory to Total Assets Ratio} = \frac{\text{Inventory}}{\text{Total Assets}} \times (\%)$$

iv. Return on Net Worth

Return on Net Worth or shareholders equity is calculated by dividing the net profit after tax by the net worth. This ratio indicates how the firm has used the resources of the owners.

Mathematically,

$$\text{Return on Net Worth} = \frac{\text{Net Profit After Tax}}{\text{Net Worth}} = (\%)$$

v. Return on Total Assets

The return on total assets ratio is a useful measure of the profitability of all financial resources invested in the firm's assets. It evaluates the use of total funds without any regard to the sources of funds. It is obtained dividing the net income by total assets,

Mathematically,

$$\text{Return on Total Assets} = \frac{\text{Net Profit After Tax}}{\text{Total Assets}} \times 100\%$$

vi. Net Profit Margin

This ratio establishes relationship between net profit and sales and indicates management's efficiency in manufacturing administering and selling and products. This ratio is the overall measure of the firm's ability to turn each rupee of sales into net profit. If the net profit margin is inadequate, the firm will fail to achieve satisfactory return on owner's equity.

Mathematically,

$$\text{Net Profit Margin} = \frac{\text{Net Profit After Tax}}{\text{Sales}} \times 100\%$$

3.7.2 Percentage and Indies

Those statistical tools are used to indicate the variations in the variables in different variables during the analysis process. The analysis on the following topics was made:

-) Trend of inventory stock position.
-) Trend of sales and total manufacturing cost.
-) Trend of sales and profit.

3.7.3 Mean

An average is the statistical measure of central tendency; it represent the entire series by a single values, which can be substituted for each and every values in the series without causing any change in the total magnitude of the series. So mean in a given set of observation is the sum of all the observation divided by the total number of observations.

$$\text{Mean } (\bar{X}) = \frac{\text{Sum of Observation } (\sum X)}{\text{No. of Observation } (n)}$$

3.7.4 Standard Deviation

The standard deviation is defined as the positive square root of the arithmetic mean of the squares of the deviations of the given observations from their arithmetic mean. The greater the amount of dispersion, greater the standard deviation. A small standard deviation means high degree of uniformity of the observation as well as homogeneity of a series and vice versa. It is calculated as;

$$\text{S.D} = \sqrt{\frac{\sum f_x (x - \bar{x})^2}{n}}$$

3.7.5 Coefficient of Variation

Another useful measure of risk is the coefficient of variation (CV), which is the standard deviation divided by the expected return (mean). It shows the risk per unit and provided a more meaningful basis for comparison when the given phenomenon is not same. It is calculated as,

$$\text{C.V} = \frac{\text{S.D}}{\bar{x}} \times 100\%$$

A company with low CV has less risk per rupee than a company with high C.V.

3.7.6 Coefficient of Determination (r^2)

Coefficient of determination is a very useful and better measure for interpreting the value of correlation coefficient. It measures the percentage variation in the dependent variables. Its value can have ranging from 0 to 1. Coefficient of determination is the square of the correlation coefficient.

Coefficient of Determination $r^2 = (\text{Correlation Coefficient } r)^2$

3.7.7 Coefficient of Correlation

Correlation may be defined as the degree of linear relationship existing between two or more variables. Correlation analysis involves various methods and techniques used for studying and measuring the extent of the relationship between the two variables. Two variables are said to be correlated when the change in the value of one variable is accompanied by the change of another variables. The correlation coefficient can either be in positive or negative and can have the value between -1 to +1. If both variables

are changing in the same direction, then positive correlation exists. Whereas, then both variables are changing in the opposite direction, the correlation between them is said to be negative.

The numerical measurement of relationship between the variables is denoted by the symbol 'r' whose value ranges from -1 to +1 i.e. $-1 < r < +1$.

If $r = 0$, there is no relationship between the variables.

If $r < 0$, then there is negative relationship between the variables.

If $r > 0$, there is positive relationship.

If $r = +1$, then the relationship is perfectly positive.

If $r = -1$, then the relationship is perfectly negative.

Mathematically,

$$r_{xy} = \frac{\sum XY}{\sqrt{\sum X^2} \sqrt{\sum Y^2}}$$

3.7.8 Probable Error

Probable error is an old measure of ascertaining the reliability of the values of Pearson's coefficient of correlation. If r is the calculated correlation coefficient in a sample of n pairs of observation then its standard error usually denoted by P.E (r) is given by,

$$P.E. (r) = \frac{1.28 Z r^2}{\sqrt{n}}$$

Probable error of the coefficient of correlation can also be calculated from P.E of the coefficient of correlation by the following formula.

$$P.E. (r) = 0.6745 \times S.E. (r) \\ = 0.6745 \times \frac{1.28 Z r^2}{\sqrt{n}}$$

Significance of r is measured by the value obtained from $6 \times P.E. (r)$. When the value of Karl Pearson's correlation coefficient (r) is much greater than the value of obtained from $6 \times P.E (r)$ values of 'r' is highly significant.

3.7.9 Regression Analysis

Regression analysis is a mathematical measure of the average relationship between two or more variables in terms of the original units of the data. The regression analysis studying the relationship between one dependent and one independent variables is known as simple regression analysis and relationship between one dependent and set of two or more independent variables is known as multiple regressions. The models of simple regression as well as multiple regressions used in this study are described as follows:-

i. Simple Regression Analysis

The regression equation of Y on X, which is used to describe the variation in the valuation in the values of Y for given change in the values of X.

$$Y = a + b_1 X \dots\dots\dots(\text{Regression equation of Y on X})$$

In this model the inventory is regressed against sales and profit separately. Similarly net worth regressed against profit and profit is regressed against sales. The equations are:

$$I = a + b_1 s \dots\dots(i)$$

$$I = a + b_1 p \dots\dots(ii)$$

$$NW = a + b_1 p \dots\dots(iii)$$

$$P = a + b_1 s \dots\dots(iv)$$

Where

Y = Dependent Variable

a = Regression Constant

x = Independent Variable

b = Slope of Regression Line or Regression Coefficient of y on x and measures the change in y per unit change in x.

I = Inventory, s = Sales, p = Net Profit, NW = Net Worth.

ii. Multiple Regressions Analysis

The multiple regression equation of the dependent variables y on independent variable x1 and x2 is given by.

$$Y = a + b_1 x_1 + b_2 x_2 \text{ (multiple regression equation of y on } x_1 \text{ and } x_2)$$

In this model inventory is regressed against sales together with profit. Inventory is taken as the function of sale and profit may start as follow.

$$I = F(s, p)$$

The multiple regression equation of the model is,

$$I = a + b_1 s + b_2 p \dots \dots (v)$$

3.7.10 Hypothesis Testing

The theory of testing of hypothesis was initiated by J. Neyman and E.S Pearson. The hypothesis is one of the important and useful statistical tools, which is used to test the relationship between/among variables. In other word, a hypothesis is a conjectural statement of the relationship between two or more variables. The test of hypothesis discloses the fact whether the difference between the computed statistics and hypothetical parameters significant or not. It also prefers clear implications for testing the stated relations.

The pioneering work in the development of the exact (small) sample theory was done by an Irish brewery employee sir William S. Gosset (1876-1937) who used to write under pseudonym (pen name) of student in the beginning of 20th century. He gave a test popularly known as ‘t-test’; the t-test is used when sample size is 30 or less. t-value is calculated first compare with tabulated value of t at certain level of significance for given degree of freedom ($\hat{\uparrow}$) starting in other words, if we are to test the hypothesis that the correlation coefficient of the population is zero i.e., the variables in the population are uncorrelated: we have to apply the following test:

$$t = \frac{r}{\sqrt{1 - r^2}} \times \sqrt{n - 2}$$

Where,

r = correlation coefficient

n = no of observation.

Test of Significance

A procedure to assess the significance a statistic or difference between two independent statistics is known as test of significance.

Null Hypothesis

A statistical hypothesis, which is under test, is usually a hypothesis of no difference and hence is called null hypothesis. It is usually denoted by H_0 .

According to Prof. A.R. Fisher, "null hypothesis is the hypothesis which is tested for possible rejection under the assumption that it true."

Alternative Hypothesis

Any hypothesis which is complementary to the null hypothesis is called an alternative hypothesis. It is usually denoted by H_1 .

Level of Significance

The maximum size of the type I error (i.e. rejecting a true null hypothesis), which we are prepared to risk is known as the level of significance. It is usually denoted by α and is given by

$$P(\text{Rejecting } H_0 \text{ when } H_0 \text{ is true}) = \alpha$$

Level of significance is always fixed in advance before collecting the sample information.

On the testing, the null hypothesis will be rejected if the calculated t- value is greater than the tabulated value at 5% level of significance for then $n-2$ degree of freedom (\uparrow) and vice-versa.

CHAPTER - IV

PRESENTATION AND ANALYSIS OF DATA

Presentation and analysis of data is an important stage of the research study .the main process of analysis of data is to change it from an unprocessed form in an understandable presentation. Thus in this context, this section analyze the relevant secondary data and information regarding relationship between inventory and profitability of Unilever Ltd; which are presented in suitable format and comparison is made. In this region mainly secondary data is taken through the financial report from 2058/59 to 2065/66.

4.1 Percentage and Index

4.1.1 Inventory Stock Position of Unilever Ltd.

The following table shows the inventory stock position of UNL.

Table 4.1
Inventory Stock Position of UNL

(Rs. In million)

FY	Inventory	Actual Increment %	Index
2058/59	144.45	-	100.00
2059/60	126.11	(12.70)	83.3
2060/61	184.82	46.55	129.85
2061/62	227.92	23.32	153.17
2062/63	256.17	12.39	165.56
2063/64	321.62	25.55	191.11
2064/65	410.12	27.52	218.63
2065/66	247.32	(39.70)	178.93
Mean	239.82	-	-
Std Dev.	93.49	-	-

Source: Different annual reports of UNL (From year 2058/59 to 2065/66)

Table 4.1 shows the position of inventory of UNL for different fiscal year, their mean standard deviation and percent increase or decrease in inventory is calculated in above table.

According to the table 4.1, for Unilever Ltd, the highest percentage increase in inventory stock is in fiscal year 2064/65 with 218.63 % and inventory maintain rate is reduced by 39.7% in the fiscal year 2065/66. The mean average inventory is 239.82 million and deviation is calculated 93.49% for Unilever Ltd.

4.1.2 Trend of Profit and Sales in UNL

The following table shows the trend of profit and sales in UNL.

Table 4.2(a)
Trend of Profit and Sales in UNL

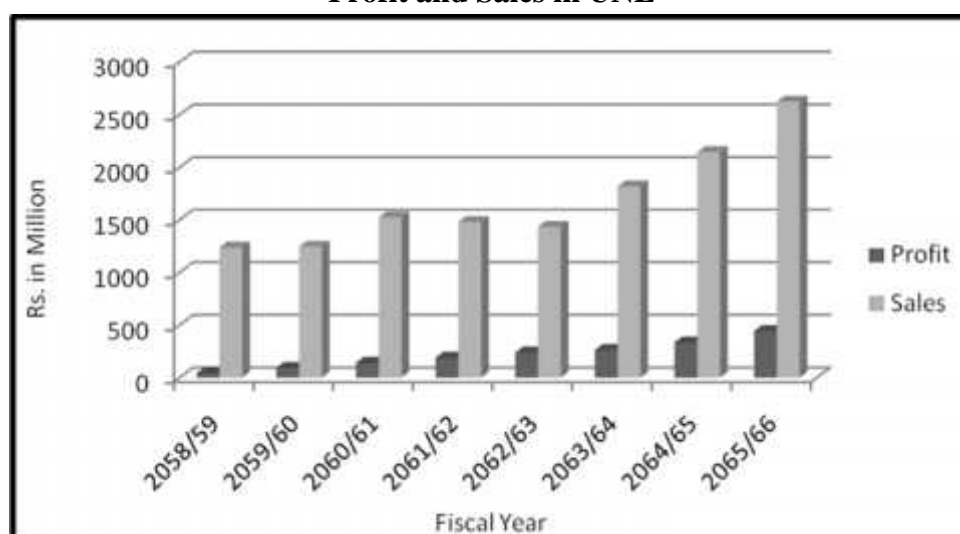
(Rs. In Million)

FY	Profit	Changes (%)	FY	Sales	Changes (%)
2058/59	42.61	–	2058/59	1236.61	–
2059/60	93.17	118.66	2059/60	1244.73	6.57
2060/61	140.78	51.10	2060/61	1524.90	22.51
2061/62	189.20	34.39	2061/62	1481.56	(2.84)
2062/63	238.16	25.88	2062/63	1434.94	(3.15)
2063/64	263.06	10.46	2063/64	1818.53	26.73
2064/65	335.12	27.39	2064/65	2144.59	17.93
2065/66	444.04	32.50	2065/66	2625.83	22.44
Mean	218.27	–	Mean	1688.96	–
Std Dev.	49.57	–	Std Dev.	124.64	–

Sources: Different Annual Reports of UNL (from year 2058/59 to 2065/66)

Above, table shows the trend of profit and sales in Unilever Ltd., which is presented in the following graph.

Figure 4.1(a)
Profit and Sales in UNL



Source: Table 4.1

Table 4.2(b)

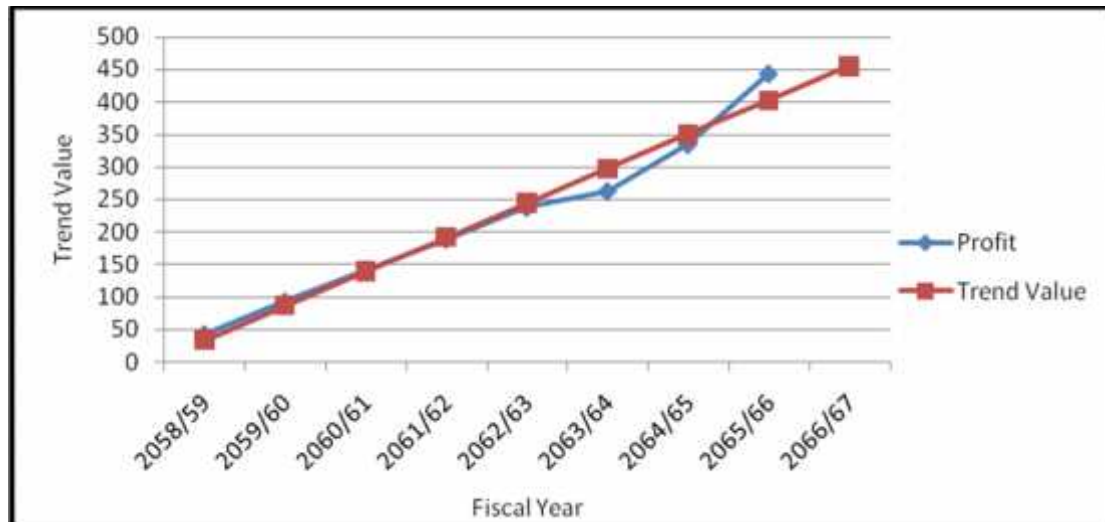
The Trend Value of Profit

Year	2058/59	2059/60	2060/61	2061/62	2062/63	2063/64	2064/65	2065/66	2066/67
Profit	42.61	93.17	140.78	189.20	238.16	263.06	335.12	444.04	-
Trend Value	33.46	86.26	139.06	191.86	244.66	297.46	350.26	403.06	455.86

(Source: Appendix-I)

Figure 4.1(b)

The Trend Line of Profit



Above the graph explain the trend of profit and sales in Unilever Nepal Limited. According to table 4.2, the mean average of profit during the study period is 218.27 million and the standard deviation between profits is 49.57%. The profit is increase in increasing trend from 2063/64 to 2065/66 i.e. 10.46%, 27.39%, 32.50% respectively. It is good sign for the company. The highest percentage increase in profit is in fiscal year 2058/59 is 118.66%.

Similarly, the mean average of sales in Unilever is 1688.96 million during the study period, but the deviation is very high between sales trends. It is 124.64%. Trends of sales increase by 6.57%, 22.51% in year 2059/60 and 2060/61 respectively. After then the trend of sales is decrease by 2.84%, 3.15% in year 2061/62 and 2062/63. After the trend of sales increase up to 2065/66.the highest percentage increased in sales is in 2063/64 by 26.73%.

4.1.3 Trend of Sales and Total Cost in UNL

Following table shows the trend of sales and total cost of Unilever Nepal Ltd. for the period of 2058/59- 2065/66.

Table 4.3(a)
Trend of Sales and Total Cost in UNL

(Rs in Million)

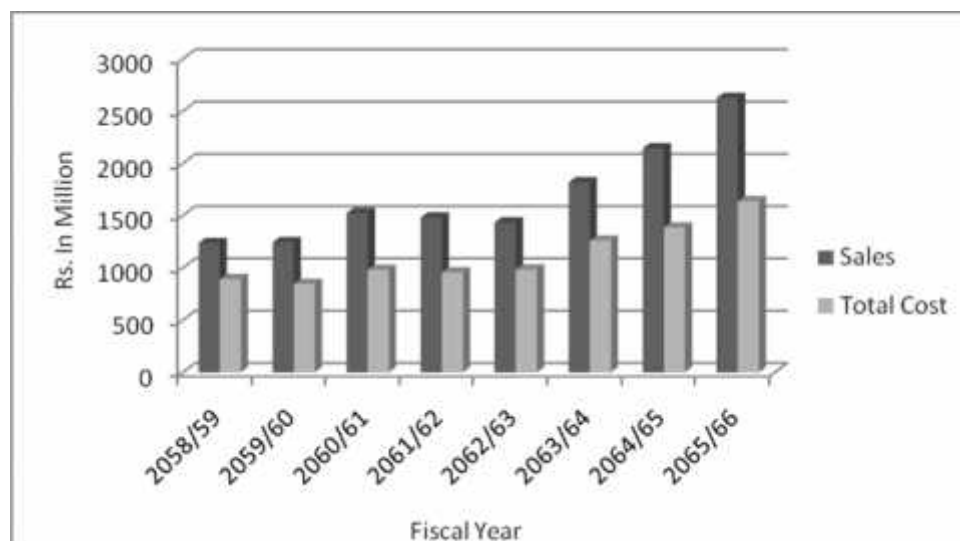
FY	Sales	Changes (%)	FY	Total Cost	Changes (%)
2058/59	1236.61	–	2058/59	891.44	–
2059/60	1244.73	6.57	2059/60	846.30	(5.06)
2060/61	1524.90	22.51	2060/61	980.16	15.82
2061/62	1481.56	(2.84)	2061/62	956.15	(2.44)
2062/63	1434.94	(3.15)	2062/63	982.76	2.78
2063/64	1818.53	26.73	2063/64	1259.50	28.16
2064/65	2144.59	17.93	2064/65	1387.38	10.15
2065/66	2625.83	22.44	2065/66	1636.53	17.96
Mean	1688.96	–	Mean	1106.28	–
Std Dev.	124.64	–	Std Dev.	280.59	–

Source: Different Annual Reports of UNL (From Year 2058/59 to 2065/66)

Table 4.3 shows the trend of sales and total cost in Unilever Nepal Ltd. for the period of 2058/59 to 2065/66. Above table is presented on following graph.

Figure 4.2(a)

Sales and Total Cost in UNL



Source: Table 4.3

Table 4.3(b)

The Trend Value of Sales

Year	2058/59	2059/60	2060/61	2061/62	2062/63	2063/64	2064/65	2065/66	2066/67
Sales	1236.61	1244.73	1524.9	1481.56	1434.94	1818.53	2144.59	2625.83	
Trend Value	1561.525	1597.935	1634.34	1670.75	1707.17	1743.57	1779.98	1816.39	1852.80

(Source: Appendix-II)

Figure 4.2(b)
Trend Line of Sales

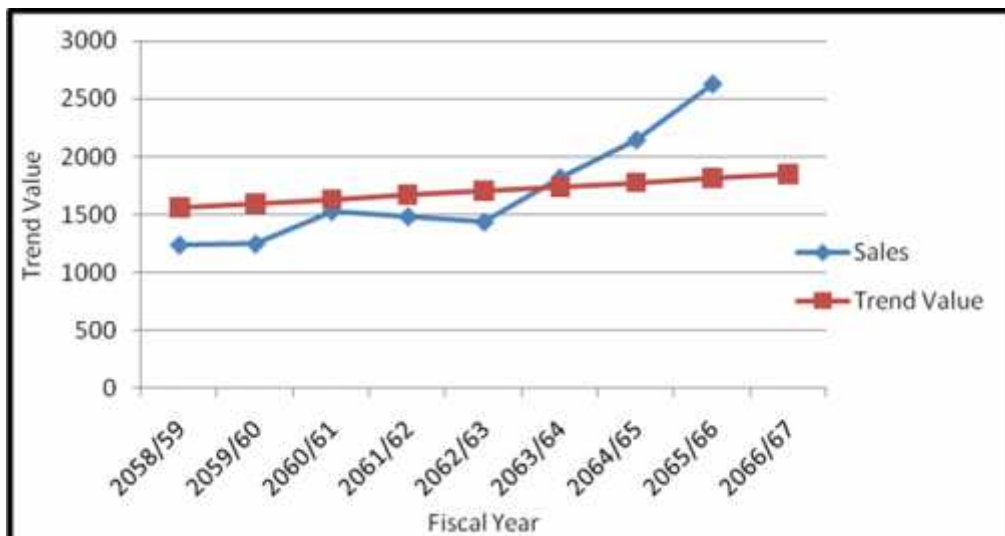


Table 4.3 and graph determined the trend of sales and total cost of Unilever Nepal Ltd. According to above table the mean average of sales during the study period is 1688.96 million and standard deviation between the sales is 124.64%. Trend of sales increase by 6.57%, 22.51% in year 2059/60 and 2060/61 respectively. After then the trend of sales is decrease by 2.84%, 3.15% in 2061/62 and 2062/63. After the trend of sales increase up to 2065/66. The highest percentage increased in sales is in 2063/64 by 26.73%.

Similarly, the mean average of total cost of Unilever Ltd. is 1106.28 million during the study period. The standard deviation between the total cost is 280.59%. Total cost decrease by 5.06% and 2.44% in 2059/60 and 2061/62. Otherwise the trend of cost is increased. It is increased by 15.82%, 2.78%, 28.16%, 10.15%, 17.96% in 2060/61, 2062/63, 2063/64, 2064/65, 2065/66 respectively. The highest percentage of cost increases is 28.16% in year 2063/64.

4.1.4 Ratio Analysis

a. Inventory Turnover Ratio

It shows the relationship between costs of goods sold and average inventory or net sales & closing inventory. It measures the efficiency on inventory management and how quickly inventory can be sold. It shows the speed with which stock is related to sales.

Investment in inventory represent ideal cash, the lesser the inventory, the greater the cash available for meeting operating expenses. A high inventory turnover indicated the efficient inventory management.

Therefore,

$$\text{Inventory turnover} = \frac{\text{Cost of Goods Sold}}{\text{Average Inventory}}$$

Cost of Goods Sold = Opening Stock + Purchase + Direct Expenditure – Closing Stock.

$$\text{Average Inventory} = \frac{\text{Opening} \Gamma \text{ Closing}}{2}$$

$$\text{Again, Inventory Turnover} = \frac{\text{Net Sales}}{\text{Closing Inventory}}$$

Table 4.4
Inventory Turnover Ratio

(Rs in Million)

Year	Net Sales	Closing Stock	Ratio (times)
2058/59	1236.05	144.45	8.56
2059/60	1244.73	126.11	9.87
2060/61	1524.90	184.22	8.28
2061/62	1481.56	229.72	6.45
2062/63	1434.94	256.17	5.60
2063/64	1818.53	321.62	5.65
2064/65	2144.59	410.12	5.23
2065/66	2625.83	247.32	10.62

Source: Different Annual Reports of UNL (From Year 2058/59 to 2065/66)

To measure the efficiency of inventory utilization the increasing ratio is favorable which shows that the firm is very efficient on inventory management. It is clearly shown that maximum inventory turnover ratio is 10.62 times in year 2065/66. And the lowest inventory turnover ratio is 5.23 times in year 2064/65. From fiscal year 2059/6 to 2064/65 it is a decreasing trend which is not positive sign of inventory management. But in the ITR is increase in year 2065/66 it is shows the positive sign of inventory management.

b. Inventory to Current Assets Ratio

Current assets mean those which are held for their conversion into cash within a year or immediately or already in cash. It refers the liquidity position of the organizations. Inventory is the main part of the current assets. Many manufacturing public enterprises in Nepal inventory to current asset ratio is exercising about 45% to 50%. However, this ratio constitutes the 60% of public limited companies in India.

$$\text{Inventory to Current Assets Ratio} = \frac{\text{Inventory}}{\text{Current Assets}}$$

Table 4.5
Inventory to Current Assets Ratio

(Rs in Million)

Year	Inventory	Current Assets	Ratio (%)
2058/59	144.45	399.14	36.18
2059/60	126.11	589.88	21.37
2060/61	184.22	724.44	25.43
2061/62	229.72	891.41	25.76
2062/63	256.17	741.61	34.54
2063/64	321.62	639.97	50.25
2064/65	410.12	761.39	53.86
2065/66	247.32	792.20	31.22
Average			34.83%

Source: Different Annual Reports of UNL (From Year 2058/59 to 2065/66)

The above table shows that the relation between inventory and current assets. During the study period, highest inventory to current Asset ratio recorded 53.86% in fiscal year 2064/65 and minimum 21.37% during 2059/60. Its average ratio comes 34.83%. In overall there is fluctuation of ratio in different year.

c. Inventory to Total Assets Ratio

This shows the relation between inventory and total assets of the company. Inventory to total assets ratio is concerned in the 16% to 30% are optimum Ratio, according to mention & Bring ham.

$$\text{Inventory to Total Assets Ratio} = \frac{\text{Inventory}}{\text{Total Assets}}$$

Table 4.6
Inventory to Total Assets Ratio

(Rs. in Million)

Year	Inventory	Total Assets	Ratio %
2058/59	144.45	571.34	25.28
2059/60	126.11	784.88	13.06
2060/61	184.22	939.72	19.60
2061/62	229.72	1098.96	20.91
2062/63	256.17	937.15	27.33
2063/64	321.62	810.27	39.69
2064/65	410.12	1085.25	37.78
2065/66	247.32	1125.50	21.97
Average			25.70%

Source: Different Annual Reports of UNL (From Year 2058/59 to 2065/66)

Form the above calculation, the maximum inventory to Total Asset Ratio 39.69% is recorded in year 2063/64 and minimum 13.06% in year 2059/60. There is fluctuation in this ratio but the average ratio lies 25.70%, Which lies in optimum Ratio.

d. Net Profit Margin

This ratio establishes the relationship between net profit and net sales to show the efficiency of management to earn net profit through sales. This ratio helps to determine the operation efficiency of the management. Higher Ratio shows the higher efficiency of the management and lower the ratio shows the lower efficiency of the management.

$$\text{Net Profit Margin} = \frac{\text{Net Profit After Tax}}{\text{Net Sales}}$$

Table 4.7
Net Profit Margin

(Rs in million)

Year	NPAT	Net Sales	Ratio %
2058/59	42.61	1236.05	3.44
2059/60	93.17	1244.73	7.48
2060/61	140.78	1524.90	9.23
2061/62	189.20	1481.56	12.77
2062/63	238.16	1434.94	16.59
2063/64	263.06	1818.53	14.46
2064/65	335.12	2144.59	15.62
2065/66	444.40	2625.83	16.92

Source: Different Annual Reports of UNL (From Year 2058/59 to 2065/66)

From the above analysis during the period of emergency in Nepal the performance of the company became poor. But establishment of democracy the performance of the company is rising upward.

e. Return on Assets

This Ratio shows the relationship of net profit and net sales. It is to determine how efficiently the total assets have been used by the management. This ratio indicates the ability of generating profit per rupee of total assets. It also evaluates the percent return on the total assets as a guide for expected on future purchase of assets. Higher the ratio shows the more efficient operating of management and lower the ratio shows the lower efficient operating of management.

This ratio is computed by

$$ROA = \frac{\text{Net Profit After Tax}}{\text{Total Assets}} = \%$$

Table 4.8
Return on Assets

(Rs in million)

Year	NPAT	Total Assets	Ratio (%)
2058/59	42.61	571.34	7.46
2059/60	93.17	784.88	11.87
2060/61	140.78	939.72	14.98
2061/62	189.20	1098.96	17.22
2062/63	238.16	937.15	25.41
2063/64	263.06	810.27	14.98
2064/65	335.12	1085.25	17.22
2065/66	444.40	1125.50	39.48

Source: Different Annual Reports of UNL (From Year 2058/59 to 2065/66)

The above table shows that the company has increasing upward from year 2059/60 to now. It seems that company maintains good position in relation to return assets which is good sign for company.

4.2 Correlation

Correlation is a statistical tool, finding out the degree of association between two or variables with the help of which we can determine whether or not two or more variables are correlated and if they are correlated the degree and direction of correlation is determined. Correlation is said to be positive or negative according to the movements are in the same of in the opposite directions.

a. Correlation between the Purchase and Inventory

The correlation co-efficient is used to analyses the relationship between purchase & inventory through the Karl Pearson's coefficient denoted by 'r'. For this purpose actual purchase is denoted by 'X' and assumed to be independent variable and inventory is denoted by 'Y' and assumed to be dependent variables.

Here, the correlation coefficient is used to analyze the relationship between purchase and inventory through the Karl Pearson's coefficient denoted by 'r'. For this purpose actual purchase is denoted by 'K' and assumed to be independent variable & inventory is denoted by 'y' and assumed to be dependent variables. Calculation of correlations coefficient is shown in appendix II. The value of 'r' is 0.7841. The figure of the value of 'r' shows that there is very high positive correlation between purchase & inventory.

Similarly probable Error also calculated in the same appendix to text the significance of 'r'. The value of probable error is $r = 0.0919$. The significant of coefficient of correlations 'r' can be judged by $PE(r)$. If $r > 6 PE$ it is supposed significant and vice versa than insignificant. Here 'r' greater than 6 time of PE (i.e. $0.7841 > 6 | 0.0919$). This shows that calculated value of correlation coefficient is significant. It is shows that the positive relationship between purchase and inventory. Where purchase and inventory still verifying in same direction (*Appendix IV*).

b. Correlation between Sales and Inventory

Efficiency of any kinds of business organization can be measured in terms of its sales. Sales play the role for better standing of organization. On the other hand large proportion of sales may not always beneficial. So that there should be match with optimum level of stocking position of inventory. To find out the relationship between

sales and inventory we use Karl person's coefficient of correlation denoted by 'r'. For this purpose sales is denoted by x and assumed to be independent variable and inventory is denoted by y and assumed to be dependent variable.

From the appendix no III r is 0.9078 which shows that there is very high positive correlation between sales and inventory. Similarly, the probable error is also calculated in the same appendix to test the significance of 'r'. The value of probable error is $r = 0.0419$. The significance of coefficient of correlation 'r' can be judged by PE (r). If $r > 6$ PE, it is supposed significant and vice versa than insignificant. Here, r is more than six times of PE. This shows that calculated value of correlation of coefficient is significant (*Appendix V*).

c. Correlation Coefficient between Net Profit & Inventory

To find out the relationship between net profit and inventory we use Karl Person's coefficient of correlation denoted by 'r'. For this purpose we assumed that inventory as independent variable denoted by x and net profit is a dependent variable denoted by Y.

From the appendix IV the value of correlation coefficient 'r' is 0.7124 it means there is positive relationship between profit & inventory or high significant correlation. Inventory & profit varying in same direction. To test whether the coefficient of correlation is significant or not the relationship of $r > 6$ PE should be watched. The probable error calculated in appendix is 0.1174 which is lower than the correlation coefficient. So the relationship shows that 'r' is significant (*Appendix VI*).

d. Correlation between Purchase & Sales

Using Karl Person's coefficient of correlation denoted by 'r'. We have to find out the relationship between purchase and sales. For this purpose purchase is assumed as an independent variable denoted by 'x' and sales is assumed as a dependent variable denoted by 'Y'.

From appendix V, the value of coefficient of correlation 'r' is +1 which indicate that there is perfect positive relation between purchase & sales. Similarly probable error PE (r) is 0. To check the significant correlation of 'r' the value of correlation 'r' might be greater than six times the value of probable error. The result also comes out the

values of 'r' is greater than six times the probable error. i.e. ($r > 6 \times 0$). The conclusion is the value of 'r' is high significant that is purchase & sale are varying in same directions (*Appendix VII*).

e. Correlation between Profit and Sales

To find out the relationship between net profit and sales we use Karl Person's coefficient of correlation denoted by 'r'. For this purpose we assumed that a sale is as independent variable denoted by x and net profit is a dependent variable denoted by Y.

From the appendix VI the value of correlation coefficient 'r' is +1 it means there is perfect positive relationship between profit & sales. Sales & profit varying in same direction. To test whether the coefficient of correlation is significant or not the relationship of $r > 6 \text{ PE}$ should be watched. The probable error calculated in appendix is 0 which is lower than the correlation coefficient. So the relationship shows that 'r' is very significant (*Appendix VIII*).

4.3 Regression Analysis

Regression analysis is the average relationship between two variables and this relation is used to estimate or predict the most likely value of one variable for specific value of other variables. In other words regression is that statistical tools with the help of which the unknown value of the other variable.

According to M.M. Blair, "regression is the measure of the average relationship between two or more variables in terms of the original unit no of the data."

In regression analysis there are two types of variable one independent and another is dependent variables.

A. Simple Regression Analysis

The simple regression equation line of Y on X is

$$Y = a + bx$$

Where,

Y = dependent variable

X = independent variable

a = numerical constant measures which is intercept of the line y.

b = regression coefficient of Y on X. these measures the average changes in the value of Y compounding to a unit it change in the value of x.

a. Simple Regression Analysis Inventory on Sales

Regression equation, $Y = a + bx$

Table 4.9

Simple Regression of Inventory on Sales

Company	Constant Value (a)	Regression Coefficient (b)
UNL	-194.89	0.2575

Source: Appendix V

The table reveals that the regression coefficient (b) of UNL is 0.2575. It shows that there is positive relationship between sales & inventory of UNL. The result indicates that if the sales increases by one rupee then the inventory will increase by as 0.2575. On the other hand, the constant value 'a' is negative i.e. -194.89 which indicates that the average inventory will not fall below this amount even if sales are zero.

b. Simple Regression Analysis of Profit on Inventory

Regression equation, $Y = a + bx$

Table 4.10

Simple Regression Analysis of Profit on Inventory

Company	Constant Value (a)	Regression Coefficient (b)
UNL	-21.411	0.999

Source: Appendix VI

The table reveals that the regression coefficient (b) of UNL is 0.999. It shows that there is positive relationship between profit & inventory of UNL. The slope of coefficient 'b' of UNL is 0.999, means the marginal propensity of profit is Rs. 0.999. Meaning that, if inventory increased by a rupee on the average the net profit goes up by Rs. 0.999. The constant value 'a' is negative i.e. -21.411 which indicates that the average inventory will not fall below this amount even if profit is zero.

c. Simple Regression Analysis of Inventory on Purchase

Regression Equation: $Y = a + bx$

Table 4.11

Simple Regression Analysis of Inventory on Purchase

Company	Constant Value (a)	Regression Coefficient (b)
UNL	-2.059	0.2580

Source: Appendix IV

The above table shows the simple regression analysis of inventory on purchase. It is clear that regression coefficient (b) is positive i.e. 0.2580. It shows that positive relationship between purchase and inventory which implies that 1 rupee increase in purchase will increase in inventory by Rs.0.2580. The constant value 'a' is negative i.e. -2.059 which indicates that the average inventory will not fall below this amount even if purchase are zero.

B. Multiple Regression Analysis

Profit of the company depends upon various factors. Some of the factors of manufacturing companies are inventory, production, sales and manufacturing cost. Therefore, the multiple regression analysis is presented to explain the relationship between the variables.

Here, dependent variable inventory and independent variables profit and sales of manufacturing companies are taken for analysis, and after that dependent variable profit and independent variables inventory and sales are taken for analysis.

a. Multiple Regression Analysis of Inventory on Sales and Profit

Multiple regression analysis of inventory on sales and profit.

$$\text{Regression equation } y = b_1x_1 + b_2x_2 + \dots \dots \dots (I)$$

Where, y = dependent variable, inventory

X_1 = independent variable, sales

X_2 = independent variable, profit

b_1 = slope of y with sales holding profit is constant,

b_2 = slope of y with profit holding sales is constant,

Following table determine multiple regression analysis of inventory on sales and profit of Unilever Nepal Limited.

Table 4.12
Multiple Regression Analysis of Inventory on Sales and Profit

Company	(b1)	(b2)	Coefficient Multiple Determination R_1^2	Standard Error of Estimate
UNL	0.0244	0.423	0.50	78.20

Sources: Appendix VIII

The multiple regression line, $y = 107 + .0224x_1 + 0.423x_2$

The above table shows the multiple regression analysis of inventory on sales and profit. It is clear that regression coefficient (b1) is positive i.e. 0.0244. It shows that positive relationship between sales and inventory which implies that 1 rupee increase in sales will increase in inventory by Rs.0.0244.similarly, regression coefficient (b2) is also positive i.e. 0.423.it shows that positive relationship between profit and inventory which implies that 1 rupee increase in profit will increase in inventory by Rs. 0.423.

Since, the coefficient of multiple determinations is 50%, which means the 50% of total variation in inventory (y) is explained by the two independent variables sales (x1) & inventory (x2). In other words 50% of the variation in y is due to the variables sales_(x1) & profit (x2).

Standard Error of Estimate

The meaning of standard error estimate is same as the measuring of standard deviation. As the standard deviation measures the average variation of data from central value, the standard error of estimate also measures of the average variation of data from central value of the estimated values from multiple regression line. The smaller value of standard error implies that the actual data are more near or close to estimated data from regression line.

4.4 Descriptive Analysis

Purchase procedure, store, control device & issuing materials on UNL are descriptive analysis made in this study.

Purchasing Procedure in UNL

Purchasing is the first important function in inventory management. UNL is a manufacturing company. So it require different types of Raw material such as oils, Laurie Acid, caustic soda, orbital salt, palm, fatty acid, sulphuric acid, galaxy, chiury clay etc for the production of different types of products.

Unilever needs regular supply of different types of Raw materials for continues productions pernlion. Required raw materials for the factory are purchased by using the following purchasing procedures.

a. Collection or Requisition

Purchasing procedure starts immediately with the collection of purchase requisition from the respective department for the supply of essentials.

b. Decision for Purchase

When the purchase requisition is received by the purchasing department then purchasing manager decides what when and how much to buy.

c. Selection of Suppliers

Unilever is a subsidiary company of Hindustan Unilever Ltd. So, the requirements of all materials are purchased from HUL of India. Therefore UNL has adopted centralized purchasing procedure.

d. Purchase Order

In case of centralized purchasing, UNL purchasing department prepares orders and send to the UIL to supply a specific quality and quantity of materials at the stipulated terms at the time and place mentioned.

e. Receiving & Inspection of Materials

When materials are arrived then they are received and checked by clerk for each the order placed by the purchasing department. After proper checking materials are

delivered to the store department for checking, if any discrepancy is found regarding the quality and quantity, it is immediately sent to the purchasing department to adjust the discrepancy. Since the company is purchasing raw materials from HUL, there are no discrepancy regarding quality & quantity.

4.4.1 Store Central Device

The raw materials are received by the purchasing department then all items received by the purchasing department should be passed into store for protection against deterioration and pilferage. To minimize the cost of holding materials in store all companies generally, use different types of controlling devices like Bin cards & store ledger. But the UNL uses bin cards. A bin card is kept for each items store carries. These cards are maintained by the storekeeper and storekeeper is accountable for any difference between the physical stock & balance shown in bin card. These cards are used not only for recording receipts and issues of stores but also for assist the store keeper to control the stock.

For each items of store, minimum quantity, maximum quantity & ordering quantity are stated on the card. By seeing the bin card the storekeeper can send the material requisition for the purchase of materials in time.

4.4.2 Issuing & Pricing

The pricing of the issues can be determined by value as per weighted average method at the lower cost or market price.

4.5 Major Findings

Inventory of UNL and its relationship with profitability has been analyzed by using various financial and analytical tools. The various ratio and financial have noticed amicable performance of the factory. UNL follow the centralized purchasing procedures and required RM and finished products are purchased from Unilever India Limited. However, data analysis and interpretation of UNL reveals the major findings as follows:

-) Bin card and store ledger techniques have applied to control inventory.

- J Unilever follows the centralized purchasing procedures and required RM and finished products are purchased from Unilever India Limited.
- J There is no systematic and scientific to determine ordering and carrying cost.
- J Due to political, crisis and especially labor strike and Nepal band, uncertainty about the future supply of materials, operation of factory strikes, and fluctuation of material prices directly affect the company and its inventory management while geographical barriers and transportation problems are other problems faced by UNL.
- J The company has not been adopting appropriate inventory policy because inventory constitute and the higher proportion than that of other items of current assets. The company has not followed any type of inventory policies.
- J The valuation of inventory can be determined as per weighted average cost method at the lower of the cost or market price.
- J The co-relation between sales and inventory is 0.9078. Therefore, there is significant relationship between sales and inventory and it is concluded that change in sales results change of inventory.
- J The co-relation between inventory and net profit is 0.7124. So, it becomes clear that there is positive and high degree of co-relation between inventory and net profit.
- J Inventory turn over ratio of UNL is also in satisfactory level.
- J Net profit margin of UNL is in satisfactory level except during emergency period.
- J The average amount of inventory is Rs 239.82.the inventory fluctuation rate is high in UNL.
- J The mean amount of profit is RS.218.27 million and a sales is RS. 1688.89 million .And the deviation between sales is too high.
- J The mean average of inventory to current assets ratio is 34.83% of UNL, which is acceptable ratio.
- J UNL has closest inventory to total assets ratio. The mean average of ITA of UNL is 25.70%, which is also acceptable ratio.
- J Return on total assets, return on net worth and a net profit margin ratio are satisfactory result, for three ratios.

-) The coefficient of sales is positively correlated with sales. It determines that increase in inventory will cause increase in sales.
-) The correlation coefficient of net profit has positive correlation for UNL.
-) The correlation between sales and net profit has positive correlation for UNL.
-) Regression analysis between inventories on sales is positive; the regression coefficient is 0.2575, which implies positive impact of sales over inventory.
-) In regression analysis between profits on inventory the slope of coefficient (b) is positive i.e.0.999, which indicates positive relationship between profits and inventory it good sign for the company.

CHAPTER - V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

Unilever Nepal Limited is the leading multinational company among the manufacturing and processing companies. This was established in 1994 as a joint venture with an objective of establishing a factory to manufacture soaps, cosmetics etc. and other chemical products under the brand name of the product of Unilever India Limited with 80% ownership.

Inventories are stock of the product a company is manufacturing for sales and the components that make up the product. The various forms in which inventories exist in manufacturing companies are raw material, work in process (or semi finished goods) and finished goods.

The success or failure of business industries or manufacturing sectors mainly depends upon the effective overall management of the organization. Besides this, inventory plays a vital role in the success of any organization.

To earn profit it is necessary to run the company efficiently, economically as well as profitably. To ensure in this situation in UNL the efficient management of inventory takes a vital role. So, this study is concerned with what extent the company is applying the inventory management techniques to minimize the cost of inventory, which directly affects the price of the product. Most manufacturing and trading companies invest a huge amount of money in the form of inventory. UNL, also being a manufacturing company, invests a huge amount of capital in the form of inventory and the cost of carrying inventory is higher than that of total cost. The cost of inventory directly affects the cost of production and profitability of the company. It means a slight reduction in the cost of inventory, decreases the production cost and ultimately profitability at a remarkable rate. For this efficient management of inventory is desirable.

The main objective of this study is to examine the impact of inventory in UNL. To make this study the related literatures have been reviewed. Review of literature gives

the concepts of inventory management framework from various books, journal and articles.

To fulfill the objective as described, appropriate research methodology has developed. It consist the research design, population and sample, nature and sources of data, data gathering procedures, data covered and method of analysis. In order to carryout the study data have been basically collected from secondary sources such as annual report, official report and financial statement of UNL. The primary data is also collected from with direct interviews with concerned staffs of the company to find out the problem of company to carryout the fact and finding for tabulation and presentation of data and information. The study comes only 8 years of financial data i.e. from 2058/59 to 2065/66. Various inventory descriptive and statically tools have been used to analyze the available data.

5.2 Conclusion

The growing members of corporation in Nepal are facing the problem of inventory. Due to the lack of proper inventory polices, there are many corporation where large amount of capital has been blocked up and very little measures have been taken to manage the inventories on the basis of inventory decision models and techniques that have so far developed. The main objective of this study is to analyze the inventory management practices of UNL and problem faced by UNL in the management of inventory. For the propose of this study the data and the necessary information were collected from the records and annual reports provided by the company.

UNL has applied bin cards and store ledger as the inventory control techniques. The company does not properly classify the innovatory does carrying and ordering cost. The company does not follow the economic purchase order so the total cost of carrying and ordering the inventory in higher. However, the EOQ is fluctuation in study period. The ratio analysis shows the satisfactory level of the company but there is lots of work still to be done.

It is conclude that political disorder, economic condition of the company and foreign trade relation etc are found major threats of the company; it should maintain

economic order size which helps to minimize the inventory cost and to increase the profit of the company.

5.3 Recommendation

The management of inventory in manufacturing company is not only necessary but also compulsion for the better performance. If manufacturing companies initiates step to the appropriate management of inventory, certainly it will cope its set objectives successfully. Based on the major findings it may be appropriate to make some suggestions. Although these suggestions may not be adequate but it is hoped that these suggestion will help improving the management of the company.

-) Inventory management system is a part of management planning system. Management and financial forecasting system are essential to carryout the inventory management procedures in the organization.
-) There should be up to date record of inventory kept by factory and store department.
-) The selective model should be apply by the company for control the inventories.
-) Separate inventory management department should be opened so that the strategic plan and an effective decision can be taken to regulate purchase, production, sales and inventory management in the competitive market.
-) The management executives of the UNL should made aware of inventory management aspects on profitability by various case studies, researchers, market studies and so no.
-) To penetrate the market, market survey should be done as huge capacity of production is kept utilized.
-) Feasibility study, field study and survey, mobilization of available resource and historical analysis should be taken to standardize the procurement system and control the fluctuation of raw materials collection.
-) Purchase plan should be prepared for different types of raw materials with the proper co-operation and co-ordination on among the planning purchasing storing production, marketing and sales department to avoid the excessive investment on inventory.
-) The popular scientific inventory, management techniques should be applied by the company for purchasing different types of raw materials so as to maintain

optimum level of inventory and to minimize the total inventory cost i.e. carrying and holding cost.

- J The company uses various types of raw materials ABC inventory management system is useful to categorize these materials. It is an easy, fast and reliable method to overcome the inventory classification problems.
- J Lower investment crisis in the side of production total assets may create immediate crisis in the side of the production in short duration on favorable circumstances. Therefore it is necessary to maintain the adequate level of investment on inventories.
- J Research and development should be done to develop new methods and technologies that can produce better performances.
- J Proper co-ordination between management and labor should be maintained.

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APPENDICES

Appendix - I

Trend of Profit in UNL

FY(X)	Profit(y)	(x=X-2062.5)	xy	x ²
2059	42.61	-3.5	-149.135	12.25
2060	93.17	-2.5	-232.925	6.25
2061	140.78	-1.5	-211.17	2.25
2062	189.2	-0.5	-94.6	0.25
2063	238.16	0.5	119.08	0.25
2064	263.06	1.5	394.59	2.25
2065	335.12	2.5	837.8	6.25
2066	444.04	3.5	1554.14	12.25
Total	1746.14		2217.78	42

Let the trend line be $Y = a + bx$ 1

Where, $x = x - \text{middle Year}$

Since, $\sum x = 0$,

$$a = \frac{\sum y}{n} = 218.26$$

$$b = \frac{\sum xy}{\sum x^2} = 52.8$$

Now, substituting the values of a and b in equation 1

$$Y_c = 218.26 + 52.8 * x$$

Trend values substituting $x = -3.5, -2.5, -1.5, -0.5, 0.5, 1.5, 2.5, 3.5$

Where, $x = -3.5$

$$\begin{aligned} Y_c &= 218.26 + 52.8 * -3.5 \\ &= 33.46 \end{aligned}$$

Where, $x = -2.5$

$$\begin{aligned} Y_c &= 218.26 + 52.8 * -2.5 \\ &= 86.26 \end{aligned}$$

Where, $x = -1.5$

$$Y_c = 218.26 + 52.8 * -1.5$$
$$= 139.06$$

Where, $x = -0.5$

$$Y_c = 218.26 + 52.8 * -.5$$
$$= 191.86$$

Where, $x = 0.5$

$$Y_c = 218.26 + 52.8 * 0.5$$
$$= 244.66$$

Where $x = 1.5$

$$Y_c = 218.26 + 52.8 * 1.5$$
$$= 297.46$$

Where, $x = 2.5$

$$Y_c = 218.26 + 52.8 * 2.5$$
$$= 350.26$$

Where, $x = 3.5$

$$Y_c = 218.26 + 52.8 * 3.5$$
$$= 403.06$$

Where, $x = 4.5$

$$Y_c = 218.26 + 52.8 * 4.5$$
$$= 455.86$$

Where, $x = 5.5$

$$Y_c = 218.26 + 52.8 * 5.5$$
$$= 508.66$$

Year	2058/59	2059/60	2060/61	2061/62	2062/63	2063/64	2064/65	2065/66	2066/67
Profit	42.61	93.17	140.78	189.20	238.16	263.06	335.12	444.04	-
Trend Value	33.46	86.26	139.06	191.86	244.66	297.46	350.26	403.06	455.86

Appendix - II

Trend of Sales in UNL

FY(X)	Sales(Y)	x=X-2062.5	Xy	X ²
2058/59	1236.61	-3.5	-4328.1	12.25
2059/60	1244.73	-2.5	-3111.8	6.25
2060/61	1524.9	-1.5	-2287.4	2.25
2061/62	1481.56	-0.5	-740.78	0.25
2062/63	1434.94	0.5	717.47	0.25
2063/64	1818.53	1.5	2727.8	2.25
2064/65	2144.59	2.5	5361.48	6.25
2065/66	2625.83	3.5	9190.41	12.25
Total	13511.69	0	7529.06	42

Let the trend line be $Y = a + bx$ 1

Where, x = x- middle Year

Since, x = 0,

$$a = \frac{\sum Y}{n} = 1688.96$$

$$b = \frac{\sum xy}{\sum x^2} = 36.41$$

Now, substituting the values of a and b in equation 1

$$Y_c = 1688.96 + 36.41 * x$$

Trend values substituting x=-3.5,-2.5,-1.5,-0.5,0.5,1.5,2.5,3.5

Where, x=-3.5

$$\begin{aligned} Y_c &= 1688.96 + 36.41 * -3.5 \\ &= 1561.525 \end{aligned}$$

Where, x= -2.5

$$\begin{aligned} Y_c &= 1688.96 + 36.41 * -2.5 \\ &= 1597.935 \end{aligned}$$

Where, $x=-1.5$

$$\begin{aligned} Y_c &= 1688.96 + 36.41 * -1.5 \\ &= 1634.345 \end{aligned}$$

Where, $x= -0.5$

$$\begin{aligned} Y_c &= 1688.96 + 36.41 * -0.5 \\ &= 1670.75 \end{aligned}$$

Where, $x=0.5$

$$\begin{aligned} Y_c &= 1688.96 + 36.41 * 0.5 \\ &= 1707.16 \end{aligned}$$

Where $x=1.5$

$$\begin{aligned} Y_c &= 1688.96 + 36.41 * 1.5 \\ &= 1743.57 \end{aligned}$$

Where, $x= 2.5$

$$\begin{aligned} Y_c &= 1688.96 + 36.41 * 2.5 \\ &= 1779.98 \end{aligned}$$

Where, $x= 3.5$

$$\begin{aligned} Y_c &= 1688.96 + 36.41 * 3.5 \\ &= 1816.39 \end{aligned}$$

Where, $x = 4.5$

$$\begin{aligned} Y_c &= 1688.96 + 36.41 * 4.5 \\ &= 1852.80 \end{aligned}$$

Where, $x= 5.5$

$$\begin{aligned} Y_c &= 1688.96 + 36.41 * 5.5 \\ &= 1889.21 \end{aligned}$$

Appendix-III
Unilever Nepal Limited.(UNL)
Balance sheet and P/L a/c

(Rs in million)

Year	2058/59	2059/60	2060/61	2061/62	2062/63	2063/64	2064/65	2065/66
Fixed Assets	172.20	195.00	215.28	207.54	195.54	170.30	323.87	361.06
Current Assets	399.14	589.88	724.44	891.41	741.61	639.98	761.39	792.20
Inventory	144.45	126.11	184.22	229.72	256.17	321.62	410.12	247.32
Net Worth	348.13	358.43	396.01	216.93	1949.14	425.02	270.68	616.7
Current Liabilities	223.21	426.45	543.71	882.02	742.23	767.77	814.57	508.80
Total Assets	571.34	784.88	939.72	1098.96	937.15	810.27	1085.25	1125.50
Sales	1236.05	1244.73	1524.90	1481.56	1434.94	1818.53	2144.59	2625.83
Total Cost	891.44	846.30	980.16	956.15	982.76	1259.50	1387.38	1636.53
Net Profit	42.61	93.17	140.78	189.19	238.16	263.06	335.12	444.04

APPENDIX-IV

Calculation of coefficient of correlation between purchase & inventory of UNL

Year	Purchase (X)	Closing stock (Y)	$(X - \bar{X}) = x$	$(Y - \bar{Y}) = y$	x^2	y^2	xy
2058/59	610.33	144.45	-327.75	-95.52	107420.0625	9124.0704	31306.68
2059/60	651.70	126.11	-286.38	-113.86	82013.5044	12964.0996	32607.2268
2060/61	841.48	184.22	-96.69	-55.75	9331.56	3108.0625	5385.45
2061/62	792.14	229.72	-145.94	-10.25	21298.4836	105.0625	1495.885
2062/63	824.09	256.17	-113.99	16.2	12993.7201	262.44	-1846.638
2063/64	1163.71	321.62	225.63	81.65	50908.90	6666.7225	18422.6895
2064/65	1264.30	410.12	326.22	170.15	106419.9884	28951.0225	55506.333
2065/66	1356.92	247.32	418.84	7.35	175426.9456	54.0225	3078.474
	X = 7504.67	Y X 1919.73	$\sum (X - \bar{X}) = x = 0$	$\sum (Y - \bar{Y}) = y = 0$	$\sum x^2 =$ 565812.6615	$\sum y^2 =$ 61235.5025	$\sum xy =$ 145956.1003

Coefficient of correlation between purchase and inventory of UNL

$$r_{xy} = \frac{\sum xy}{\sqrt{\sum x^2} \sqrt{\sum y^2}} = \frac{145956.1003}{\sqrt{565812.6615} \sqrt{61235.5025}} = 0.7841$$

Probable Error of Coefficient of Correlation

$$\text{P.E. (r)} = 0.6745 \mid \text{S.E. (r)}$$

$$= 0.6745 \mid \frac{1 - r^2}{\sqrt{n}} \times 0.6745 \mid \frac{1 - 0.7841^2}{\sqrt{10}}$$

$$= 0.0919$$

$$\text{P.E. (r)} = 0.0919$$

Calculation of Regression Analysis

Simple Regression Analysis, $Y = a + bx$

$$b = \frac{\sum xy}{\sum x^2} = \frac{145956.1003}{565812.6615} = 0.2580$$

$$a = \frac{\sum y - b \sum x}{N} = \frac{1919.73 - 0.2580 \times 7504.67}{8} = -2.059$$

The Regression equation line is $Y = -2.059 + 0.2580X$

APPENDIX V

Correlation between Sales and Inventory

Year	Sales (X)	Inventory (Y)	$\sum X - Z\bar{X}$ = u	$\sum Y - Z\bar{Y}$ = v	u^2	v^2	uv
2058/59	1236.05	144.45	-452.84	-95.52	205064.0656	9124.0704	43255.2768
2059/60	1244.73	126.11	-444.16	-113.86	197278.1056	12964.0996	50572.0576
2060/61	1524.90	184.22	-163.99	-55.75	26892.7201	3108.0625	9142.4425
2061/62	1481.56	229.72	-207.33	-10.25	42985.7289	105.0625	2125.1325
2062/63	1434.94	256.17	-253.95	16.2	64490.6025	262.44	-4113.99
2063/64	1818.53	321.62	129.64	81.65	16806.5296	6666.7225	10585.106
2064/65	2144.59	410.12	455.7	170.15	207662.49	28951.0225	77537.355
2065/66	2625.83	247.32	936.94	7.35	877856.5636	54.0225	6886.509
	$\sum X$ =13511.13	$\sum Y$ 1919.73	0	0	$\sum u^2$ 761180.2425	$\sum v^2$ 61235.5025	$\sum uv$ 195989.8846

Coefficient correlation between sales & inventory

$$r_{uv} = \frac{\sum uv}{\sqrt{\sum u^2} \sqrt{\sum v^2}} = \frac{195989.8894}{\sqrt{761180.2423} \sqrt{61235.5025}} = 0.9078$$

Probable Error of coefficient of correlation

$$PE(r) = 0.6745 |SE(r)$$

$$= 0.6745 \left| \frac{1 - r^2}{\sqrt{n}} \right| = 0.6745 \left| \frac{1 - 0.908^2}{\sqrt{8}} \right| = 0.0419$$

Regression Analysis of profit on inventory

$$Y = a + bx$$

$$b = \frac{uv}{u^2} = \frac{195989.8894}{761180.2425} = 0.2575$$

$$a = \frac{\sum Y - b \sum X}{n} = \frac{1919.73 - 0.2575 \times 13511.13}{8}$$

$$= -194.89$$

The regression equation line,

$$Y = -194.89 + 0.2575X$$

APPENDIX - VI

Calculation of Correlation Coefficient between Inventory and Net Profit

Year	Inventory (X)	Net profit(Y)	$X - \bar{X}$ u	$Y - \bar{Y}$ v	u^2	v^2	uv
2058/59	144.45	42.61	-95.52	-175.66	9124.0704	30856.4356	16779.0432
2059/60	126.11	93.17	-113.86	-125.1	12964.0996	15650.01	14243.886
2060/61	184.22	140.78	-55.75	-77.49	3108.0625	6004.7001	4320.0675
2061/62	229.72	189.20	-10.25	-29.07	105.0625	845.0649	297.9675
2062/63	256.17	238.16	16.2	19.89	262.44	395.6121	322.218
2063/64	321.62	263.06	81.65	44.79	6666.7225	206.1447	3657.1035
2064/65	410.12	335.12	170.15	116.85	28951.0225	13653.9225	19882.0275
2065/66	247.32	444.04	7.35	225.77	54.0225	50972.0929	1659.4095
	$X =$ 1919.73	$Y =$ 1746.14	0	0	$u^2 \Sigma$ 61235.5025	$v^2 \Sigma$ 120383.9822	$uv \Sigma$ 61161.7227

Correlation Coefficient between Net Profit & Inventory

Coefficient of Correlation between Net Profit & Inventory =

$$r_{uv} = \frac{uv}{\sqrt{u^2} \sqrt{v^2}} = \frac{61161.7227}{\sqrt{61235.5029} \sqrt{120383.9822}}$$
$$= 0.7124$$

Probable Error (PE) = $0.6745 |SE(r)$

$$= 0.6745 \left| \frac{1 - r^2}{\sqrt{n}} \right|$$
$$= 0.1174$$

Calculation of Regression Analysis

Simple regression Equation $Y = a + bx$

$$b = \frac{uv}{u^2} = \frac{61161.7227}{61235.5029} = 0.9988$$

$$a = \frac{\sum Y - b \sum X}{n} = \frac{174614 - 0.988 \times 191973}{8}$$

$$= -21.411$$

The regression equation line,

$$Y = -21.411 + 0.9988x$$

APPENDIX - VII

Correlation between Purchase & Sales

Year	Purchase(X)	Sales(Y)	$X - \bar{X}$	$Y - \bar{Y}$	x^2	y^2	xy
2058/59	610.33	1236.05	-327.75	-452.84	107420.0625	205064.0656	148418.31
2059/60	651.70	1244.73	-286.38	-444.16	82013.5044	197278.1056	127198.5408
2060/61	841.48	1524.90	-96.69	-163.99	9331.56	26892.7201	15841.434
2061/62	792.14	1481.56	-145.94	207.33	21298.4836	42985.7289	30257.7402
2062/63	824.09	1434.94	-113.99	-253.95	12993.7201	64490.6025	28947.7605
2063/64	1163.71	1818.53	225.63	129.64	50908.90	16806.5296	29250.6732
2064/65	1264.30	2144.59	326.22	455.7	106419.9884	207662.49	148658.454
2065/66	1356.92	2625.83	418.84	936.94	175426.9456	877856.5636	392427.9496
	$\Sigma X =$ 7504.67	13511.13	0	0	$\Sigma x^2 =$ 565812.6615	$\Sigma y^2 =$ 761180.2423	$\Sigma xy =$ 921000.8623

Calculation of Coefficient of Correlation between Purchase and Sales

$$r_{xy} = \frac{\Sigma xy}{\sqrt{\Sigma x^2} \sqrt{\Sigma y^2}} = \frac{921000.8623}{\sqrt{565812.6615} \sqrt{761180.2423}} = 1$$

$$\text{Probable Error (PE)} = 0.6745 |SE (r)$$

$$= 0.6745 | \frac{1.2715}{\sqrt{8}}$$

$$= 0$$

Calculation of Regression Analysis

Simple regression Equation $Y = a+bx$

$$b = \frac{\sum xy}{\sum x^2} = \frac{921000.8623}{565813.1646} = 1.62774$$

$$a = \frac{\sum Y - b \sum X}{N} = \frac{13511.13 - 1.62774 \times 7504.67}{8}$$

$$= 161.927$$

The regressions equation line,

$$Y = 161.927 + 1.6277 X$$

APPENDIX - VIII

Calculation of Correlation Coefficient between Profit and Sales

Year	Sales (X)	Profit (Y)	$X - \bar{X}$ x	$Y - \bar{Y}$ y	x^2	y^2	xy
2058/59	1236.05	42.61	-452.84	-175.66	205064.0656	30856.4356	79545.8744
2059/60	1244.73	93.17	-444.16	-125.1	197278.1056	15650.01	55564.416
2060/61	1524.90	140.78	-163.99	-77.49	26892.7201	6004.7001	1270758.51
2061/62	1481.56	189.20	207.33	-29.07	42985.7289	845.0649	6027.0831
2062/63	1434.94	238.16	-253.95	19.89	64490.6025	395.6121	-5051.0655
2063/64	1818.53	263.06	129.64	44.79	16806.5296	206.1447	5806.5756
2064/65	2144.59	335.12	455.7	116.85	207662.49	13653.9225	53248.545
2065/66	2625.83	444.04	936.94	225.77	877856.5636	50972.0929	211532.943
	X 13511.13	Y X 1746.14	0	0	$x^2 =$ 565813.1646	y^2 X 120383.9822	xy X 419381.951

Coefficient correlation between sales & profit

$$r_{xy} = \frac{\sum xy}{\sqrt{\sum x^2} \sqrt{\sum y^2}} = \frac{419381.95182}{\sqrt{565813.1646} \sqrt{120383.9822}} = 1$$

Probable Error of coefficient of correlation

$$PE (r) = 0.6745 \quad | \quad SE (r) = 0.6745 \left| \frac{1 - r^2}{\sqrt{8}} \right| = 0$$

APPENDIX- IX

Multiple Regression Analysis of Inventory on Profit & Sales

Inventory = Dependent=y

Sales and Profit Independent= x1x2

Time	Yx1	Yx2	X1x2	X1 ²	X2 ²	Y ²
8 years	195989.8894	61161.7227	419381.95182	761180.2425	120383.9822	61235.5029

The multiple regression equation, $y = b_1x_1 + b_2x_2 \dots(i)$

To find out the value of b_1 and b_2 we use normal equations are,

$$y_1 = b_1 \sum x_1^2 + b_2 \sum x_1x_2 \dots (ii)$$

$$y_2 = b_1 \sum x_1x_2 + b_2 \sum x_2^2 \dots (iii)$$

$$195990 = b_1 \cdot 761180 + b_2 \cdot 419381$$

$$61162 = b_1 \cdot 419381 + b_2 \cdot 120384$$

By using crammers rule, we get,

$$D = \begin{vmatrix} 761180 & 419381 \\ 419381 & 120384 \end{vmatrix} = -8424653004$$

$$D_1 = \begin{vmatrix} 195990 & 419381 \\ 61162 & 120384 \end{vmatrix} = -2056120562$$

$$D_2 = \begin{vmatrix} 761180 & 195990 \\ 419381 & 61162 \end{vmatrix} = -3563919103$$

2

419381

611621

Finally, $b_1 = \frac{D_1}{D} = 0.0244$, $b_2 = \frac{D_2}{D} = 0.423$

The multiple regression line is, $y = 0.0244 x_1 + 0.423x_2$

Calculation of Multiple Determinations $R_{y^2 \cdot x_1 x_2} = \frac{b_1 \sum y x_1 + b_2 \sum y x_2}{\sum y^2}$

$$= \frac{0.0244 \times 195990 + 0.423 \times 61162}{61236} =$$

0.50

Standard Error Estimated = $\sqrt{\frac{\sum y^2 - \frac{(\sum y x_1)^2}{N} - \frac{(\sum y x_2)^2}{N}}{N - 3}}$

$$\sqrt{\frac{61236 - \frac{195990^2}{8} - \frac{61162^2}{8}}{8 - 3}}$$

X78.20