A COMPARATIVE STUDY ON INVENTORY MANAGEMENT SYSTEM

(A Case Study of Kantipur Publication Pvt. Ltd. and Kamana Prakashan Samuha Pvt. Ltd.)

A Thesis

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DECLARATION

I hereby declare that the work reported in this thesis entitled **A Comparative Study on Inventory Management System (A Case of Kantipur Publication Pvt. Ltd. and Kamana Prakashan Samuha Pvt. Ltd.)** Submitted to **Nepal Commerce Campus**, New Baneshwar, Kathmandu, Faculty of Management, Tribhuvan University, is my original Work done in the form of partial fulfillment of the requirement for the Master of Business Studies (MBS) under the supervision of **Rajeshwar Neupane** and **Pitambar Shrestha** of Nepal Commerce campus.

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ABBREVIATIONS

ABC	**Always Better Control**
A/C	**Account**
B.S.	**Bikram Sambat**
C.V.	**Co-efficient of Variation**
F/Y	**Fiscal Year**
GDP	**Gross Domestic Product**
GPC	**Gorkhapatra Corporation**
i.e.	**That is**
JCF	**Janakpur Cigarette Factory**
KG	**Kilogram**
KP Pvt. Ltd.	**Kantipur Publication Private Limited**
KPS Pvt. Ltd.	**Kamana Prakashan Samuha Private Limited**
L/C	**Letter of Credit**
MT	**Metric Ton**
NOCL	**Nepal Oil Corporation Limited**
RDL	**Royal Drug Limited**
ROL	**Re-Order Level**
ROP	**Re-Order Point**
Rs.	**Rupees**
S.D.	**Standard Deviation**

T.U.	**Tribhuvan University**
Sq. k.m.	**Square Kilometer**
DNPL	**Dabur Nepal Private Limited**
NLL	**Nepal Lever Limited**
P.E.	**Probable Error**

CHAPTER – 1

INTRODUCTION

1.1 Background of the Study

An Asian small country Nepal is one of the least developed with poorest economic condition of the world. Nepal is said to be sand-witched in between two giant and most popular countries of the world, China in the North and India in the East, West and South. Nepal is land-locked country beside this it is the country of Himalayas and Mountains. It covers an area of 147,181 Sq. Km and runs all along 885 Kilometers from the East to the West and 145 Kilometer to 241 Kilometer from the North to the South. It has more the 38% people living below poverty line. The per capita income of Nepalese people only about $275. The development of the country which is reflected by the annual Gross Domestic Product (GDP) growth is around 3.7% and it has also fluctuating trend. The sound economic development of any nation depends upon the higher rate of growth of production activities in the different sector of the country's economy.

The evaluation of public enterprises in the world has a long history. During the 18th Century, a concept was developed like problems of poverty and unemployment may be solved by government intervention in economy. During the period, most of the developed countries had adopted the Laissez fair policy in the economy. During the 19th Century, the application of Laissez fair policy evolved the capitalism that increased the poverty, corruption, worker exploitation, unbalanced distribution of wealth etc. Therefore, to avoid these serious situation intervention by the government was started the economy. The government intervention in the economy was rapidly increased during 20th Century.

All the countries in the world either developed or under developed have accepted the existence of public and private enterprise for the economic and social development. It plays a strategic and crucial role in our mixed economy. They have been established in many sectors for overall development of the country with different goals and objectives. According

some Newspaper Corporation has been established under people utility and social sector.

Now, Nepal has adopted the policy of economic liberalization and privatization and goes to the membership of the World Trade Organization through the globalization for strengthening the economy, any country both the private and public sector should play vital role. This fact has been realized by our country too.

As the study concentrates over inventory management system followed in two private sector publications named "Kantipur Publication Private Limited and Kamana Prakashan Samuha Private Limited" it is necessary to know that what is inventory, what types of inventories are used in these publication house and what is the role of inventory for the smooth publication and its influence on profit.

The various forms of material goods that is held by an enterprise for the future use is known as inventory. Inventory form a link between production and sale of product. Inventory is stores of goods and stocks. In manufacturing organization, inventories include raw materials, work in progress and finished goods. In trading concerns, inventories consist of merchandise held for sale and office packing and other suppliers. Inventory management is the technique of maintaining inventory items (raw materials, work in progress, finished products and factory suppliers) at desired levels. Inventory management has great significance in almost all types of business enterprises. Inventory constitutes the most significance part of current assets of a large majority of companies. Because of the large size of inventories maintained by firms, a considerable amount of funds is required to be committed to them. It is therefore, absolutely imperative to manage inventories efficiently and effectively in order to avoid unnecessary investment. A neglecting the management of inventories will be loosing is long run profitability and many fail ultimately. Hence an optimum level of inventory should be determined on the basis of the trade off between costs and benefits associated with the level of inventory. In the competitive world profit can be earned only by reducing cost. So, the cost be minimized and production should be maximized.

For strengthening the economy of a country, both the private and public sector enterprise should play a great role. This is realized in our context too. Most of the productive enterprises hold a large size of inventory. It is possible for a company to reduce its levels of inventories to a considerable degree without any adverse effect in production and sales by using simple inventory planning and control techniques.

Modern concept of inventory management can be traced form 1915 to 1922 with several authors like R.C. Davis, H.S. Owen, E.K. Clark and R.C. Wilson conceived an independently developed an economic lot size equation which minimized the sum of carrying and holding cost for particular material where the demand is known as constant.

As per view of Dr. G.R. Agrawal, one of the management experts of Nepal, "**Inventory management is an integral part of financial management. It is inventory maintaining at desired level. Inventory should be effectively managed. The real task of top management is to minimized investment in inventory for the attainment of desired objectives**." (Agrawal, 1980, P - 85)

Another management experts, R.M. Bhandari says, "**Inventory management is determining how much inventory there should be on hand to serve for the purpose of the business most economically**." (Bhandari, 1997, P - 65)

Thus, inventory management and control system is adequately considerable by the top management of the trading houses so as to reduce the cost of store. So, high inventory isn't a good sign because there is a cost associated with storing the extra inventory of the trading houses. Inventory should be maintained appropriate quantity so as to avoid the risk of both over and under stock situation. For this purpose, the inventory management is necessary; it is because the aim of optimum level of inventory is maintained for the smooth supply to the market and sales operation. Therefore, inventory is maintain desired level so as to minimize the total cost of investment that will lead to obtained inventory investment for attainment of desired objectives.

The area of inventory management covers the following individual phases: determine the size of inventory with time schedule, procedure and lot sizes for new order determine minimum safety stock level and co-ordinate the sales department for inventory policy such that proper store facility arrange the receipt, disbursement and procurement of goods are in operation. There are also develop the form of recording the transaction, assign the responsibility for carrying out the inventory control function and provide the necessary report for supervise these overall activities of top management.

There are various scientific techniques to the solution of a variety of inventory management related problems. The inventory management problem is one of the maintaining minimum financial investments and provides for an adequate to supply of something in order to meet an expected distribution or patterns of demand. Thus, management should pay adequate attention to the inventory management to reduce the cost of production, sales and working capital requirement.

- Availability of items required,

- No excessive investment in inventory,

- Purchase of reasonable price,

- Minimum wastage,

- Avoidance of spoilage and obsolescence of stock to the management,

- Control the misappropriation on inventory through internal check.

The sound performance of firms largely depends upon how it utilizes its available resources.

1.1.1 Functions of Inventory Management

- Determining the size of inventory to be carried.

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- Establishing to schedules, procedures and lot size of new order.

- Providing proper storage facilities.

- Arranging the receipts, disbursement and procurement of materials.

- Developing the forms for recording the transactions.

- Assigning responsibility for carrying out the inventory control functions.

- Providing the reports necessary for supervising in overall capacity.

1.1.2 Background of the Companies under Study

As the study concentrates over inventory management study followed in Kantipur Publications Pvt. Ltd. and Kamana Prakashan Samuha Pvt. Ltd. it is necessary to study these two private sector publications.

Kantipur Publication Private Limited

Kantipur Publications Pvt. Ltd is one of the renowned and leading publication houses from private sector of Nepal. It has deep seated belief in Democracy and freedom of press for positive change in safety. It is committed to provide new picture of news and analytical review to the Nepalese society. The publication adopts latest digital printing technology with satellite printing stations the major cities in the country.

Kantipur Publication Pvt. Ltd was established in 2047 B.S. First it started to publish "Kantipur Daily" and "The Kathmandu Post" in 7th Falgun 2049 B.S. In the beginning, the publication was under Goyanka but later it was replaced by Gyawali and Sirohiya from 2050 B.S. Baisakh 12, Kantipur started publishing a four page supplement Kosheli with an aim of giving entertainment purely. Jyestha 5, 2052, Saptahik was printed on every Friday.

For making publication well, organized branch offices were established at Biratnagar, Pokhara, Bharatpur and Nepalgunj. The process of distribution and advertisement are well maintained through these offices. At the same

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time, capable and experienced journalists are appointed in the regional offices for the better coverage of the regions. From eight pages, Kantipur Daily increased to the pages up to 16, but it is fluctuated according to time. Due to popularity of Saptahik, the 16 page was increased to 24 pages in published from 2057 Shrawan 15, publications another progress is "Nepal" a bi-monthly magazine published from 2057 Shrawan 15. Publications latest progress is a woman oriented magazine from "Sarbottam" to "Sarbottam Nari" that could be found in market in Nepali medium at monthly scheme. All the publications of Kantipur have own types of different news at different headlines for different countries, Kantipur publication is awarded by the "Gorkha Dakshin Bahu" by HMG and many other associations honored it too.

Kantipur Publication Pvt. Ltd. has been expanding its publication in a wide range. The present publication of Kantipur Publication Pvt. Ltd has been traced out below:

- **Kantipur Daily Newspaper -**
  Most widely circulated Nepali Daily broadcast with largest readership in Nepal.

- **The Kathmandu Post -**
  The only all color English Daily newspaper.

- **Saptahik -**
  Entertainment based family Weekly paper.

- **Nepal -**
  Country's fastest growing Social-Political news magazine especially famous for Acute Political reporting and analysis.

- **Sarbottam Nari -**
  Publication's first Monthly Women's Magazine

- **Kantiur Online -**
  Internal part of any news site that publishes report and general information. The site has largest number of hits per day. It has

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catered not just to those people living outside the country but also to those people who requires prompt news service.

The present publication of Kantipur Publications Pvt. Ltd. is presented below in the form of table:

Table: 1.1

DIFFERENT PRODUCT, PRODUCTION UNIT AND PRICE PER UNIT OF KANTIPUR PUBLICATION PVT. LTD.

S.N.	Publications	Nature	Production Unit	Price/unit
1.	Kantipur Daily	Daily	210,000 (Daily)	Rs. 5
2.	The Kathmandu Post	Daily	40,000 (Daily)	Rs. 3
3.	Saptahik	Weekly	90,000 (Weekly)	Rs. 10
4.	Nepal	Bi-monthly	35,000 (Bi-monthly)	Rs. 25
5.	Sarbottam Nari	Monthly	25,000 (Monthly)	Rs. 35

Source: Unpublished records of Kantipur Publication Pvt. Ltd Publications.

Kamana Prakashan Samuha Private Limited

Kamana Prakashan Samuha Pvt. Ltd. is another renowned and leading publication house from private sector of Nepal. It was established in Mangsir 15, 2041 B.S. First it started to publish "Kamana – Cine magazine" a monthly magazine related with film industry, promotion of Nepalese film, art, music, culture, fashion and entertainment. The circulation of "Kamana – Cine Magazine" has in 35 countries around the world with more than 2000 copies monthly. Publication's another magazine is "Sadhana – Health Digest" a monthly magazine publishing from Baisakh 1, 2048 regularly, aims to focus on choice for healthy living, explain common diseases and treatments, cardiovascular health, latest medical breakthroughs as well as unethical clinical practices and health care policies. The circulation of "Sadhana - Health Digest" has in 25 countries around the world with more than 1500 copies monthly. In Mangsir 29, 2049, publication launched "Mahanagar" as daily evening vernacular aims

to focus on daily incidents and activities in Kathmandu valley. But "Mahanagar" is not publishing by publication from Baisakh1, 2065. In 2052, Aswin 1, publication launched a daily newspaper named "Aaj Ko Samacharpatra" aims to deliberate balanced and perceptive news and issues on politics, economics and social justices as well as global affairs. "Aaj Ko Samacharpatra" was converted to "Nepal Samacharpatra" in Aswin1, 2056with a supplement issue "Saugat" on every Saturday.

"Nepal Samacharpatra" is a first daily newspaper of the country which is published and distributed from two destination Kathmandu and Biratnagar in Baisakh 24, 2058. "Nepal Samacharpatra" has over 73 districts nationwide coverage. The process of distribution and advertisement are maintained through these offices. Kamana Prakashan Samuha Pvt. Ltd. is awarded by the "Gorkha Dakshin Bahu" by the HMG. Kamana Prakashan Samuha Pvt. Ltd. has been expanding its publication in a wide range. The present publication of K P S Pvt. Ltd. has been traced out below:

Table: 1.2

DIFFERENT PRODUCT, PRODUCTION UNIT AND PRICE PER UNIT OF KAMANA PRAKASHAN SAMUHA PVT. LTD.

S.N.	Publications	Nature	Production Unit	Price/Unit
1.	Nepal Samacharpatra	Daily	90,000 Daily	Rs. 5
2.	Kamana – Cine magazine	Monthly	40,000 Monthly	35
3.	Sadhana – Health digest	Monthly	40,000 Monthly	30
4.	Mahanagar	Daily		

Source: Unpublished records of K P S Pvt. Ltd.

1.2 Statement of the Problems

Investment generally represents the major element in the working capital of an organization and a very significant proportion of total assets. Investment in inventory also involves certain risks and costs. Therefore, a manager of the firm should try to maintain optimum size of inventories i.e. neither too much nor too little of inventory, which maximizes the value of the firm and minimizes the total costs associated with the inventory management. The inventory management should determine and maintain optimum level of

inventory. Re-order level, minimum stock safety stock and maximum stock help to maintain optimum level of inventory.

The lead time is not given proper attention which has been problem to the enterprises. The inputs for publishing various newspapers are found to be established by the publication house and on the other hand economic order size, market price of inputs and unit price are fixed on the basis of annual requirement and they are fixed unscientifically and are not based on mathematical models. Sometimes these publication houses have to face excess inventory and sometimes they have no face shortage of inventory to satisfy its customers demand. Poor performance is the outcomes of poor planning, controlling and decision making. This has raised the question whether Nepalese managers are competent enough? Do they practice inventory management tools and techniques to carryout planning, decisions making and controlling functions?

In this research, we are trying to get the answer of the following questions.

- Which techniques of inventory management are adopted by sample listed publications?

- Are firms seriously considering about optimum level of inventory?

- Whether or not a publication house gives proper attention to lead time?

- Are publications successful in estimating annual requirement?

- What are the major difficulties in the application of inventory management in these publication houses?

- Is quality of inventories are given proper attention?

- Is a systematic and scientific inventory management system followed by sample listed publications?

- Is the management of inventories planned or not?

1.3 Objectives of Study

This study aims to explore the underlying constraints in existing management and control system of inventory and their impact towards profitability of the publication houses. Along with the aforesaid objectives, the following functional objectives have been embodied in this study:

1. To analyze the present position of inventory management of the publications.

2. To study the prevailing inventory management practices and identifying the problem faced by the publication.

3. To analyzes the relationship between inventory material costs and profit.

4. To analyze different aspects of inventory management of the publications with the help of statistical and financial tools.

5. To provide appropriate suggestions based on the major findings.

1.4 Significant of Study

The recent advanced technology has enable to manufacture new products and to accelerate the rate of manufacture of existing products faster than ever before. As we make more capital as the goods flow along and fall in the channels of distribution or await usage productivity and profitability as measure of growth, profit and efficiency. The concept of profitability as measure of the productivity of capital enables to evaluate inventory policies also as it forms the basis for the production or sale. The interest shown in the subject is recognition by management of inevitability of inventory. It explores the problems and provides literature to the researcher, who wants to carry on further research in this field.

1.5 Limitations of Study

- The study has been carried out for the partial fulfillment of Master's

Degree, Faculty of Management T.U., so the efforts and resources are major limitation of study.

- Out of various enterprises indifferent sectors this study has chosen the Kantipur Publication and Kamana Prakashan Samuha such the study is suggestive rather than prescriptive.

- Most of the firms are not interested to provide actual reports of their activities. There is lack of detailed information required for the research.

- The study covers a four to five year periodic data.

- The study is more specific in inventory management and its impacts in profitability not other functional management.

- This study will depend upon the secondary data provided from the management of the publication.

1.6 Chapter Scheme
The whole study is divided into five chapter plans which are as follows:

Chapter 1: Introduction

This part includes introduction, a brief history of Kantipur Publication Pvt. Ltd. and Kamana Prakashan Samuha Pvt. Ltd. statement of the problem, significance of the study, objectives of the study, limitation of the study, chapter scheme.

Chapter 2: Review of Literature

Review of literature includes review from books, journals, thesis, dissertations, business reports, government publications and independent study.

Chapter 3: Research Methodology

This chapter includes with introduction, research design, sources and nature

of data, data gathering instruments and analytical tools and techniques used.

Chapter 4: Data Presentation Analysis

This part deals with the presentation and analysis of data with the help of various tools and techniques of inventory management.

Chapter 5: Summary, Conclusion and Recommendations:

This chapter presents the finding of the study and advice to remove weakness and difficulties.

CHAPTER – 2

REVIEW OF LITERATURE

2.1 Review of Books

2.1.1 Conceptual Review

Inventories refer to goods and materials used by a firm for the purpose of production and sales, i.e. all the movable refers in store either ready for sale or for consumption in the course of production with a view to converting them into finished goods for sale. Thus, inventory includes stock of raw materials; work-in-progress, finished goods and accessories form a major part of working capital and rebury a considerable investment. Inventory constitutes one of the important items of current assets, which permits smooth operation of production and sale process of a firm.

"The term inventory refers to stockpile of the product a firm is offering for sale and components that make up the product" (Botten, 1975, p-426).

"Inventory is composed of assets that will be sold in future in the normal course of business operation" (Khan and Jain, 1992, p-726).

Among the different aspects of inventory management is also one of the major factor that play significant role in firm's working capital management, which is concerned with maintaining optimum investment in inventory and applying effective control system of inventory so as to minimize the total inventory cost. Inventory as a type of current assets involves significant investment of funds. Therefore, all types of business enterprises should control inventory. The basic objectives of inventory control is identical to material control i.e. maintaining inventory of adequate size for an uninterrupted production and lowest possible investment on the inventory in conformity with production requirement. Inventory management application reduces time, increase overall plant

capacity, reduces investment in stock and space, improves customer's service and provides inventory data and reports (Lal, 1996, p-101).

2.1.2 Types of Inventory

The various forms of materials or goods that is held by an enterprise for future use is known as Inventory. Inventory is the bridge between production and sales of product. Inventory reserves the vital functions of operation in the sequence beginning with raw materials extending through all the manufacturing operations and in finished goods storage and continuing to ware house and retail store. The various forms in which inventory exist in manufacturing enterprises are raw materials, work-in-progress and finished goods.

a) Raw Materials

Raw materials are the basis inputs which are converted into finished products through the manufacturing process. Raw material inventories are those units which have been purchased and stored for future production. Materials used in a factory are traditionally classified as direct materials and indirect materials. Direct materials are generally defined to include all materials and part that are an integral part of finished product and contribution can be directly identified to the finished product. The publication houses use P/S Developer negative, Dele printer role, photo graphic film, Agfa paper soft, image remover, offset ink, Anfix, acetic acid etc. as raw materials.

b) Work-in-progress

Work-in-progress inventories are semi-manufactured products and they represent that it need more work before they are converted as finished products for sale. Sometimes, it becomes very difficult to determine which material is work-in-progress and which are not because the some material is a raw material in one industry and the same material may be a work work-in-progress as well as finished goods in other industry. It depends upon the nature of production. Publication houses do not keep the work-in-progress

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inventory raw material to produce finished products directly i.e. newspapers and magazines etc.

c) Finished Products

Finished Products inventories are those completely manufactured products which are ready for sale. Stock of raw materials and work-in-process facilitate production, which stocks of finished goods are reburied for smooth marketing operations.

A fourth kind of inventory supplies is also maintained by firms. Suppliers include office and plant cleaning materials like soap, brooms, oil, fuel, light bulbs etc. These materials do not directly enter in production system but they are necessary for production process. Two different publications have been publishing various publications as the finished products which are mentioned below:

S.N.	Kantipur Publication	S.N.	Kamana Prakashan
1.	Kantipur Daily (Daily Newspaper)	1.	Nepal Samacharpatra (Daily Newspaper)
2.	The Kathmandu Post (Daily English Newspaper)	2.	Kamana-Cine Magazine (Monthly Newspaper)
3.	The Saptahik (Weekly Newspaper)	3.	Sadhana-Health Digest (Monthly Newspaper)
4.	The Nepal (Bi-Monthly Magazine)	4.	Mahanagar (Daily Newspaer)
5.	The Sarbottam Nari (Monthly Magazine)		

2.1.3 Need of Holding Inventories

The question of managing inventories arises only when the company holds inventories. Maintaining inventories involves tying of the company's funds and incurrence of storage and handling costs. If it is expensive to maintain inventories, why do companies hold inventories? There are many benefits

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of holding inventories and used to provide cushions so that the purchasing, production and sales functions can processed at their own optimum paces.

There are three general motives for holding inventories. (Stam and other, 1963, p-17)

1. The transactions Motives: This emphasizes the need to maintain inventories to facilitate smooth production and sales operations.

2. The precautionary Motive: Which necessities holding of inventories to guard the risk of unpredictable change in demand and supply forces and other factors.

3. The speculative Motive: which influences the decision to increase or reduce inventory levels to take advantage of price fluctuations.

A company should maintain adequate stock of materials for a continuous supply to the factory for an uninterrupted production. It is not possible for a company to available raw materials whenever it is needed. A time lag exists between demand for materials and its supply. Also, there exists uncertainty in procuring raw materials in time at many occasions. The procurement of materials may be delayed because of factors like strike, transport, disruption or short supply. Therefore, the firm should maintain sufficient stock of raw materials at a given time to streamline production. Other factors which may necessary purchasing and holding of raw materials inventories are quantity discount and anticipated price increase. The firm may purchase large quantities of raw materials than needed for desired production and sales levels to obtain quantity discount of bulk purchasing at times. The firm would like to accumulate raw materials in anticipation of price rise at the same time.

2.1.4 Objectives of Inventory Management

The basic managerial objectives of inventory control are two fold to avoid over and under investment in inventories and to keep the right quantity of goods of right quantity at proper time and at reasonable price. Other objectives are mentioned below:

a) To maintain optimum level of inventory for efficient, smooth production and sales operation.

b) To maintain minimum investment in inventory so that the cost is minimizes while profit is maximized.

c) To maintain adequate supply of materials, stores spares etc.

Both excessive and inadequate inventories are not desirable. There are two dangers point within which firm should operate. The objectives of inventory management should be determine and maintain optimum level of inventory. Optimum level of inventory will be between two dangers point i.e. excessive and inadequate inventories.

The major danger points of excessive inventory:

a. The unnecessary tie up to the firm's with minimum profit.
b. Excessive carrying cost.
c. The risk of liquidity.

The major danger points of inadequate level of inventory:

a. Productions hold up.
b. Failure to meet delivery commitments.

2.1.5 Need and Importance of Inventory Management

Inventory plays vital role in any organization. If the organization is not paying attention to inventory management, it will affect the efficiency and profitability of the organization. Inventories serves as the vital functions for developing the various operations in sequence beginning with raw materials extending through all manufacturing operations into finished goods.

The importance of inventory management can be written as follows:
(Goel, 1985, p-145)

a. Inventory helps in smooth and efficient running of business.

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b. Inventory provides services to the customers immediately or at a short notice.

c. Due to absence of stock, the company may have to pay high price because of emergency purchasing. Maintaining of inventory may help to earn discount because of bulk purchasing.

d. Inventory also acts as buffer stock when raw materials are received late and many sales orders are likely to be rejected.

e. Inventory also reduces product costs because there is an additional advantage of batching a long smooth running production.

f. Inventory helps in maintaining the economy by absorption some of the fluctuations.

g. Pipeline stocks (also called process and moment inventories) are also necessary where the significant amount if time is consumed in the trans-shipment of items from one locality to another.

2.1.6 Inventory Cost

After the great depression 1930's and before 2nd world war, American economy as well as world economy plagued by capacity utilization, material shortage, inflation and high interest rates. So, cost and balancing of cost lie heart of all production and inventory control problems. Therefore, the managers of the organizations must pay attention to inventory.

The various concepts and techniques have been developed in this regard. These are ordering cost, holding cost i.e. capital cost, operational cost (handling cost) spoilage and shortage cost, insurance and tax cost, system cost, stock out cost, under cost concept and Economic Order Quantity (EOQ), ABC analysis, safety stock calculation, re-order calculation and techniques in inventory valuation under technical approach, which have been discussed in detail.

All these cost discussed are necessary to arrive at or find out the optimum or best inventory policy that results in the least cost to inventory

management. In this contact the different types of inventory costs are considered which are given below.

a) Acquisition Cost or Ordering Cost

The most obvious cost is those involved in the acquisition of the inventory, including the expenses of such clerical operations as filling, reviewing the requisition. Processing the purchase orders, checking the incoming vouchers and paying the bills. The important features of these costs are that they are "one time costs" and therefore may treated like fixed costs. The larger the order quaintly, the smaller these costs become on a per unit basis the entire expenses of the order is spread over more items.
(Solemn, 1995, p-41)

Ordering cost can be calculated from the following process:

Ordering cost (set up cost) = $\dfrac{\text{Annual demand x Ordering cost per order}}{\text{Ordering size}}$

Or, O.C. = $\dfrac{A \times O}{Q}$ I

From the above equation, we can calculate the total ordering cost involved in inventory management. While calculating the ordering cost it is necessary to find out which cost is include in the material order and it is not easy to find out from the store records.

b) Holding or carrying cost:

Total carrying cost generally increases indirect proportion to the average amount of inventory carried. Inventory carried in turn depends upon the frequency the orders are placed.

The cost associated with having inventory which included storage cost, insurance cost of typing up fund and depreciation cost and so on. This cost generally increase in proportion to the average amount of inventory held.

Carrying costs are difficult to find out from company store ledger or other ledger accounts or costs statements. Carrying costs are varying according to

the size of the quantity ordered. If order high quantity of material that time per unit cost of carrying inventory would be minimize and vice versa. Fit is calculated from the following formula: (Western and others, 1996, p-428)

Carrying cost = Average Inventory x Carrying cost/unit per annum.

Or, C.C. = $\dfrac{Q}{2}$ x c II

Where Q = Quantity order size.

There are other costs which are regards as carrying costs:

I) Capital Cost

As with any other asset, inventories require capital investment. Funds associated to inventories are not available for other uses. Therefore, the opportunity cost is determined by the alternative use to which the funds could be put. If the firm has alternative uses for the capital that would return 8 percent for example, then the capital cost of the inventory is 8 percent.

II) Space Cost:

Inventory keeping needs space and therefore the 'how much' and 'when' questions of inventory keeping are related to the space requirements. The cost may be the rent paid for the space.

III) Handling and storage cost:

The cost associated with maintenance of inventory is storage cost. The costs include expenditure made on inventory staffs, expenditure to provide various facilities like heating, lighting, cooling etc. These costs generally depend up on the value ratio of inventory. Facilities required to store an inventory creates cost such as rent, heat and light. Often storage facilities are available and have no alternative use in that case the cost of storage is fixed and does not vary with inventory level. Beyond a given level of

inventory, however, these costs will begin to increase as more items are kept in stock. (Solemn, 1995, p-43)

IV) Obsolescence, spoilage or deterioration costs:

If inventory is procured in a large quantity there is always a risk that the item may become obsolete due to a change in product or the item might get spoilt because of the natural ageing process. The latter is particularly true of many sensitive chemicals and drugs which have limited shelf life. Such costs have, definitely a relation to basic questions of how much and when.

A common type of spoilage cost occurs when stock is left in inventory after the demand for the product has vanished. This cash occur with varying degrees of severity. A classic example of this situation is the Christmas trees that are still unsold after the holiday season, they have virtually no further economic value, and their full purchase cost must be written off as a loss. (Megge, 1985, p-39)

Another type of spoilage cost occurs when products deteriorate physically in storage. Food products, for example spoil when they are stored to long.
(Solemn, 1995, p-40)

V. Insurance Costs:

There is always a risk of five, theft or pilferage of materials. These costs should therefore be estimated or an organization might have been taken insurance against such mishaps and the insurance premiums paid are relevant costs inventory decisions.

Inventory often represents a significant investment of a firm's capital. Conservative management practice calls for increase protection. Naturally the cost of this insurance will vary according to the size and the value of inventory. The same is true for taxes. Some countries levy inventory taxes. For example on various dates throughout the year, the inventory a firm has no hand on those dates the higher their tax bill will be.
(Megge, 1985, p-44)

VI) Cost of general administration:

Inventory keeping will involve the use of various staff with large inventories: the costs of general administration might go up.

VII) Stock out costs:

A company also experiences a cost called stock out cost if its supply of goods sunsets before the demand for the products is satisfied. There are two types of stock out (Syder, No. 32, p-30).

a) Occurs of an item is not available for sale or to meet the production schedule but can be obtained through the emergency procedures. In this case, the customer or production department receives the goods but the supplier incurs the added cost of making them available quickly so that the sale will not be cost or the production line stopped.

b) In the case of finished goods, if an item is not available and cannot be obtained by emergency procedure the seller has lost a sale often he loss more than that at first glance this type of stock out cost might be appear to be simply the loss of profit that would have resulted from the sale on the closer inspection. However, it becomes apparent that customer's goodwill may have been lost too. If the customer goes to competitors for the item, he may continue going there in the future. Clearly this cost is difficult to assess but it is often considered to be a large sum. Some firms feel so strongly about avoiding this type of cost that they offer the customer substitutes of greater value than the items from a competition themselves and furnish it to the customer at a loss (Syder, No. 32, p-40).

Stock out cost can be computed from the following formula (Western and Brigham, 1981, p-331)

Stock out cost = Inventory cycle per year x stock out units x probability of a possible stock out x unit stock out cost.

Where,

Inventory cycle/year = Annual usage (requirement)/Quantity order size

The costs associated with demanded when stocks have been depleted, take the form of last sales or backorder costs. Backorder costs include loss of goods will and money paid to recorder goods and notifies customers when goods arrive. In totality we can formulate an equation which gives us about the cost of maintaining inventory.

TCMI = TCC + TOC + CSS

Or, TCC = [(C %)(P) (AI)] + [(O) x (N)] + [C %)(P) (S)]

Where,

TCMI = Total cost of maintaining inventory

TCC = Total carrying cost

TOC = Total ordering cost

CSS = Cost of safety stock

C% = % of cost of carrying inventory

P = Price per unit of inventory

A = Average inventory

O = Cost of placing an order

N = No. of times to be order per year

S = Safety stock

VIII) Cost Trade-Off:

The optimum inventory size is commonly referred to, as economic order quantity (EOQ). It is that order size at which annual total costs of ordering

and holding will minimum. We can follow three approaches i.e. the trial and error approach, the formula approach and the graphic approach to determine the economic order quantity (EOQ). We assume that total annual demand is ordering and carrying cost per unit is assumed to be constant.

These costs can be expressed in general cost equation:

Total annual relevant cost = Cost of the item + Procurement cost + Stock out cost

Each cost in equation can be expressed in term of order quantity and reorder point for a given inventory system. The equation method is to minimize the total cost. This can be accomplished graphically by tabular analysis, using trial and error or by using calculus.

Operation researches have developed a wide range of optimal formula, which vary with changes in the actual inventory situation. Graphically, minimizing total costs means cost trade-off.

For a simple model, in which cost of item and cost of stock out are irrelevant, the trade off is between only two costs of item and cost of stock out are irrelevant, the trade off is between only two costs i.e. procurement cost and carrying cost. The annual carrying cost increase with large volume of order quantity. When quantity order size is large, fewer orders must be placed during the year so that the annual procurement cost decrease.

2.1.7 Inventory Techniques

a) Economic Order Quantities

One of the major inventory management problems to be resolved is how much inventory should be added when inventory is replenished. If the firm is buying raw materials, it has no decide lots in which it has to be purchased on each replenishment, if the firm is planning a production run the issue is how much production to schedule (or how much to make). These problems are called the order quantity problem and the task of the firm is to determine the optimum or economic order quantity. Determining an optimal inventory level involves two types of coots. a) Ordering costs b) Carrying costs. The economic order quantity is that inventory level which

minimizes the total of ordering and carrying costs. (Pandey, Op: Cit. p - 886)

Following three methods are commonly used for determination of economic order quantity. (Saxena and Vashist, 2004, pp-2.10 – 2.11)

I) Tabular Determination of EOQ

A tabular arrangement of data relating to items of materials may allow the determination of an approximate EOQ. This arrangement may help the company to find out the number of orders that need to be placed monthly, weekly, quarterly or yearly. EOQ corresponds to order size having the least annual cost.

Cost Data Assumed

Ordering cost is Rs.3 per order. Inventory carrying cost is 7-1/2% of inventory value of the annual usage is Rs.1, 000.00

If the item in question were ordered once every month, the ordering cost per year would be Rs.36.00 similarly, if items were purchased once every two months, cost of ordering for the year would be Rs.18.00 (RS.3x6). The cost has been similarly calculated for other frequencies in the table given below:

Table-2.1

TABULAR DETERMINATION OF EOQ

Order Frequency (Times per year)	Annual Acquisition cost	Annual Possession Cost	Total Annual Cost
(1)	(2)	(3)	(4)
12	Rs. 36	Rs. 6.25	Rs. 42.25
6	18	12.50	30.50
4	12	18.75	30.75
3	9	25.00	34.00
2	6	37.50	43.50
1	3	75.00	78.00

By adding the acquisition cost (column 2) and possible cost (column 3), one can arrive at the total annual cost of the purchasing the items at different order frequencies per year. It will be observed that total annual costs for purchasing the cost at this frequency is Rs.30.50 per year. At this frequency it will be observed that ordering cost Rs.18 and carrying charge are 12.50 and these two costs are more nearly equal than they are at any order frequency.

ii) Graphic Presentation of EOQ:

Economic Order Quantity can be determined graphically. This approach is very simple and presents pictorial view of the different variables, whose interplay influences the EOQ. This can be illustrated by the data given below:

Table-2.2

Graphic Presentation of EOQ

Quantitative data

	200	400	800	1200	2400
Order size in units	200	400	800	1200	2400
Number of orders		12	6	3	2	1
Average inventory (Order Size/2)		100	200	400	600	1200

Cost Data

	200	400	800	1200	2400
1. Average Inventory cost @ Rs.1.50		150	300	600	900	1800
Total Ordering Cost						
10% of Avg. Inventory Cost		15	30	60	90	180
(Rs.6 per order)		72	36	18	12	6
2. Cost to order and carrying inventory	87	66	78	102	186
3. Total variable inventory cost (1+2)	237	366	678	1002	1986

The above data have been plotted in the graph given below:
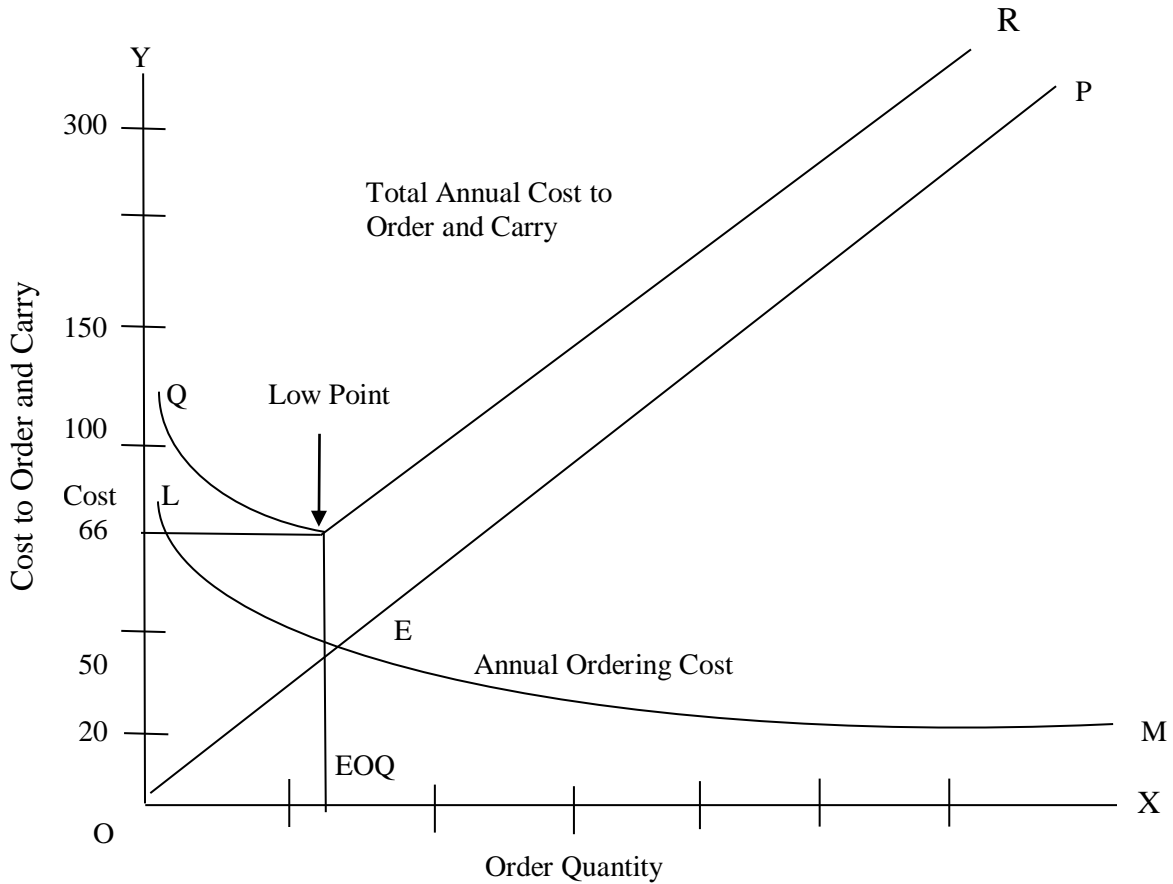
Fig. 2.1: Graphic Determination of the EOQ

iii) Formula Method of EOQ

This formula is used in case of certainty where usage rate don't fluctuate over the year.

Thus average quantity $= \frac{Q}{2}$ and

Carrying cost = Q/2 x c

No. of orders over a period = A/Q
Ordering cost = A/Q x O

The total inventory cost, there is the sum of total carrying cost and ordering cost.

Total cost = A/Q x O + Q/2 x C................... I

By differentiating the equation we get,

$DT/dQ = C/2 - AO/Q^2$....................... II
(Pandey, 1999, p-89)

Again

$C/2 - AO/Q^2 = 0$

Or, $Q^2C = 2AO$

Or, $Q^2 = 2AO/C$

Or, $Q = \sqrt{2AO/C}$

Let us illustrate this EOQ method

i) Annual Demand (A)	= 1,000.00
ii) Ordering Cost (O)	= Rs.5 per Order
iii) Carrying Cost (C)	= Rs. 1.25 per unit per year
iv) Price per unit (P)	= Rs.12.50

Solution:
EOQ = $\sqrt{2AO/C}$

= $\sqrt{2}$ x 1000 x Rs.5 /Rs. 1.25

=$\sqrt{Rs.10,000/Rs.1}$
=$\sqrt{8,000}$

=89.4427 Units =90 Units (approx.)

b) Assumption of EOQ

The calculation of EOQ presumes that:

a) There is a known stock - holding cost,

b) There is known constant ordering cost,

c) Rate of demand is known.

d) Constant price per unit is known, and

e) Replenishment is made instantaneously.
   (Saxena, Op. Cit. p-A 2.13)

c) Lead-time

It is assumed that an organization would get suppliers of materials immediately after placing order but there may be a span of time between receiving and ordering. This span of time is known as lead-time i.e. an organization places 20 times order per year. If the lead-time is 8 days, management simply should decide to order 12 days after the receipt of the previous delivery.

d) Re-order Point

The problem how much to order, is solved by EOQ, yet the answer to be sought to the reordering point. The reordering point is that inventory level at which an order should be placed to replenish the inventory. To determine the reorder point under certainty, we should know a) lead time b) average usage and c) EOQ

Lead time is the time normally taken and replenishing inventory after the order has been placed. By certainty we mean that usage and lead time do

not fluctuate under such situation reorder point is simply that inventory level which will be maintained for consumption during the lead time that is:

Reordering point = lead time x average usage
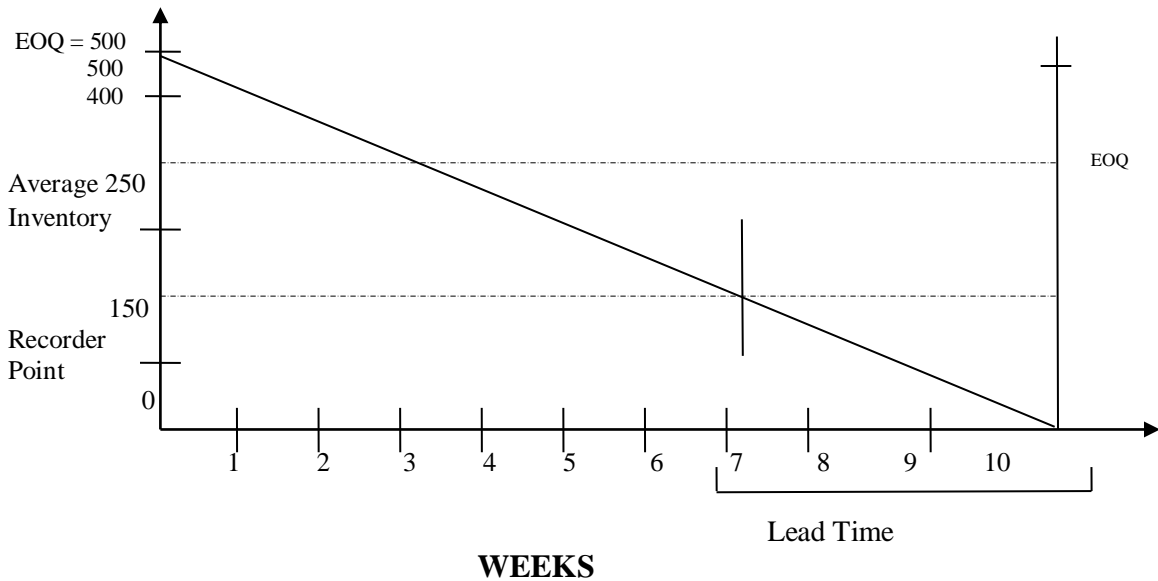
WEEKS
Fig. 2.2: Recorder Point under certainty

To illustrate, let us assume that the economic order quantity is 500 units. Lead time is 3 weeks and average usage is 50 per weeks. If there is no lead-time i.e. delivery of inventory is instantaneous, the new order will be placed at the end of 10th week, as soon as EOQ reaches zero level. But as the lead-time is 3 weeks, the new order should be placed at the end of 7th week, when there are 150 units to consume during the lead-time. As soon as the lead-time means an inventory level reaches zero the new stock of 500 units will arrive. Thus, the reorder point is 150 units (50x3 weeks), this is illustrating in this figures.

e) Safety Stock Level

The demand of material fluctuates from day to day or forms week to week. Similarly, the actual delivery time may be different from the normal lead-time. If the actual usage increases or the delivery of inventory is delayed, the firm can face a problem of safety stock. The firm may maintain a safety stock-some minimum or buffer inventory as cushion against expected

increase usage and/or delayed in a delivery time. Assume in the previous example: the reasonable expected stock-out is 25 units per week: the firm should maintain a safety stock of 75 units (25 units x 3 weeks). Thus, the reorder the point will be 150+75 units = 225 units. The maximum inventory will be equal to the economic order quantity + safety stock, i.e. 500 units + 75 units = 575 units. The formula to determine the reordering point when safety stock is maintained is as follows:
(Pandey, Op. Cit., pp-888-889)

Re-order Point = Lead time x Average usage + safety stock
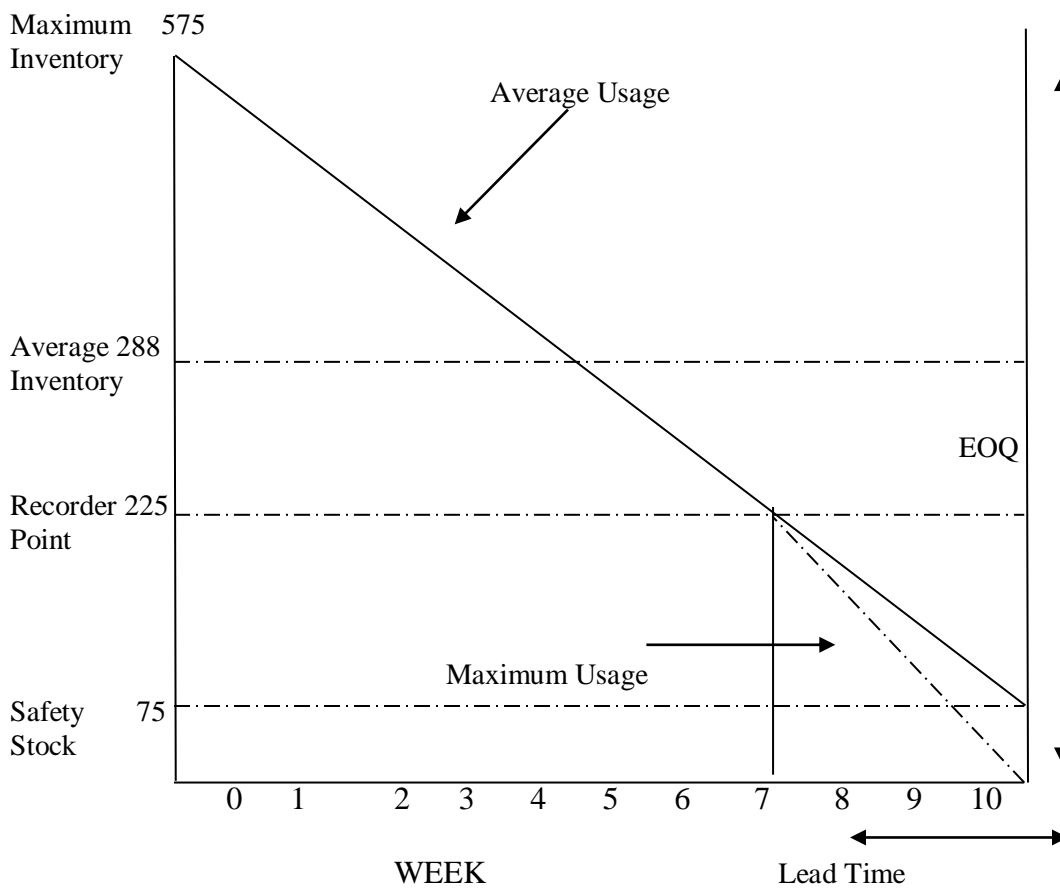
Fig. 2.3: Re-order Point and Safety Stock under Uncertainty

If in case of uncertainty, the reorder point may be like below:

Re-order point = safety stock + lead time x Average usages.
In this case we must know the maximum and minimum stock level and danger stock level.

i) Maximum Stock Level:

This represent the quantity above which stock should not be allowed to keep the purpose of keeping this level is saving the company from the demerits of overstocking. Maximum stock level represents the upper limit beyond which the quantity of any item is not normally allowed to rise. The main object of establishing this limit is to ensure that necessary working capital is not blocked in stores. Theoretically, maximum stock level is the sum-total of minimum stock level and economic order quantity. Maximum level may be expressed as follows:

Maximum Level = Recording Level + Re-ordering quantity - Min. Consumption

=Re-ordering Level + Re-ordering quantity - {Min. Consumption per Period x Minimum Re-ordering Period}

The maximum stock level for particular items is fixed after considering the following points:

a) Rate of consumption of material. b) Storage space available. c) Lead time from the date of placing the order. d) Nature of materials. e) Working capital required. f) Inventory carrying cost. g) Market trends. h) Fashion habits. i) Government restriction. j) Economic order quantity. k) Risk involved due to fire, obsolescence and evaporation.
(Saxena and Vashist, Op. Cit., p-A 2.9)

ii) Minimum Stock Level:

This is the lower limit below which the stock of any item should not normally be allowed to fall. This is also technically known as safety or buffer stock. The main objects of determining this limit is to protect against stock out of a particular item. The prime considerations in fixing the

minimum stock level or safety stocks are: a) Average rate of consumption and b) lead time, i.e. the time required for replenishment.

Minimum Level = Re-ordering Level - {Normal Usage per period x
Average delivery time}

iii) Danger Stock Level:

This is generally fixed below the minimum stock level. Normal stock should not be below the minimum level. If it reaches the danger level at any point of tie, urgent action for replenishment of stock must be taken to prevent stock out (Saxena and Vashist, Op. Cit., p-A 2.10).

2.1.8 Inventory System

a) Inventory System Concepts

An organization keeps different types of items in inventory to meet its needs. In order to know the concept of inventory and its application in our real practice, it will be better to be clear about the inventory system concepts. The concepts of inventory system can be broadly viewed as follows. (Regmi and others, p-86)

b) Multi-Stage Inventory

If an organization produces product, it generally has to use raw materials and other supplies. For this purpose, it has no maintained stock of raw materials to regulate production of goods and service. Similarly, it has to maintain inventory of parts and components. Work in progress in different production stages to produce desired goods and services in time, cost and quality. Multi stage inventory focuses on the inventories of different points of production stages and tries to maintain balance inventory levels at each stage and for the whole conversion system. 1bid
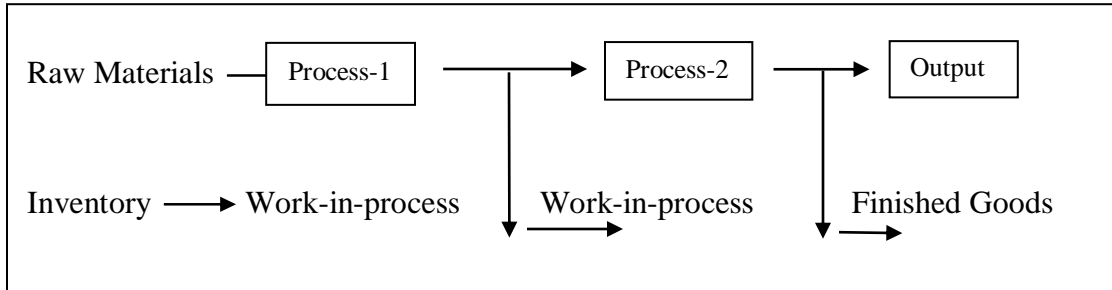
Fig: - 2.4 Multi – stage Inventory System Concept

c) Multi-echelon/Level Inventory

After production of goods, they have to be distributed to customers through a proper marketing channel. While distributing goods in the market, inventories may be maintained in various levels in its distribution system. In concept of multi-echelon inventory is concerned with the study, analyze and control of inventories in various distribution levels. In other words, it deals with the management of inventories at different points of distribution system of an organization (Regmi and other, p-87).
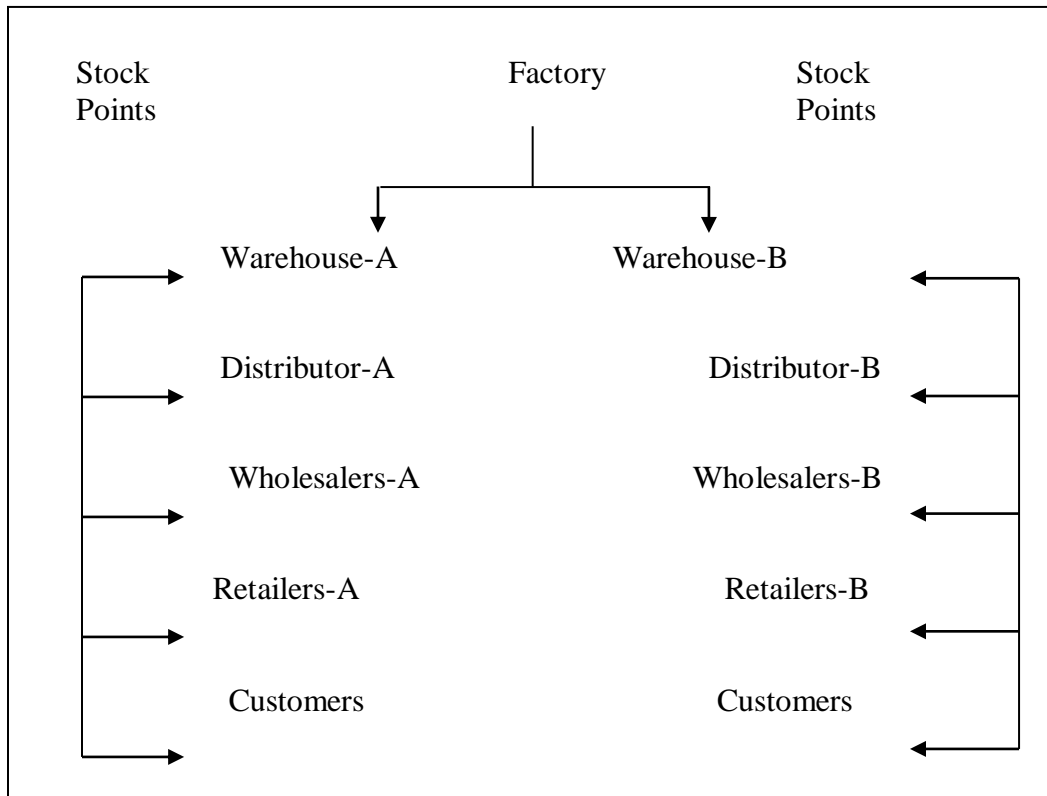
Fig: - 2.5: Multi Level Inventory

2.1.9 Types of Inventory System

There are two types of inventory systems. They are as follows:

i) Continuous Inventory system

ii) Periodical Inventory System

a) Continuous Inventory System (Q/R-Model)

This system first of all determines the fixed order quantity Q, and reorder stock level R. Fixed order may be in units or amount but the reorder level should be in the units, in other words, order quantity is predetermined. Therefore, it is also called fixed order quantity/perpetual inventory system or economic order quantity model (EOA) or Q/R model.

Fixed order quantities models are event triggered because fixed quantity of inventory is ordered when it reaches at reorder level. The order can be placed at any time which depends on the demands of the stock. Therefore, withdrawals and additions of stock should be reordered and monitored regularly to update and ensure the reorder level.

The basic assumptions of the fixed order quantity model are as follows:

a) Demand for product (D) is constant throughout the period.

b) Lead time (L) is constant.

c) Price Cost (P) per unit is constant.

d) Carrying cost/holding cost (C) depends on average inventory

e) Ordering and setup cost (O) are constant.

f) No stock out or back orders (S)

The graphic presentation of continuous inventory system is as follows: (Regmi and other, pp-87-88)
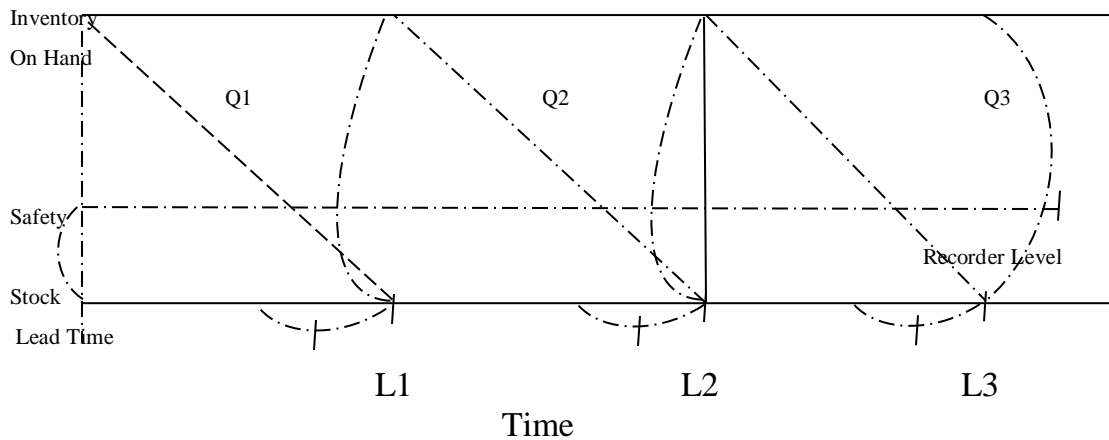
Fig: 2.6 Continuous Inventory Systems

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b) Periodical Inventory System (P-Model)

Under this system, inventory is counted in fixed time interval (t) to determine the quantity of inventory to place an order (Q). In this system, order quantity (Q) depends on the actual quantity of period. It is time triggered, varies from time to time, depending upon usage rates. Generally, it requires high level of safety inventory than Q/R model. It is also called fixed period inventory system.

In this system, it is assumed that inventories would be counted as the specific time intervals. As a result, it is unnoticed about the stock position and shortages. Periodical inventory system is as follows. (Regmi and other, pp-88-89)
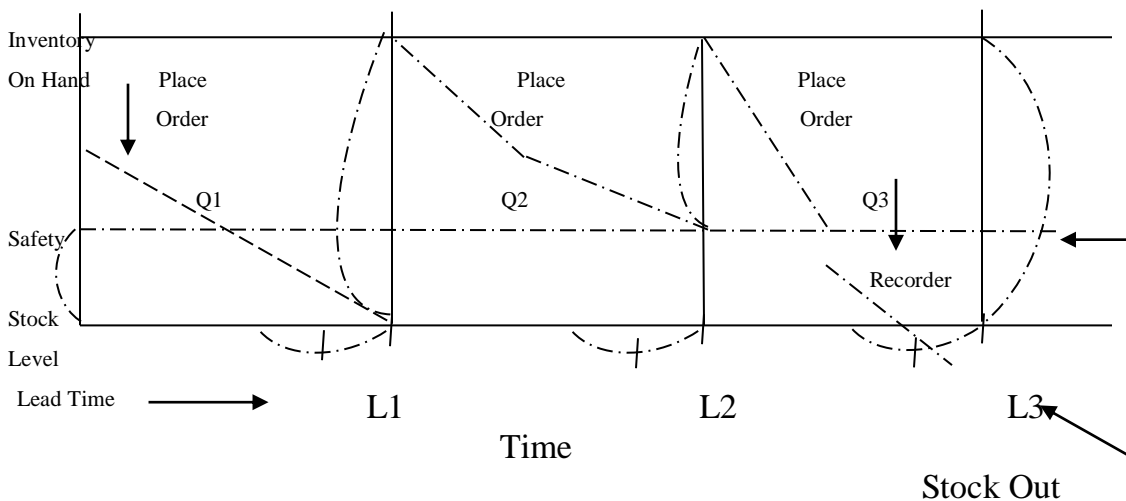
Fig: 2.6 Periodical Inventory Systems

From the above figure, it is clear that inventory will be inspected in certain time interval. There is no constant order quantity (Q). On the first order quantity Q1, second order Q2 and third order Q3 should be placed according to the inventory position at the time of inspection. As a result, sometimes stock out may occur during the inventory planning period.

2.1.10 Inventory Control Procedure

There are many inventory control system. They are followed in maintaining

adequate control each inventory item, and ensuring accuracy of stock on hand. The following are some controlling systems:

a) One Bin System

It is a periodical replacement system of inventory control. In this system, inventory for a fixed period such as a week, month, quarter etc. is purchased up to predetermine maximum inventory level. Whenever inventory is used, it will be replaced in certain periods. Therefore, there is not fixed order quantity like periodical inventory system.
(Regmi and other, pp-89-90)

b) Two Bin System

Under this system, two bins are used. First bin contains the items for day to day operations and second bin contains the stock or item equal to reorder point. When stock in the first bin is finished, stock would be brought from second bin and order will be placed to replenish stock in the second bin as well as in the first bin like Q model. This process will continue till the date of inventory planning.
(Regmi and other, pp-88-89)

c) Cardex File System

A cardex file system is a manual operated inventory system in which inventory card represents each stock item with transaction kept on the cardex. Following are some characteristics of the cardex file system:

i) A card for every item is filed on a rotating down on file cabinet.

ii) On the top of the each card is the computed operating doctrine (EOQ reorder level)

iii) Balance of the card refers the ledger of the beginning inventory, orders placed, ordered received and issues from stores and current inventory levels.

When transaction occurs, the entry with corresponding date is recorded. When physical inventories are taken, cards are adjusted to show current inventory levels. ibid

d) Management Accounting and Production Information Control System (IBM's MAPICS)

It is an IBM's computerized common data base system for manufacturing information and control. It includes many models such as financial order processing; accounting and manufacturing for implementation of planning, key models for controls are product data management, material requirement planning, inventory management production costing and control applications.

Inventory management application reduces times, increases overall plant capacity, reduces investment stock and space, improves customer's services and provides inventory and reports.

2.1.11 ABC Inventory Planning System

A firm maintains large number of inventories of several types. It is impractical and impossible to control all these inventories with equal attention. The main reason is that all inventories are not equally important to firm from the viewpoints of cost, profit, sales, availability etc. Therefore, firm should pay more attention to those items whose value is the highest. Therefore, always better control (ABC) analysis is a technique which concerns with classification of inventory into three groups.

i) Group A: It includes few items with large values.

ii) Group B: It includes items with moderate volume and value.

iii) Group C: it includes items with high volume with small value.

Break Down of Group A, B and C of items depends on individual business conditions as follows.
(Regmiand and other, pp-98-99)

Table: 2.3

ABC Inventory Planning System

Category	Percent of Items	Annual Value of Inventory
A	10-20	70-85
B	20-30	10-25
C	60-70	5-15

The classification is based on actual percentage of inventory items and annual value of such item by plotting in a graph called ABC distribution curve (pereto curve)

The comparison of A, B and C items are as follows.
(Regmi and other, p-99)

Table: 2.4

The Comparison of A, B and C items.

Group A	Group B	Group C
Maintain close control	Moderate control	loose control
size of order based on calculated requirement	size of order based on usage	size of orders based on inventory level
keep record receipt and uses	keep record of receipt and use	no records are kept
more effort to reduce load time	moderate effort	minimum effort
frequent ordering	less frequent ordering	bulk ordering
high consumption value	average consumption value	low consumption value
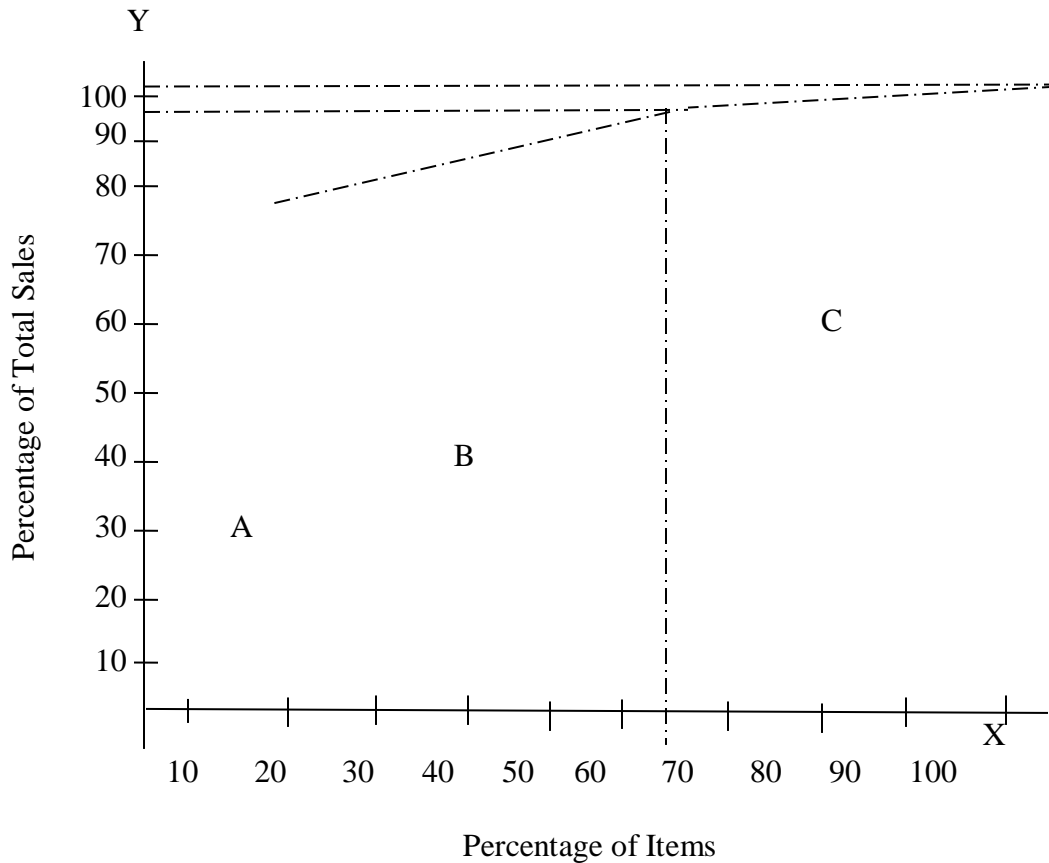
Fig. 2.8: ABC Classification of Inventory Items

2.1.12 Inventory Turnover

The relationship between sales and stock is known as Inventory turnover. The ratio of sales to stock evaluates the efficiency of the company in inventory management. Inventory effects on sales directly because sales is supported by the level of inventory of finished goods. Generally higher ratio indicates the efficiency of the inventory management.

The efficiency of firm's inventory may be calculated by dividing the costs of goods sold by the firm's inventory.

Inventory turnover =   <u>Cost of goods sold</u>

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Average inventory

The significance of inventory turnover is that it helps the analyst measure the adequacy of goods available to sell compared to the actual sales. Either a high or low ratio may be an indication of poor management as follows:

a) High turnover may indicate future shortage

A high inventory turnover results when the firm maintains extremely low stock of goods or raw materials. The low level of finished goods may indicate that firm will suffer a loss of sales due to an inability to deliver good promptly. The low level of raw material could cause shut down of the firm's production line resulting in higher cost.

b) Low turnover may indicate overstocking of Inventory:

A low inventory turnover results from excessive inventory being used by the firm. Overstocking invites higher carrying cost.

2.1.13 Inventory Valuation:

In any organization different goods are purchased at different time at different price rate. But the problem emerged to identify the position to current assets of the organization is to assign value to these goods. Balance sheet of the organization should show true and fir view of the financial position of the organization. For these purpose assets including inventory should be properly valued to exhibit a true and fair view. True profits cannot be calculated unless assets are properly valued. There are different methods available for the inventory valuation.

a) Specific Identification Method

Under this method, purchase made for particular jobs are kept physically separate in the store in the storerooms and store cards are made out for the individual purchase. When materials are issued for jobs, requisitions are priced at the exact cost as recorded on the appropriate store cards. This system is time consuming but it is used effectively.

Some concerns operating on a job order basis use this method to price issues of materials that is regularly used in production. This method does not have wide usage in big concerns due to its obvious limitations. This method is also referred to as specific cost method (Saxena and Vashist, Op. Cit., p-A 2.42).

b) First in First out Method (FIFO)

Under this method, the earliest lots of materials or goods purchased or goods manufactured are exhausted first and closing stock is out of the latest consignments received or goods manufactures and is valued at the cost of such goods. In other words, cost of goods sold is calculated keeping in view the earliest lots exhausted on the presumption that units are sold in the order in which they were acquired (Jain and Narang, Op. Cit., pp-111-115).

c) Last in First out Method (LIFO)

As against the first in first out method, latest consignment of materials or goods manufactured is exhausted first under this method. Therefore, closing stock is valued at the cost of the earliest lot on hand and the cost of goods sold is based on the cost of recently purchased goods. This method is also sometimes known as the replacement cost method because materials are charged to production at the current cost unless materials were purchased long ago. This method was first introduced in the USA during the Second World War to get the advantages of rising prices (jain and Narang, Op. Cit., pp-111-115)

d) Average Cost Method

The principle on which the average cost method is based is that all items in the stores are so mixed up that consumption of materials or sales of finished goods cannot be made from my particular lot of purchase or manufactured goods. So, closing stock is valued at the average cost of the various items on hand. Average may be of two types:

i) Simple Arithmetic Average Price

It is obtained by taking the average of the prices without taking into consideration. Suppose, following are the three different lots of material in stock at the end of the year when stock taking is done.

1,000 units purchased @ Rs.10 per unit

2,000 units purchased @ Rs.11 per unit

3,000 units purchased @ Rs.12 per unit

In this example simple average price will be Rs.11 calculated as below:

(Rs.10+Rs.11+Rs.12)/3

= Rs.11

Closing inventory of 6000 units will be valued @ Rs.11 per unit and it will valued at Rs.66, 000.

ii) Weighted Arithmetic Average Price

This price is obtained by dividing the total cost of items in stock by the total quantity of items in hand. In the above example, the weighted average price is Rs.11.33 per unit calculated as follows:

(1000x10+2000x11+3000x12)/(1000+2000+3000)
= Rs.11.33
(Jain and Narang, Op. Cit., pp-118-119)

e) Inflated Price Method

Under this method, closing stock is valued at a price higher than the actual cost to provide for the normal loss. For example, 1000 tones of coal are purchased @ Rs.300 per tomes, incidental expenses being Rs.15000. If the loss due to loading and unloading is 50 tones and if the quantity of coal used is 760 tones, then the value of closing stock (190 tones) of coal will be

as follows:

	Rs.
Cost of 1000 tones of coal @ Rs.300	300000
Add. Incidental expenses	+15000

	315000

Cost of 1000 tones becomes the cost of 950 tones because of a normal loss of 50 tones.
There fore value of closing stock = (315000x150)/950 = Rs.63000
(Jain and Narang, Op. Cit., pp-111-118)

f) Higher in First out Method (HIFO)

This method is used on the assumption that closing stock of materials or goods manufactured should always remain at the minimum value, so lots of the highest cost of materials purchased or goods manufactured are exhausted first. Consequently closing stock is valued at the minimum value of various lots, which are not exhausted up to the date of stock taking. This method is not popular as it always undervalues the stock, which amounts to creating a secret reserve. This method is mainly used in case of cost plus contracts or monopoly products as it is helpful in increasing the price of the contract or products. (Jain and Narang, Op. Cit., pp-111-117)

g) Market Price Method

Market price can either be the replacement price or the realizable price. The replacement price is used in case of items, which are held in stock for use in production while realizable price is used in respect of the items which are kept in stock for sale. This method of valuation of stock is followed when the market value is lower than the cost so that possible losses may be provided for. This method can also be successfully used for the valuation of obsolete items of stock which have been lying in the sores for a long period. (Jain and Narang, Op. Cit., pp-111-119)

h) Standard Cost Method

Under this method requisitions of materials are priced at standard cost. Standard cost is determined after careful consideration of different factors that are likely to affect cost when standard cost of material is determined. Management assumes specified efficiency in efforts relating to purchase of material issue of material storing of material and use of material etc.

When standard cost is used as a basis for pricing the material issue, a standard price is set for each material and actual price is compared with standard price. This method is very useful for management in determining the efficiency of efforts relating to materials purchase materials issue and materials usage etc. (Jain and Narang, Op. Cit.,pp-111-120)

i) Just in Time (JIT)

Just in time philosophy is dedicated to elimination of waste. In the context of JIT, waste is anything that does not add value. In an ideal JIT system, throughput time exactly equals its processing time. (Through time is the interval between the first stage of production and the point at which the finished product comes out of production line). This goal just like zero defects may be unattainable, but it sets target by which progress can be measured. When JIT philosophy is implemented throughout time is minimized. Inventory holding costs are almost eliminated and large gains are realized by improvement of quality and productivity. Throughput time is the aggregate of processing time, inspection time conveyance time and waiting time. In many factories processing time is less than 10% of throughout time. The Japanese manufacturers who have led way in devising and implementing JIT system emphases the importance of reducing throughput times rewriting the throughput equation as follows:

Throughput time = added value time + non added value time
(Saxena and Vashist, Op. Cit., p-A 2.13)

2.2 Review of Articles and Journals

Some studies have been made in the subject of inventory management but a few studies have been done on this matter some studies will be reviwed in

this chapter:

i) Govinda Ram Agrawal, management experts claim that inventory management in Nepal is probably the weakest aspect of management. The tools and techniques for controlling inventory has not been applied in Nepalese enterprises for controlling their physical as well as financial dimension. (Agrawal, 1980, p-296)

ii) Puskar Bajracharya has conducted a study on management problem in public secter manufacture enterprises in Nepal. One of the important findings was regarding the inventory. Their management suffers from lack of planning, high carrying cost, poor recording and stores management and virtual absence of controlling system.
(Bajracharya, 1983)

iii) Rao and Jagmohan also 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 orienting the attitude of the staffs towards material cost because lack of knowledge and carelessness, which were the responsible of this management of inventory.
(Rao and Jagmohan, 1981)

iv) A study relating to Nepal Transport Corporation concerning with various aspect was made by CEDA. One of the major findings was that through inventory management of this factor is rather simple but due to management of stocking spare parts hampered the smooth operation of the enterprises. (CEDA, 1973)

2.3 Review of Previous Studies on Inventory Management

As management of any enterprise is the vital point, which will determine that whether the enterprise is running towards the objectives of no. Similarly, inventory management is very important and vital point to be considered for the achievement of objective.

From the study of various thesis, dissertations, business reports and government publication it is found that no public enterprises are applying

modern methods or techniques to manage inventory as per the requirement while private enterprises are applying some modern methods.

Some earlier studies made of inventory management considered relevant are reviewed below.

1. Mr. Karna, Sanjeev Lal conducted a research work in the topic of "Inventory management system of listed publications". Comparative studies of Gorkhapatra Corporation and Kantipur Publications Pvt. Ltd. in 2007. The main objective of the study were to assess how the inventories are maintained and their consequences on cost and profit, to find out what techniques have been applied to manage the inventories in the corporation, to provide an idea of how inventories of inputs are maintained and how replenishing orders are placed.

Major findings of his study were that the both corporation has not applied scientific tools and techniques of inventory management to make major decisions. When and how much to buy and steps taken by the corporation with regard to according and maintain the inventories is not well. Unnecessary cost involved in ordering and carrying is reduced to certain level by the use of models, formula etc.

At the end, Mr. Karna, Sanjeev Lal had recommended to the economical order quantity (EOQ) formula to determine the most economical order quantity. He had further suggested to classify the required inputs according to ABC model i.e. items having highest usage value should be given precise control while lowest and early applicable system can be used to manage inventory in a simple way.

2. Mr. Sharma, Amrit Kumar has conducted a research work on the topic of "Inventory management: A case study of Royal Drugs LTD". The main objectives of this study are to identify the problem underlying in inventory management and control system of Royal Drugs Limited. The other objectives are:

- To assets all types 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.

Some major findings pointed out based in his analysis work as follows:

- When and how much to order is estimated haphazardly and orders quantity fluctuates year to year.

- The Royal Drugs Limited (RDL) has established a separate unit for management of inventory although the separate unit is unable to manage the inventory.

- Economic order quantity (EOQ) model is not applied and safety stock is estimated roughly.

- The company does not use ABC analysis and plays equal attention for the entirely inventory held in the store.

On the basis of study conducted by Mr. Sharma, the following suggestion has been recommended.

- The company should define its goal and objectives clearly.

- The company should follow all the quantitative techniques and models such as EOQ model and ABC analysis model so that total cost can be reduced.

- Ledger cards can also be used to manage inventory in a simple way.

- General Manager should be professional one and he should not be changed frequently due to political interference.

3. Mr. Yadav, Surendra Prasad has conducted the research work on the topic of "Inventory management of public manufacturing enterprises: A case study of Janakpur Cigarette Factory Limited"

The main objectives of this study were to identify the problems in inventory management of Janakpur Cigarette factory. To achieve these objectives he has defined the following sub-objectives:

- To study the present practice of collection and procurement of raw materials in Janakpur Cigarette Factory (JCF).

- To analyze the present position of inventory in JCF.

- To identify the problems faced by JCF in the management of inventory.

- To provide suggestion and recommendation on the basis of above study and finding.

Finding of Mr. Yadav is that although the company is running at profit during research period, the production and sales of cigarette is JCF are gradually decreasing. The consumption pattern of the factory is also fluctuating from year to year like purchasing pattern. No EOQ model is used to determine optimum order quantity. Various inventories used in the company are not classified according to ABC analysis. Management should be handed over to skilled and professionally expert person having no political interference. Reliable source of supplier of in puts should be determine

4. Mr. Pant, Dinesh Kumar conducted a research work on "Impact of Inventory over the profit: A case study of Gorkhapatra Corporation". He has reflected some problems 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 seems not reliable because in casual circumstances the corporation has taken the basis of local purchase, which is nearly double, costly than the L/C purchase. No any tools and techniques have been used to improve as well as prevent cause of wastage and leakage of the cost. But there cost

is the economic parameter for corporation's decision model. Moreover, lack of transit to home facility, dissatisfaction among employees, biasness in performance appraisal, lack of accountability towards the work, the poor vision of top authority are also the major problems.

The objective of his study were to explore the underlying constraints in existing 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 materials i.e. newsprint, ink, film sheet and aluminums sheets in GPC, asses the relevant financial ratios, analyze the relationship between inventory/material cost and profit and to provide appropriate suggestion base on the major finding

The major findings of this study were that the corporation did not use any tools and techniques to manage inventory. Inventory turnover ration is flexible, net profit margin is inconsistent, return on total assets is more flexible return on net. Worth is also inconsistent, regression and correlation analysis have shown the positive relationship between inventory/material costs and profit.

5. Mr. Gautam, Vibhas has conducted a research study on "A study of inventory
management of Nepal Oil Corporation Limited" to analyze the efficiency and present position of inventory management of NOCL. His objective was to identify the problem faced by NOCL in application and practice of inventory management.

Mr. Gautam has collected related information and data from both primary and secondary sources. Primary data are collected through interviews and discussion whereas secondary data are obtained from published and unpublished documents related to NOCL. He gathered books, articles, magazines and official record on NOCL for the company's actual data collection. The researcher has applied statistical, financial and accounting approaches to evaluate and examine the gathered data. Some of his significant findings are as follows.

- NOCL is the only organization to supply the petroleum related fuels

in the kingdom of Nepal; therefore it has to act in favor of consumer interests and needs.

- NOCL's inventory control system is weak; therefore the company has always suffered over stock or stock out situations.

- NOCL is failed to practice basic inventory management techniques and it always maintain rough safety stock for 35 days which is fluctuating every time.

- NOCL should attempt convenient models and techniques to control and manage the inventory to avoid over stock, under or stock out situation, which lead organization to maintain mutual price level during the right time period.

6. Mr. Niraula, Sangit had studied on "Inventory management in Diary Development Corporation (Biratnagar Branch)" in April 2003. From his study he had concluded the following finding.

- Biratnagar milk supply scheme do not have good practice for optimum number of order to procure the materials.

- It has utilized low percentage of production capacity than it has.

- The project has lack of study on effective and efficient inventory management system for controlling inventory.

- The factory is not applying the method of calculating maximum, minimum safety stocks.

- There is no proper and timely improvement in inventory management.

- Inventory handling days of the company is being higher.

7. Mr. Dahal, Purushottam Prasad has carried out a research study on "A study on Inventory Management of Dabur Nepal Pvt. Ltd. and Nepal Lever

Ltd." in 2008. His aim of study was to examine and find out the present position of inventory management of both companies.

Mr. Dahal has used both primary and secondary sources of data along with previous studies, articles and published\unpublished official record of both organization for the sake of examination and analysis. He used various accounting financial and statistical tools to analyze the data his findings were:

- Both the organizations use raw materials from local, India and third countries where they are unable to practice inventory management.

- Purchasing raw materials in NLL is fluctuated where as 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 don't apply dynamic management system.

- The researcher has suggested that the both companies should apply the control of stock level to get better performance.

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 and techniques that have been developed to optimize inventories.

Many studies have reported that implementation of scientific inventory management is essential in Nepalese business organization. However, there has been very little research on the effectiveness of such use. To practice of the scientific inventories management tools, it is most essential to improve the organizational effectiveness along with well-trained and experienced professor's ideas. The present study is directed towards the effective use such tools as compared to traditional inventory management tools.

CHAPTER – 3

RESEARCH METHODOLOGY

3.1 Introduction

Research is a systematic organized effort to investigate problem that needs a solution. This process of investigation involves a series of well through-out activities of gathering, recording, analyzing and interpreting the data with purpose of finding answer to the problem. Thus, the entire process by which we attempt to solve the problem or search the answer to question is called research methodology. The object of this research work aims to answer to the question that what inventory management system is being applying recently and what should be the actual inventory management system in Kantipur Publication and Kamana Prakashan Samuha. The objective of this study is to analyze the inventory management and control system of Kantipur Publication and Kamana Prkashan Samuha and there by forward some measures to improve the situation (Wolf and Pant, 2002, p-4).

The methodology which has been used in this study consists of research design nature and sources of data, data gathering procedure and analytical tools used etc.

3.2 Research Design

It is plan structure to investigate and the facts in order to arrive at the conclusion. This enables to save time and resources, such a plan of study or blueprint for study is called a research design. The design may be a specific presentation of various steps in the research process. The step includes the selection of a research problem, presentation of the problem, formulation of hypothesis, conceptual clarity, and methodology, survey of literature and documentation, bibliography, data collection testing hypothesis, interpretation, presentation and writing.

3.3 Population and Sample

The study has been focused 0n the topic of inventory management of print

media business. It is a comparative study on inventory management system of two old and most competitive private sector publication, "Kantipur Publication Pvt. Ltd. and Kamana Prakashan Samuha Pvt. Ltd." The population includes all the print media business in Nepal i.e. all the publishers of news, journals and magazines. They are regional, national, international newspapers and magazines available in Nepal.

There are all together 110 small and medium publication houses outside the Kathmandu valley. They are initiated towards the print media business. The publishers of the newspapers and magazines in the Kathmandu valley are given below:

   i.   Gorkhapatra Corporation, Kathmandu

   ii.   Kantipur Publication Pvt. Ltd., Kathmandu

   iii.   Kamana Prakashan Samuha Pvt. Ltd., Kathmandu

   iv.   Himalayan Times Pvt. Ltd., Kathmandu

   v.   Nepal Republica Media Pvt. Ltd., Kathmandu

   vi.   Naya Prakashan Pvt. Ltd., Kathmandu

   vii.   Bhrikuti Prakashan Pvt. Ltd., Kathmandu

 viii.   Mulyankan Prakashan Pvt. Ltd., Kathmandu

   ix.   Utasarya Prakashan Pvt. Ltd., Kathmandu

   x.   Spective Pvt. Ltd., Kathmandu

   xi.   International Media Network Nepal. Pvt. Ltd., Kathmandu

   xii.   Earth Pvt. Ltd., Kathmandu

  xiii.   Rajkamal Pvt. Ltd., Kathmandu

xiv.   Suman Pvt. Ltd., Kathmandu

xv.   Shivpuri Pvt. Ltd., Kathmandu

xvi.   Himkoli Mudrak Tatha Pvt. Ltd., Kathmandu

xvii.   Suprawaha Publication Pvt. Ltd., Kathamandu

xviii.   Nepal Bhushan Neupane Pvt. Ltd., Kathmandu

xix.   Bikash Prakashan Pvt. Ltd., Kathmandu

xx.   Current Publication Pvt. Ltd., Kathmandu

xxi.   Kalpatru Prakashan Pvt. Ltd., Kathmandu

xxii.   Udagam Publication Pvt. Ltd., Kathmandu

xxiii.   The Mirror Media Pvt. Ltd., Kathmandu

(Source: Mudran Sansar Directory, 2009)

3.4 Nature and Source of Data

For the reliability and effectiveness of research work valid information are necessary because information are the lifeblood for any research.

In order to achieve the objectives of the study, both primary as well as secondary data have been used. Primary data is collected through personnel observation, information, and interview with officials of publication houses. For this purpose some structured questions have been asked with personnel officials of both publication .These are:

a) What is the current position of inventory?

b) Which type of difficulties faced to manage inventory previous inventory position?

c) To make co-ordination between current inventory position, which types of tools and techniques, is used?

d) What types of preparation is made to face the problem which may arise in relating to inventory?

e) Which types of problem is faced to calculate total inventory cost?

f) How many units of raw material are generally ordered by inventory department to produce at given time?

g) Which types of problem is created by the suppliers of publication and provisions to face the same problem?

h) What inventory items warrant special attention?

i) What is the condition in which there may arise relating to high cost problem?

j) Which types of provisions made to face the high cost of raw materials?

k) Which types of inventory /goods may misuse and what is the provision is made to prevent the misuse of inventory?

l) How does goods in transit affect the re-order lend?

m) Which model is used by publication to seasonal demand fluctuation?

Secondary data have been collected from the published and unpublished documents, books, articles and newspaper, and record keeping books, financial statements like balance sheet, profit and loss account of publication houses.

Inventory management system of listed publication (A comparative study of Gorkhapatra Corporation and Kantipur Publication Pvt. Ltd.). A thesis submitted to Nepal commerce campus by Mr. Karna, Sanjeev Lal in 2007.

A comparative study of inventory management of Dabur Nepal Pvt. Ltd. And Nepal (Uni) Lever Ltd. A thesis submitted to T.U. by Mr. Dahal , Purushottam Prasad in 2008 other related thesis found in NCC & T.U. library and related websites.

3.5 Data Gathering procedure

The data collecting procedure used for the study are as:

a) Selecting and making the topic and finally making the bibliography from the available literatures, journals and other books.

b) Reviewing these Literature, Journals and books.

c) For collecting the required data, different type data unpublished financial statement, records have been collected.

d) For the collection of primary data, different types of interview have been conducted with official persons along with personal observations of the activities relating to staffs. A questionnaire was also prepared for the collection of necessary information.

3.6 Analytical Tools used

The study is basically conducted on inventory management area. So, inventory related data are used for drawing conclusion. To draw the conclusion, crude data are compiled and analyzed. To analyze the collected facts and figures, various tools and techniques were used to analyze the effectiveness of inventory management and control whenever necessary. Various analytical tools were used in this study.

3.6.1 Financial Tools

a) Economic Order Quantity (Deterministic Model) (EOQ)

The economic order quantity is that inventory level which minimizes the total cost of ordering and carrying. It attempts to establish the most economic balance between the carrying costs and ordering costs determining the quantity to be ordered.

The basic objectives of this technique; however is to determine the optimal size of order to be placed on the basis of usage ordering costs and carrying costs. The formula used in calculating the EOQ is:

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

Where,

A = Annual requirements

O= Ordering cost per order

C = Carrying cost per unit per year

b) Re-order Level (ROL)

This refers to the level at which new orders are placed to low stocks. New supplies will be received before reaches the minimum level. It is set on the basis of:

- Rate of consumption

- Minimum level

- Delivery Time

- Stock cost

Re-Order level can be calculated from the following formula:

Re-Order Level = Maximum Consumption X Maximum Delivery Time

OR

Re- Order Level = Safety stock + Lead time X Average uses

Where,

Safety Stock= Amount of stock needed to guard against a stock out.

Lead time = The time span between placing an order and
                    Receiving the goods

OR

RE- Order Level =   Maximum Level + Consumption during the time
                    Required to get the fresh delivery (i.e. Daily
                    Requirement X Time required for fresh delivery.)

c) Safety Stock

Safety stock is buffer to meet some unanticipated increase in usage. In order to guard against the stock out, the firm may maintain a safety stock. It is difficult to predict or forecast accurate usage and lead-because of the time is uncertain. The demand of inputs may fluctuate from day or week to week.

Safety Stock = Average Consumption   X $\sqrt{\text{Lead –Time}}$

d) Lead Time

It is a time span between one order and second order. It is calculated as follows:

Cycle time = $\dfrac{\text{Days in year}}{\text{A/EOQ}}$

Where,

A= Annual Requirement

EOQ = Economic Order Quantity

There are 365 days in a year

e) ABC analysis (Selective inventory control system)

According to this control system the inventories, which have highest value and lower quantity, pay more attention. The firm therefore, should classify inventories to identify which item should receive the most effort in controlling. The high value items are classified "A" and around be under the tight control "C" items represent the high quantity but the low value would be under simple control. Items "B" fall between these two categories and require moderate attention of management.

According to ABC analysis concept, the item of inventory of Kantipur Publication Pvt. Ltd. and Kamana Prakashan Samuha Pvt. Ltd. are categories as A, B and C on the basis of their usage value as shown in table below:

Category	Inventory Item
A	Newsprint Paper
B	Ink Color, Film Sheet & Aluminum Sheet
C	Ink Black / White, Chemical & Stationery

Detail analysis of ABC Analysis has explained on the presentation and analysis of data chapter.

f) Inventory Turnover Ratio

In rests the efficiency of current assets i.e. inventory to convert it into sales. It is calculated from the following formula:

$$\text{Inventory turnover ratio} = \frac{\text{Cost of goods sold}}{\text{Average Inventory}}$$

Where,

$$\text{Average Inventory} = \frac{(\text{Opening Inventory} + \text{Closing Inventory})}{2}$$

3.6.2 Statistical Tools

Many kinds of statistical tools can be applied to examine the relationship between financial data of the publication. In this study the following statistical tools have been taken into consideration.

a) Mean

It is calculated by dividing the number of variables to number items, symbolically,

$$\bar{X} = \frac{\sum x}{N}$$

Where $\bar{X}$ denotes mean / average

$\sum X$ denotes the sum of all variables and N denotes no. of items observed.

b) Standard Deviation (SD)

It is a measure of each individual firm the mean it expresses mathematically how far the individual values deviated or differ from the mean. It is calculated using the following formula:

$$SD = \sqrt{\frac{\sum d^2 - \frac{\sum(d)^2}{n}}{n-1}}$$

Where SD, N and d denotes standard deviation, no. of observations and deviation from assumed mean respectively.

c. Coefficient of Variance (CV)

It measures corresponding relative of variation CV is computed as under:

$$CV = \frac{SD}{\bar{X}} \; X \; 100$$

d. Coefficient of Determination

It measures the degree of correlation between two variables, one dependent and another independent variable. Symbolically,

$$r^2 = \frac{a \sum y + b \sum XY - n\,y^2}{\sum y^2 - \; ny^2}$$

Where,

$$a = \bar{y} - \overline{bx}$$

$$b = \frac{\sum XY - n\,\overline{XY}}{\sum X^2 - \; N\overline{(X)^2}}$$

e. Correlation analysis:

The terms correlation indicates the relationship between two such variables in which with changes in the values of one variable, the values of the other variables also changes.

If two or more quantities vary in sympathy so that movement in the one tends to be accompanied by corresponding moments in the other then they are said to be correlated.

Karl Pearson, the greatest biologist and statistician, has given a formula for the calculation coefficient of correlation. According to it the coefficient of correlation of two variables is obtained by dividing the sum of the products

of corresponding deviations of the various items of the series from their respective means by the product of their standard deviation and the number of pairs of observations.

The formula of Karl Pearson's, coefficient of correlation is:-

$$r = \frac{\sum xy}{n\sqrt{\dfrac{\sum x^2}{n}\dfrac{\sum y^2}{n}}}$$

Probable error of coefficient of correlation

$$P.E = 0.6745\frac{1-r^2}{\sqrt{n}}$$

The value of r in the universe would be:

$$r \pm P.E$$

CHAPTER – 4

PRESENTATION AND ANALYSIS OF DATA

4.1 Introduction

The main objectives of this study is to examine the existing position of the inventory management system of Kantipur Publication Pvt. Ltd. and Kamana Prakashan Samuha Pvt. Ltd. on the basis of the analysis and diagnosis of the collected data and to provide the suggestions and recommendation for the improvement of inventory management of these publication.

In this chapter, collected data from the publishing houses are analysis according to the deterministic as well as probabilistic model or techniques as per the requirements of this study so as to know the real situation of inventory management system of publishing houses. The study covers the period of five years from 2061/062 to 2065/066.

4.2 EOQ Analysis

Economic Order Quantity is an important inventory control techniques. This technique is widely used in many countries in these days. Many organization of Nepal has been using this technique. The Kantipur Publications Pvt. Ltd. and Kamana Prakashan Samuha Pvt. Ltd. have been applying this technique from many years. It is tried to find out the economic order quantity (EOQ) of each item for both publishing houses with the help of their data and the data have been collected for five years starting from 2061/062 to 2065/066.

Table 4.1

EOQ ANALYSIS OF NEWSPRINT OF KP Pvt. Ltd. and KPS Pvt. Ltd.

Item A –"Newsprint"

FY	2061/062		2062/063		2063/064		2064/065		2065/066	
	KP	KPS	KP	KPS	KP	KPS	KP	KPS	KP	KPS
Annual Requirement (MT)	900	700	1000	688	910	735	950	620	1100	900
Pen Order Quantity (MT)	300	300	350	300	400	350	450	400	500	400
Cost Per Order (Rs.)	38000	35000	40000	38500	45900	42730	48000	45350	55000	49492
No. of Order Placed within a year	3 times	2 times	3 times	2 times	2 times	2 times	2 times	2 times	2 times	2 times
Ordering Cost (Rs.)	7054000	4869500	8026000	5439000	8065000	7090500	8601000	5550200	10112000	8580000
Carrying Cost (Rs.)	830	1485.71	795	1505.81	882	1596.32	899	1646.45	1013	1788.88
EOQ (MT)	3911.24	2142.09	4493.46	2229.37	4079.46	2555.27	4263.55	2044.51	4686.24	2938.25
Re-order Point (MT)	148	172	164	170	150	181	156	153	181	222

Source: Unpublished Records of KP Pvt. Ltd. and KPS Pvt. Ltd.

From the above table, it is found that both organizations have fluctuating trend in annual requirement of Newsprint. EOQ is greater than annual requirement of Newsprint of both organizations. Therefore, order should be placed up to its annual requirement at a time so that various expenses can be minimized. Number of orders placed within the year for both publishing houses are almost dame i.e. 2 times. Ordering cost of KP is higher than KPS. In the same way carrying cost of KP is lower than KPS. EOQ of Kantipur Publications is greater than Kamana Prakashan Samuha. Re-order point for both organizations have fluctuated comparatively it is seemed that Re-order point of Kamana Pakashan Samuha is higher Kantipur Publication. Therefore Kamana Prakashan Samuha should minimize the lead time.

Table 4.2

EOQ ANALYSIS OF INK OF KP Pvt. Ltd. and KPS Pvt. Ltd.

Item – B "Ink"

FY	2061/062		2062/063		2063/064		2064/065		2065/066	
	KP	KPS	KP	KPS	KP	KPS	KP	KPS	KP	KPS
Annual Requirement (MT)	16000	10500	18500	11720	20000	13880	21000	9800	21800	9460
Pen Order Quantity (MT)	4500	4000	5000	3500	6000	4000	7000	3000	7000	3000
Cost Per Order (Rs.)	150	120	175	150	190	165	220	180	260	200
No. of Order Placed within a year	4 times	3 times	4 times	4 times	4 times	4 times	3 times	4 times	4 times	4 times
Ordering Cost (Rs.)	31200	16380	42088	22854	49400	29773	60060	22932	73648	24596
Carrying Cost (Rs.)	40000	43200	46000	54060	51000	65204	57000	55580	65000	58840
EOQ (MT)	19984	9148.41	25058.44	10779.7	27837	13275	30509.32	8903.43	32833.54	8656.59
Re-order Point (MT)	1314.9	862.8	1520.4	963	2643.7	1140.6	1725.9	805.2	1791.6	777.30

Source: Unpublished Records of KP Pvt. Ltd. and KPS Pvt. Ltd.

From the above table, it is seemed that annual demand of Ink in Kantipur Publications is higher than Kamana Prakashan Samuha. Both publications should order according to EOQ at a time to minimize the total cost per order quantity of "INK" in Kantipur Publication is higher than Kamana Prakashan Samuha. Number of order placed within a year for both publications is almost same. Ordering cost and carrying cost has been increased per in both publications. Re-order point of Kantipur Publications is higher then Kamana Prakashan Samuha. It is seemed that lead time for both publications is same i.e. 30 days buy daily consumption of "INK" in Kantipur Publication and Kamana Prakashan Samuha.

Table 4.3

EOQ ANALYSIS OF FILM SHEET OF KP Pvt. Ltd. and KPS Pvt. Ltd.

Item – B "Film sheet"

FY	2061/062		2062/063		2063/064		2064/065		2065/066	
	KP	KPS	KP	KPS	KP	KPS	KP	KPS	KP	KPS
Annual Requirement (SHEET)	15000	10000	18000	12000	16000	11000	19000	12500	21000	1300
Pen Order Quantity (SHEET)	8000	5000	9000	6000	8000	6000	9000	6000	10000	7000
Cost Per Order (Rs.)	200	175	250	200	300	250	370	320	400	350
No. of Order Placed within a year	2 times	2 times	3 times	2 times	2 times	2 times	3 times	3 times	3 times	2 times
Ordering Cost (Rs.)	47000	28750	68000	38200	73200	42250	103390	59500	23200	67150
Carrying Cost (Rs.)	40000	50000	52500	64200	52000	72500	67150	98000	77000	111000
EOQ (SHEET)	23023.36	10723.8	29004.08	13090.62	26846.57	11876.32	33361.35	13774.32	37600.13	14306.55
Re-order Point (SHEET)	2465.4	2465.1	2958.6	2958.30	2629.8	27711.7	3123	3081.6	3451.8	3204.9

Source: Unpublished Records of KP Pvt. Ltd. and KPS Pvt. Ltd.

From the above table, it is seemed that annual demand of Film sheet in Kantipur Publications is higher than Kamana Prakashan Samuha. EOQ is greater than annual demand of Film Sheet in both Publications. Therefore orders should be placed up to its annual requirement at a time so that various expenses can be minimized. Number of order placed within a year for both publications is same but is changed in FY 2063/064 and 2064/065. Ordering cost of Kantipur Publications is higher than Kamana Prakashan Samuha. Carrying cost of Kamana Prakashan Samuha is higher than Kantipur Publication. Re-order point for both publications almost same. Lead time of Kamana Prakashan Samuha should be minimized.

Table 4.4

EOQ ANALYSIS OF ALUMINIUM SHEET OF KP Pvt. Ltd. and KPS Pvt. Ltd.

Item – B "Aluminum Sheet"

FY	2061/062		2062/063		2063/064		2064/065		2065/066	
	KP	KPS	KP	KPS	KP	KPS	KP	KPS	KP	KPS
Annual Requirement (SHEET)	9800	5500	10200	6200	9500	6500	11000	7100	13000	7700
Pen Order Quantity (SHEET)	4500	2500	5000	3000	4000	3200	5000	3500	6000	3800
Cost Per Order (Rs.)	275	240	290	270	340	320	350	320	400	350
No. of Order Placed within a year	3 times	3 times	3 times	3 times	3 times	3 times	3 times	3 times	3 times	3 times
Ordering Cost (Rs.)	47035	22160	51954	27762	54790	33540	64050	36536	82800	42835
Carrying Cost (Rs.)	48475	51400	52790	61480	56150	72100	62250	77440	710100	7900
EOQ (SHEET)	13660.76	5105.93	14317.89	5893.85	1327.91	6270.28	15919.64	6899.08	19856.62	7603.55
Re-order Point (SHEET)	805.2	903.6	838.2	1018.80	780.6	1068	903.9	1167	1068.30	1265.4

Source: Unpublished Records of KP Pvt. Ltd. and KPS Pvt. Ltd.

From the above table, it is seemed that annual demand of Aluminum Sheet in Kantipur Publications is higher than Kamana Prakashan Samuha. Both Publications should order according to EOQ at a time which enables to minimize the total cost. Number of order placed within a year for both publications is same i.e. 3 times. Ordering cost of Kantipur Publications is higher than Kamana Prakashan Samuha. Carrying cost of Kamana Prakashan Samuha is higher than Kantipur Publication. Lead time of Kamana Prakashan Samuha should be minimized.

Item-B "Chemicals"

Chemicals have been categories under the item "B" i.e. moderate important items in the sense of value and weight in both publications. Under the head of chemicals there are many kinds of chemicals which are used in these publications. Economic order quantity calculation of each and every item of chemicals is not possible but the concept of EOQ must be followed while placing the view order for three chemicals. What is the cost to be incurred, what is the lead time and what is the quantity used during the year should be considered.

The chemicals used in both publishing houses are Gum Arabic, Fountain Solution, Blanket Fixture, Image Remover Negative, Acetic Acid, Paper Developer, Reducer Oil, Phosphorous Acid, Dunlop, Rubber Solution, Blanket Wash Solution etc.

Total annual cost incurred for chemicals in the Kamana Prakashan Samuha for last fiscal year is Rs.850,000/- (Eight Laces and fifty thousand only) as record kept in stores department in the same way Kantipur Publications has kept the record of Rs.1,000,000/- (Ten Laces only) for chemicals in last fiscal year.

It is seemed that although both publications use same kinds of chemicals, expense incurred by Kantipur Publications of chemicals is higher than Kamana Prakashan Samuha.

Item-C "Stationary"

Stationary have been categorized under the item-C i.e. as least important

items. Stationary contains so many items which cannot be treated individually. Inventories of stationary are checked physically once in every three months to determine new order to be placed in Kamana Prakashan Samuha which in Kantipur Publications, it is checked in every two months. EOQ calculation is impossible for stationeries.

The stationary used in both publishing houses are: Tipex, pen, Ball pen, Scale, Calculator, Pencil, Stapler and Gum etc. The quantity of stationary required is relatively small and daily usage could not be found exactly.

According to the Kamana Prakashan Samuha's record the total cost incurred for stationary during last fiscal year Rs.520,000/- (Five laces and twenty thousand) which in Kantipur Publications total cost incurred stationary during last fiscal year is RS.430,000 (four laces and thirsty thousand)

It is seemed that both publications use same kind of stationary. Total cost incurred for stationary in Kamana Prakashan Samuha is higher than Kantipur Publications.

4.3 ABC Analysis

It is a method of selective inventory control. The term ABC is known items whose value is the highest. Therefore the firm should classify inventories to identity items that should receive the special attention. These include 'A' items. Category 'B' includes lesser important items and category 'C' includes less important items of store. The classification of items into A, B and C category is based upon value, usage, rate etc.

According to ABC analysis concept, the items of inventory of the publications are categorized as A, B and C on the basis of their usage value as shown in the table below.

ABC Classification of Inventories in Kantipur Publications Pvt. Ltd. and Kamana Prakashan Samuha Pvt. Ltd.

Table: - 4.5

ABC CLASSIFCATION OF INVENTORIES

Fiscal Year	KP Pvt. Ltd.				KPS Pvt. Ltd.			
	A	B	C	Total	A	B	C	Total
2061/062	70.30	11.20	12.50	100	72	16.20	11.80	100
2062/063	71.50	15	13.50	100	75.20	18.50	6.30	100
2063/064	75.10	18.10	6.8	100	74.80	15.70	9.50	100
2064/065	76.30	14.20	9.5	100	73	19	8	100
2065/066	74.60	16.40	9	100	76	19.40	4.60	100

Source: Unpublished Records of KP Pvt. Ltd and KPS Pvt. Ltd.

Both publications have categories it's all materials according to its importance and value. In both publication category A includes Newsprint, category B includes INK, Film Sheet, Aluminum sheet and chemicals, category C includes stationary.

4.4 Trend Analysis

1. Annual Usage of Newsprint

Table: - 4.6

ANNUAL USAGE OF NEWSPRINT IN KP AND KPS PVT. LTD

Fiscal Year	KP Pvt. Ltd.		KPS Pvt. Ltd	
	Total Purchase	% Change	Total Purchase	% Change
2061/062	41100500	-	30409500	-
2062/063	47811000	16.35	32275000	6.13
2063/064	45267000	10.13	369228800	24.43
2064/065	52204750	21.27	32611000	7.23
2065/066	64026000	55.27	50690000	66.69

Source: Unpublished Records of KP Pvt. Ltd and KPS Pvt. Ltd.

From above table, it is seemed that KPS Pvt. Ltd has fluctuating trend in collection of Newsprint. The usage of Newsprint in KPS Pvt. Ltd. has increased by 21.43% in FY 2063/064, but it is decreased by 7.23 in FY 2064/065. In fiscal year 2065/066 it is increased to 66.69% from the base FY 2061/062. On the other hand KP Pvt. Ltd has fluctuating and high increasing trend in usage of Newsprint. It is increased by 165% in FY 2062/063 from base FY 2061/062 in FY 2063/064, it is increased by 10.13% then it is increased by 21.27%, 55.77% in FY 2064/065 and FY 2065/066 respectively from the base 2061/062.

Graph - 4.1
Showing annual usage of Newsprint
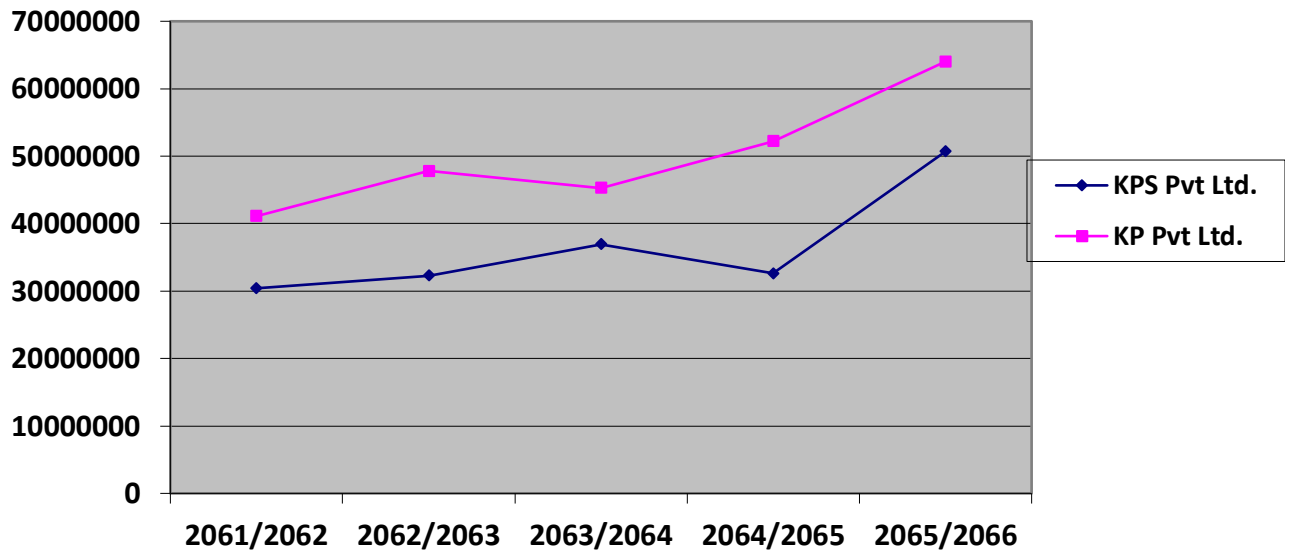
From the above group, it is clear that both publications have fluctuating trend of usage of newsprint. So it is better to purchase according to planning and planning should be according to economic order quantity.

2. Annual Uses of INK (Value in NRS)

Table: - 4.7
ANNUAL USAGE OF INK IN KP PVT. LTD. AND KPS PVT. LTD

Fiscal Year	KP Pvt. Ltd.		KPS Pvt. Ltd	
	Total Purchase	% Change	Total Purchase	% Change
2061/062	2471200	-	1319580	-
2062/063	3325588	34.57	1834914	39.05
2063/064	3900400	57.83	2385177	80.75
2064/065	4737060	91.69	1842512	39.62
2065/066	5806684	-	1975436	49.70

Source: Unpublished Records of KP Pvt. Ltd and KPS Pvt. Ltd.

From above table, it is seemed that KPS Pvt. Ltd has fluctuating trend in usage of INK. In FY 2063/064 it has highly increased by 80.75% from the base FY 2061/062 it is increased by 39.62% and 49.70% in FY 2064/065 and FY 2065/066 respectively from the base FY 2061/062. On the other hand KP Pvt. Ltd. has very high increasing rate in usage of INK. It is increased by 34.57% to 134.97% from the base FY 2061/062 to FY 2065/066.

Graph – 4.2
Showing annual usage of Ink.
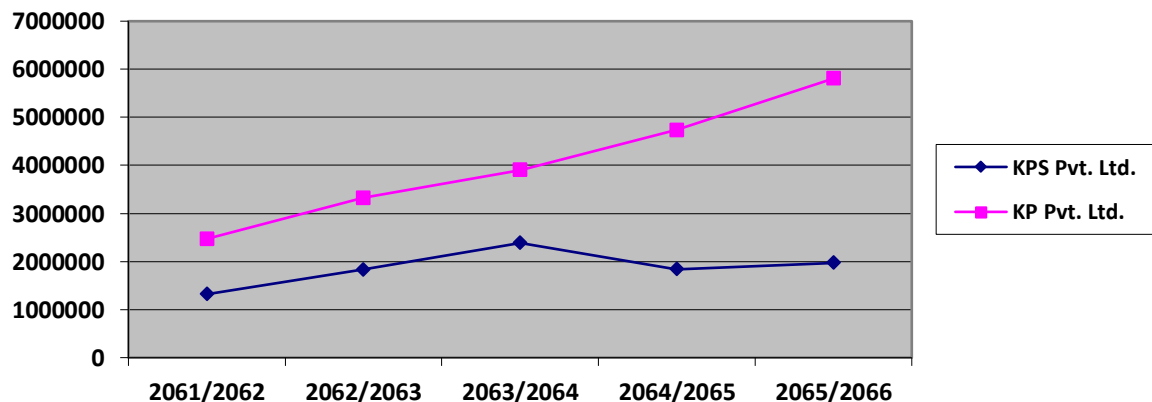
From the above graph, it is seemed that KPS Pvt. Ltd. has fluctuating end in usage of ink. On the other hand, KP Pvt. Ltd. has highly increasing end in usage of ink. Therefore, it is advised to KPS Pvt. Ltd. to scan external environment to avoid fluctuation.

3. Annual Usages of Film Sheet (Value in NRS)

Table: - 4.8

ANNUAL USAGE OF FILM SHEET IN KP PVT. LTD. AND KPS PVT. LTD

Fiscal Year	KP Pvt. Ltd.		KPS Pvt. Ltd	
	Total Purchase	% Change	Total Purchase	% Change
2061/062	3087000	-	1828750	-
2062/063	4620500	49.67	2502400	36.83
2063/064	4925200	59.54	2874750	56.65
2064/065	7200540	133.25	4157500	127.34
2065/066	8600200	178.59	4728150	158.54

Source: Unpublished Records of KP Pvt. Ltd and KPS Pvt. Ltd.

From above table it is seemed that both Publications have highly increasing rate in usage of Film sheet. In KPS Pvt. it is increased by 36.86% to 158.54% from the base FY 2061/062 to FY 2065/066. On the other hand, in KP Pvt. Ltd. it is increased from 49.67% to 178.59% from the base FY 2061/062 to FY 2065/066.

Graph - 4.3
Showing annual usage of Film Sheet
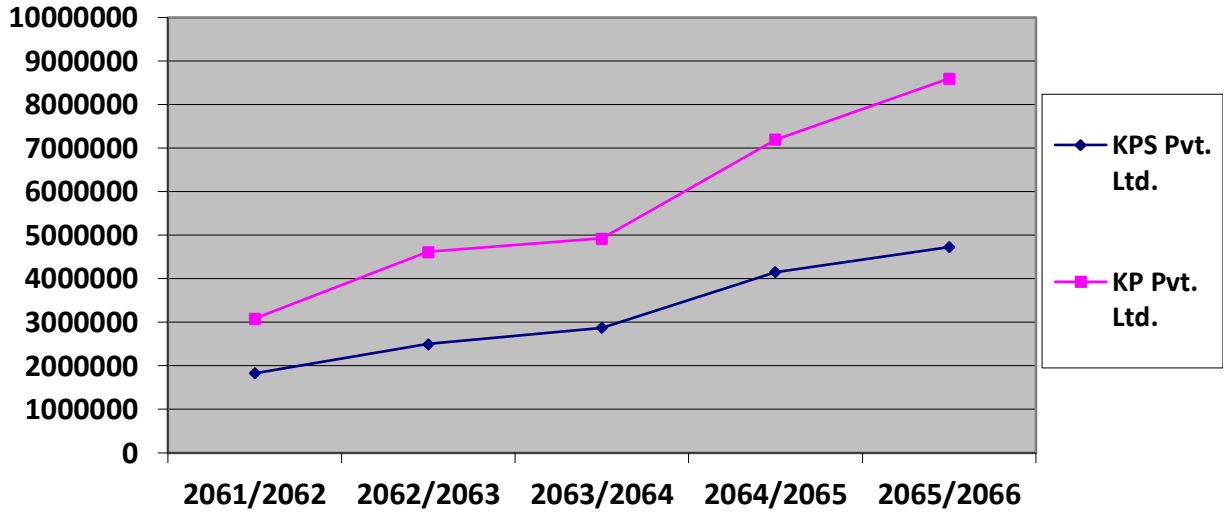
From the above graph, it is found that both publications have increasing rate in consumption of film sheet. Comparatively it is seemed that KP Pvt. Ltd. has highly increasing and consumption of film sheet. It is advised to both publications maintain optimum level inventory to control the expenses on film sheet.

4. Annual Usages of Aluminum Sheet (Value in NRS)

Table: - 4.9
ANNUAL USAGE OF ALUMINUM SHEET IN KP PVT. LTD. AND KPS PVT.

Fiscal Year	KP Pvt. Ltd.		KPS Pvt. Ltd	
	Total Purchase	% Change	Total Purchase	% Change
2061/062	2790510	-	1393560	-
2062/063	3062744	9.75	1763242	26.52
2063/064	3340940	19.72	2185640	56.83
2064/065	3975300	42.45	2385976	71.21
2065/066	5353800	91.85	2825735	102.77

Source: Unpublished Records of KP Pvt. Ltd and KPS Pvt. Ltd.

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From above table it is seemed that both Publications have highly increasing rate in usage of Aluminum Sheet. In KPS Pvt. Ltd. it is increased by 26.52% to 102.77% from the base FY 2061/062 to FY 2065/066. On the other hand, in KP Pvt. Ltd. it is increased from 9.75% to 91.85% from the base FY 2061/062 to FY 2065/066.

Graph - 4.4
Showing annual usage of Aluminum Sheet
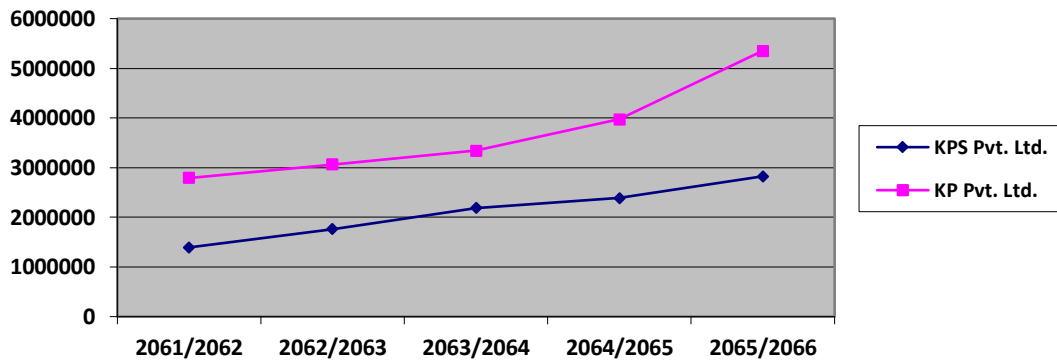
From the above graph, it is found that both publications have increasing rate in consumption of Aluminum sheet. Comparatively it is seemed that KP Pvt. Ltd has highly increasing trend in consumption of Aluminum sheet. Therefore, it is advised to both publications to control its expenses on Aluminum sheet by ordering optimum level of inventory.

5. Annual Aggregate Sales of KP Pvt. Ltd. and KPS Pvt. Ltd. (Value in NRS)

Table: - 4.10

ANNUAL AGGREGATE SALES OF KP PVT. LTD. AND KPS PVT. LTD.

Fiscal Year	KP Pvt. Ltd.		KPS Pvt. Ltd	
	Total Purchase	% Change	Total Purchase	% Change
2061/062	340426400	-	192895420	-
2062/063	351836000	3.35	202866646	5.16
2063/064	404456340	18.80	228737365	18.58
2064/065	387969870	13.96	227021835	17.69
2065/066	4251110000	24.87	333817458	42.21

Source: Unpublished Records of KP Pvt. Ltd and KPS Pvt. Ltd.

KPS Pvt. Ltd. has increment of 5.16%, 17.69% and 42.21% in sales from the base FY 2061/062 to FY 2065/066 respectively. There is decline of achieved a great improvement of sales in FY 2065/066. On the other hand, KP Pvt. Ltd. has great increment till FY 2063/064 but in FY 2064/065 it is decline by 13.96% from the base FY 2061/062. In FY 2065/066 it has improved its sales by 24.87%.

Graph - 4.5
Showing Aggregate sales of KP Pvt. Ltd. and KPS Pvt. Ltd.
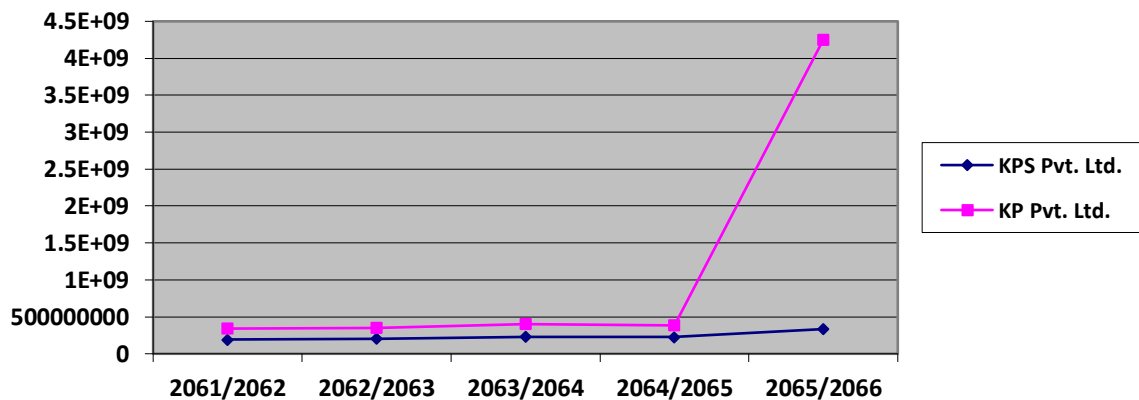
From the above graph, it is found that sales revenue growth rate in both publications is in increasing trend. Both publications have decreasing sales revenue in FY 2064/65. Comparatively sales revenue of KP Pvt. Ltd is higher than KPS Pvt. Ltd. It is advised to KPS Pvt. Ltd. increase its sales by utilizing its optimum production capacity.

4.5 Ratio Analysis

Inventory Turnover Ratio, Inventory Holding Days, Inventory to Sales Ratio, Inventory to Profit Ratio is used to measure the efficiency of inventory management.

1. Inventory Turnover Ratio (ITR)

Inventory Turnover Ratio = $\dfrac{\text{Cost of Goods Sold}}{\text{Average Inventory}}$

Where,

Cost of Goods Sold (CGS) = Operating stock + Purchase - Closing stock

Average inventory (AI) = $\dfrac{\text{Opening Stock + Closing Stock}}{2}$

Calculation of Inventory Turnover Ratio (Value in NRS)

Table: - 4.11
INVENTORY TURNOVER OF KP PVT. LTD. AND KPS PVT. LTD.

Fiscal Year	KP PVT. LTD.			KPS PVT. LTD.		
	CGS	AI	Ratio	CGS	AI	Ratio
2061/62	235779168	18507685	12.73	127549260	17662500	7.22
2062/63	253364647	193624000	13.08	118739650	18142320	7.64
2063/64	260376316	20438300	13.71	113564258	16880700	6.72
2064/65	26079772	19880700	13.11	156583400	18660700	8.49
2065/66	323779357	22774280	14.21	167525340	18538300	9.15
Average ratio			13.36			7.82

Source: Unpublished Records of KP Pvt. Ltd. and KPS Pvt. Ltd.

From the above table, it is found that both publications have fluctuating inventory ratio. In FY 2063/064 it has badly decreased in KPS Pvt. Ltd while in KP Pvt. Ltd, it has decreased in 2064/065. Comparatively inventory turnover ratio is KP Pvt. Ltd. is greater than KPS Pvt. Ltd.

2. Inventory Holding Days (DIH)

Inventory holding days is the time period in which the companies hold the average inventory. DIH is computed as follows:

DIH =   Average Inventory
        Cost of Goods Sold (CGS)

Calculation of Inventory Holding Days (Value in NRS)

Table: - 4.12

INVENTORY HOLDING DAYS OF KP PVT. LTD. AND KPS PVT. LTD.

Fiscal Year	KP PVT. LTD.			KPS PVT. LTD.		
	AI	CGS	DIH	AI	CGS	DIH
2061/62	18507685	235779188	28.25	17662500	127549260	49.85
2062/63	19362400	253364647	27.51	18142320	138739650	47.07
2063/64	20438300	280378316	26.24	16880700	113564258	53.51
2064/65	19880700	26079772	27.44	18438300	156583400	42.39
2065/66	22774280	323779357	25.44	18509875	167525340	39.77

Source: Unpublished Records of KP Pvt. Ltd. and KPS Pvt. Ltd.

Holding Inventory for long time increase holding costs. On the other hand, holding inventory for short period may create stock out station. Both KP Pvt. Ltd. and KPS Pvt. Ltd is less. Thus, it is advised to maintain moderate inventory holding days.

3. Inventory to Sales Ratio

Inventory to sales ratio means percentage of inventories in comparison to sales volume. It helps to evaluate the efficiency of the organization in terms of inventor to sales percentage.

Inventory to sales ratio = $\dfrac{\text{Inventory}}{\text{Net Sales}}$ x 100

Calculation of Inventory to sales ratio (Value in NRS)

Table: - 4.13

INVENTORY TO SALES RATIO OF KP PVT. LTD. AND KPS PVT. LTD.

Fiscal Year	KP PVT. LTD.			KPS PVT. LTD.		
	Inventory	Sales	ratio	Inventory	Sales	ratio
2061/62	50479210	340426400	14.82	358013900	192895420	18.56
2062/63	59914832	351836000	17.02	39315556	202866646	19.38
2063/64	58613540	404456340	14.19	45404367	228737365	19.85
2064/65	69387650	387969870	17.88	42146988	227021835	10.56
2065/66	65216684	425110000	20.04	61589321	333817458	18.45

Source: Unpublished Records of KP Pvt. Ltd. and KPS Pvt. Ltd.

Inventory to sales ratio of KP Pvt. Ltd. is between 14.49 to 20.40 aggregate ratio is 16.85. On the other hand, inventory to sales ratio of KPS Pvt. Ltd. is between 18.45 to 19.85 aggregate ratio is 18.96. From the above table, it is found that inventory to sales ratio of KP Pvt. Ltd. is more fluctuated than KP Pvt. Ltd. which shows that KP Pvt. Ltd. has not uniform inventory management.

4. Inventory to Profit Ratio

Inventory to profit ratio is used to examine the earning efficiency of the company in comparison to materials consumed.

Inventory to profit ratio = $\dfrac{\text{Operating Profit (OP)}}{\text{Inventory}}$ x 100

Calculation of Inventory to profit ratio (Value in NRS)

Table: - 4.14

INVENTORY TO PROFIT RATIO OF KP PVT. LTD. AND KPS PVT. LTD.

Fiscal Year	KP PVT. LTD.			KPS PVT. LTD.		
	OP	Inventory	ratio	OP	Inventory	ratio
2061/62	40851168	50479210	80.92	21218496	35801390	59.26
2062/63	42220320	59914832	70.46	24343998	39315556	61.91
2063/64	44490197	58612540	75.90	27448484	45404367	60.45
2064/65	4655384	69387650	67.09	28377729	42146988	67.33
2065/66	51013200	85216684	59.86	36719920	61589321	59.62

Source: Unpublished Records of KP Pvt. Ltd. and KPS Pvt. Ltd.

Inventory to profit ratio of KP Pvt. Ltd. is between 59.86% to 80.92% and its average ratio is 70.84%. In the same way, inventory to profit ratio of KPS Pvt. Ltd. is between 59.26% to 67.33% and its average ratio aggregate ratio is 61.71. Both publications have fluctuating inventory to profit ratio. Comparatively it is found that inventory to profit ratio of KP Pvt. Ltd. is higher than KPS Pvt. Ltd.

4.6 Correlation Analysis

Correlation Analysis is the statistical tools that we can use to describes the degree to which one variable is linearly related to other variables. Two or more variables are said to be correlated if change in the value of one variables. Two or more variables are said to be correlated if change in the other variables. In correlation analysis only one variable is treated as dependent and one or more variables are treated as independent.

Calculation of Mean, Standard Deviation, Co-efficient of Variance, Co-efficient of Correlation and Probable Error (PE) of inventory and sales.

Table: - 4.15

CORRELATION ANALYSIS OF KP PVT. LTD. AND KPS PVT. LTD. BETWEEN INVENTORY AND SALES.

Value in Rs.'0000000'

Description	KP PVT. LTD.		KPS PVT. LTD.	
	Inventory	Sales	Inventory	Sales
Mean	6.46	38.19	4.48	23.70
standard deviation	1.19	3.17	0.89	5.03
coefficient of variation (CV)	18.42%	8.30%	19.86%	21.22%
Coefficient of correlation (CC)	0.80		0.99	
Probable Error	0.108		0.006	

Source: Unpublished Records of KP Pvt. Ltd. and KPS Pvt. Ltd.

The above table shows that arithmetic mean of inventory and sales in KP Pvt. Ltd. are higher than KPS Pvt. Ltd. standard deviation of inventory in KP Pvt. Ltd. is higher than KPS Pvt. Ltd. and which indicates that inventory is high variability nature than sales. Both publications sales will go on same direction of inventory cost.

Calculation of Mean, Standard Deviation, Co-efficient of Variation, Co-efficient of Correlation and Probable Error (PE) of Inventory and Sales.

Table: - 4.16

CORRELATION ANALYSIS BETWEEN INVENTORY AND PROFIT OF KP PVT. LTD. AND KPS PVT. LTD.

Value in Rs.'0000000'

Description	KP PVT. LTD.		KPS PVT. LTD.	
	Inventory	Sales	Inventory	Sales
Mean	6.46	3.23	4.48	1.98
standard deviation	1.19	0.18	0.89	0.35
coefficient of variation (CV)	18.42%	5.57%	19.86%	17.67%
Coefficient of correlation (CC)	0.99		0.96	
Probable Error	0.006		0.023	

Source: Unpublished Records of KP Pvt. Ltd. and KPS Pvt. Ltd.

The above table shows that arithmetic mean of inventory and profit in KP Pvt. Ltd. are higher than KPS Pvt. Ltd. standard deviation of inventory in KP Pvt. Ltd. is higher than KPS Pvt. Ltd. but of profit in KPS Pvt. Ltd. is higher than KPS Pvt. Ltd. CV of inventory and profit of KPS Pvt. Ltd. is not fluctuated while CV of profit is very low than inventory in KP Pvt. Ltd. which shows high variability profit as compared to inventory. Co-efficient of correlation between inventory and profit as positive in both publications. Since co-efficient of correlation is higher in publications, profit will go on same direction of inventory cost.

4.7 Major findings of the study

The main findings of this study as revealed in the analysis are briefly presented below:

- Both KP Pvt. Ltd. as well as KPS Pvt. Ltd. has not been maintaining proper ABC analysis system.

- Annual usage of newsprint, Ink, film sheet and aluminum sheet by KP Pvt. Ltd. in the fiscal year 2060/61 to 2064/65 seems highly

fluctuated although the normal working days are same. But in KPS Pvt. Ltd. the annual usage of raw materials is not so highly fluctuated.

- KP Pvt. Ltd. as well as KPS Pvt. Ltd. has not followed proper method of inventory management techniques like purchase order, economic order quantity, safety stock, re-order points etc.

- Both publishing houses procure necessary raw materials one time in a year.

- Correlation analysis has shown the positive relationship between the inventory, cost and profit.

- Both the publications have more than two branches offices scattered over the nation and decision making process is decentralizes.

- Overall management process of KP Pvt. Ltd. and KPS Pvt. Ltd. has been influenced by various external factors like government policies, economy and environment etc.

- There is lack of practices of inventory management tools in both publications. Most of the planning and decisions making process are predicted on the basis of historical performance and ad-hoc basis.

- There is no any special department for inventory control and management. Both publications have management accounting and finance control department, which carry out the process of inventory control.

- Both publications have adopted traditional inventory record keeping techniques which need more manpower, money and time.

- Both publications have lack of trained and skilled manpower to handle the inventory control system. Besides it lack of capital, political disorder and international market is also affecting its inventory policy.

CHAPTER – 5

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 SUMMARY

Nepalese public and private enterprises play vital role in socio-economic development of our country. It enjoys a strategic and vital crucial position in our country. Public enterprises as well as private enterprises are engaged in public utilities and necessities such as electricity, water, transportation, communication, newspaper, magazines, drugs etc. whatever may be nature of business enterprises, management is the most important element, which is basically getting the things done through others.

Comprehensive management planning is the most important essential part of any business organization to increase its worth. An organization, has to implement and practice various planning, controlling and decision making tools to tackle its business company needs to implement a dynamic inventory management system to have control over its inventories. Inventory management is one of the most important functions of any corporation. Without effective inventory management, no corporation achieves their goal.

The present study has been undertaken to examine, evaluate and compare the efficiency in practice of inventory management tools in Kantipur Publication Pvt. Ltd. and Kamana Prakashan Samuha Pvt. Ltd. The objective of this study is to find out what techniques have been applied to manage the inventory and make suggestion one of quantities analysis is to help reduce cost and directly increase in profit through inventory management. All the collected data and facts are analyzed on the basis of inventory management theory with the help of ABC analysis and economic order quantity model. The order size, ordering cost, safety stock all are determined unscientifically by the both organizations and is not given proper attention to the total cost. The required data is secondary as well as primary. In this research, some structured questions, is submitted to find out actual result and the collected secondary data from annual report and various published journals.

Inventory management means directing the business for the proper handling of inventory to achieve the goal. From the study, it is found that the inventory management of both enterprises is no so good, so it require some improvement. To make certain type of inventory management decision, many financial and statistical techniques are available to control but these publication houses have not applied any sort of techniques.

5.2 Conclusion

On the basis of data analysis and observation of researcher are taken from the inventories of the financial manager, head of account and head administration and records of publications in the consultation and presentation of obtained data, the following conclusion is drawn:

- Both publications are not following any scientific tools and techniques to control and manage inventory. It is necessary to apply the theoretical and practical methods in ordering cost, carrying cost of the inventory. Being the study of inventory management purchase order is done on the basis of EOQ theory, safety stock and reorder point to know the demand.

- Both publications have many branches all over the nation and decision making process is decentralized and both publications purchase raw material from local market as well as from international market.

- Basically, Kantipur Publication Pvt. Ltd. and Kaman Prakashan Samuha Pvt. Ltd. have fails to consider controllable and non-controllable variables, which can affect the swift control over inventories.

- Both publications are unable to practice computerized inventory management techniques. Both publications are not able to minimize store keeping and suupplying cost. Due to this, overall inventory control expenses of both publications are high.

- There is lack of qualified and trained employees to handle the management systems. Both publications are unable to hire experts to

manage and guide the overall management operation system. Lack of knowledge of inventory management tools are the main factor causing problem in the application of inventory control tools.

- Political disorder, economic condition of the country and foreign trade relations etc. are found as major threats of both the publications.

- There is no well developed system of reward and punishment to employees on the basis of their work performance and qualification.

- Both publications fail to analyze its strengths and weakness in depth.

5.3 Recommendations

Based on major findings it may be appropriate to make some suggestions. All though these suggestions may not be adequate and could give negative reflection but it is hoped that these suggestions will help improving the management of the publishing houses and other concerned.

- Inventory management system is a part of management planning system. Management and financial forecasting systems are essential to carry out the inventory management procedures in both the publications.

- Feasibility study, field study and survey, mobilization of available resources and historical analysis should be taken to standardize procurement system and to control the fluctuation of raw materials collection.

- To determine the effective economic lot size, both publications should follow the monthly inventory management system, which is easy and flexible for raw material procurement.

- Average inventory level should be optimized to reduce inventory holding days. Only the proper balance between stock level and procurement can optimize inventory level, which indicates balanced inventory management system.

- Tactical budgetary forecasting should be made in order to plan to the optimum inventory level of different kind of materials. Determining probable safety stock for certain period can reduce large amount of stock holding costs. It also helps to avoid underlying and stock out situations.

- Both publications use various type of raw materials. ABC inventory management system is useful to categorize those materials. It is an easy, fast and reliable method to overcome the inventory classification problems.

- Inventory records are most essential and valuable to produce decision on various managerial tasks. It helps to build up future strategies and assists to forecasts future budgets, therefore these publications should keep the inventory record up to date. Different filling systems and computerized record system can be used to keep the inventory records. These records can also be kept in organization's management information system.

- The publications should have well experienced and qualified personnel have to manage the inventory control system. Otherwise, it should take management service from private consultancies.

- Special seminars and training programmes should be conducted among publication's personnel's, academicians and management experts to light the new and revolving tools of scientific management. Academic concepts should be used in practical field of publications.

- Research and development should be done by the various sectors to develop new methods and technologies that can produce better performance.

- Political stability, government support, motivation and foreign trade relationship etc. are such factors which can help the business organization to achieve the goal.

- Both publishing houses are procuring necessary raw materials 3 – 4 times in a year. Therefore, the inventory expenses have increased due to high ordering cost. To reduce these costs, it has to purchase once in a year.

- Every business organizations have own kind of internal and external obstacles, it is, therefore better to build up strategies to tackle them rather than blaming them.

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Appendix – I
Research Questionnaire

Name: ----------------------------
Position: -------------------------------
Experience: ---------------------------------

a) What is the current position of the inventory?
Ans. – a. Maximum   c. Sufficient

   b. Minimum   d. Insufficient

b) Which types of difficulties is faced to manage current
   inventory position and previous inventory position?
Ans. – a. Lack of Information

   b. Transfer of Inventory

   c. Officials

   d. Any Other

c) To make co-ordination between current inventory position and
   previous inventory position, which types of tools and techniques, is
   used?
Ans. – a. ------------------------------------   b. --------------------------

   c. ------------------------------------   d. --------------------------

d) What types of preparation is made to made to face the problem
   which may arise in future relating to inventory?
Ans. – a. ---------------------------------   b. ----------------------------

   c. ---------------------------------   d. ----------------------------

e) Which types of problem is faced to calculate total inventory cost?
Ans. – a. Lack of cost relating information   b. Lack of techniques

c. Any other   d. No Problem

f) How much units of raw materials is generally ordered by inventory
   dept. to produce at a given time?
Ans. – a. ----------------------------------   b. -------------------------------

       c. ----------------------------------   d. -------------------------------

g) Which types of problem is created by suppliers of the publications
   and provision to face the same problem?
Ans. – Problems: Provision to System
       a. Payment problem   a. Advance Payment

       b. Shortage problem   b. Safety Stock

       c. Quality problem   c. Pre-Observation

       d. Any Other problem   d. According to Situation

h) What inventory items Warrant special attention?
Ans. – a. Item – A   b. Item – B

       c. Item – C   d. Any Other

i) What is the condition, in which there may arise relating to high cost
   problem?
Ans. – a. At the time of strike

       b. At the time of increase in transportation cost

       c. At the time of special import of special raw material

       d. Any Other

j) Which types of provision is made to face the problem of high cost of
   raw materials?
Ans. – a. ------------------------------   b. -------------------------------------

c. ------------------------------ d. -----------------------------------

k) Which types of inventory/goods may misuse and what is the provision is made to prevent the misuse of inventory?

Ans. – problems   Provision to Solution

    a. ---------------------------   a. ---------------------------

    b. ---------------------------   b. ---------------------------

    c. ---------------------------   c. ---------------------------

l) How does a goods in transit affect the reorder point?

Ans. a. -----------------------------------   b. ------------------------------

    c. -----------------------------------   d. ------------------------------

m) Which model is used by publication to solve seasonal demand fluctuation?

Ans. a. ------------------------------------   b. ------------------------------

    c. ------------------------------------   d. ------------------------------

Appendix II
Publication / Production process

```
                                              ┌──────────────┐      ┌──────────┐
                                              │  Distributor │─────▶│  Market  │
                                              └──────────────┘      └──────────┘
                                                      ▲
                                              ┌──────────────┐
                                              │ Daily/ Weekly│
                                              │  Newspaper   │
                                              └──────────────┘
                                                      ▲
┌──────────────┐                                      │
│ Material/News│──┐                                    │
└──────────────┘  │  ┌─────────┐   ┌──────────────┐   ┌────────────┐   ┌────────┐      ┌──────────┐
                  ├─▶│ Compose │──▶│ Proof Reading│──▶│ Processing │──▶│ Press  │─────▶│ Monthly  │
┌──────────────┐  │  └─────────┘   └──────────────┘   └────────────┘   └────────┘      │ Newspaper│
│ Advertisement│──┘                        │                               │          └──────────┘
└──────────────┘                           ▼                               ▼
                              ┌───────────────────────────┐          ┌──────────┐
                              │ Film develop, Aluminum Plate│         │ Binding  │
                              │ expose through camera, Plate│         └──────────┘
                              │           Market            │
                              └───────────────────────────┘
```
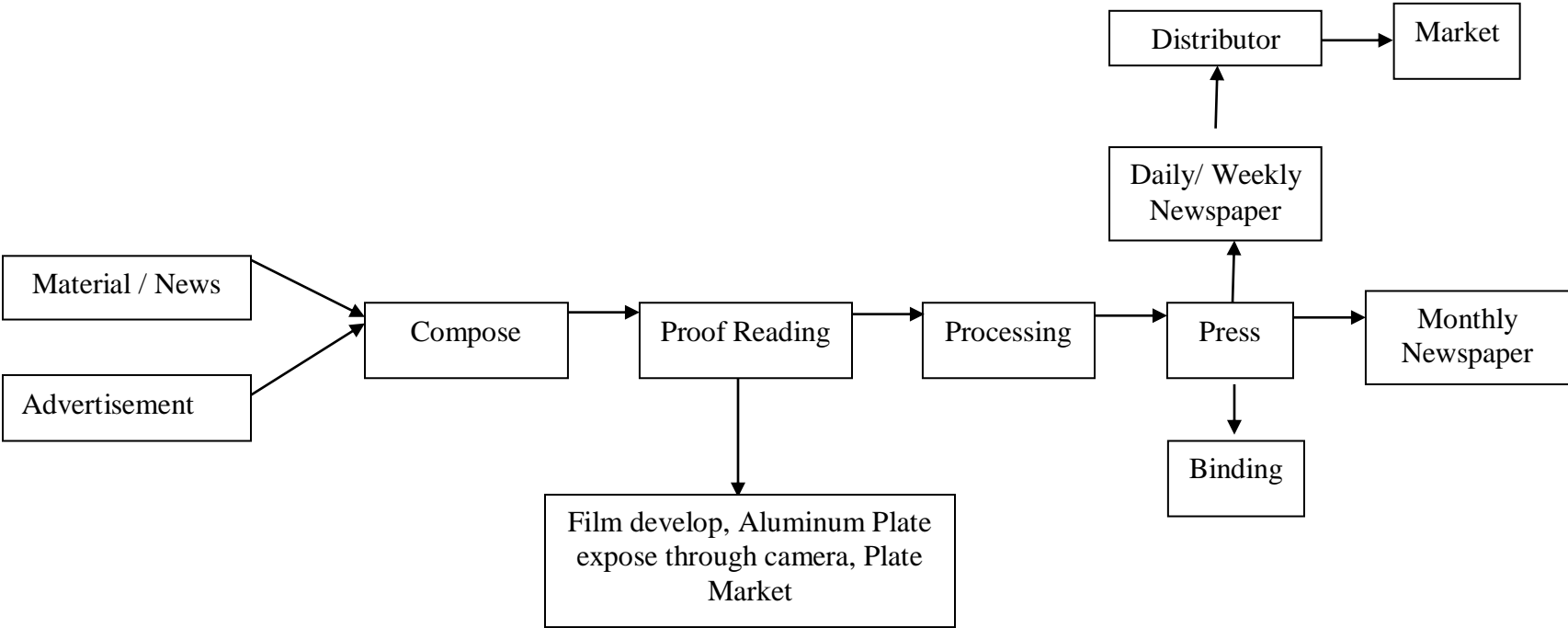
Appendix – III
ORGANIZATION CHART OF KANTIPUR PUBLICATION PVT.LTD

CHAIRMAN

MANAGING DIRECTOR

DIRECTOR

18 General Manager	Editor
17 Deputy General Manager	Deputy Editor
16 Associate General Manager	Senior Associate Editor
15 Assistant General Manager	Associate Editor
14 Sr. Manager	Senior Associate Editor
13 Manager	Assistant Editor
12 Associate Manager	Chief Sub Editor
11 Assistant Manager	Senior Sub Editor
10 Senior Executive	Assistant Senior Sub Editor
9 Assistant Senior Executive	Sub Editor
8 Executive	Junior Sub Editor
7 Junior Executive	Retainer
6 Senior Assistant	
5 Assistant	
4 Junior Assistant	
3 Junior Dispatcher	
2 Cycle Boy	
1 Peon	

Organization chart

		Chairma		
		Board of		
		Managing		

Editor in		Art & Technical		Finance in		Chief of personnel &		Marketing chief

	Chief computer	Chief Artist		Accountant	Legal			Public Relation

Computer operator

Illustrator cartoonist

Chief photographers

Account Assistant

Watchman

Peons

Circulation Manager

Marketing Executive

Circulation Representativ

Advertisement Representativ

Editor Aajako samachar	Editor The National	Editor Kamana	Editor Sadhan	Chief

Associated Editor

Sub Editor

Reporters

Correspondent

Proofreaders

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APPENDIX - IV
Calculation of EOQ
Item A-News Print:
kantipur Publication Pvt.Ltd.

	2061/062	2062/063	2063/064	2064/065	2065/066
Annual Demand (in MT)	900	1000	910	950	1100
Cost Per Metric Ton (in Rs.)	37000	39000	40000	45000	48000
Total Cost (in Rs.)	**33300000**	**39000000**	**36400000**	**42750000**	**52800000**
Ordering Cost (in Rs.)					
Freight Charge	3700000	4100000	4400000	430000	4800000
Custom Duty	1665000	1950000	1820000	2137500	2640000
Labour Charge	24000	26000	25000	26000	32000
Bank Commission	1665000	1950000	1820000	2137500	2640000
Total Ordering Cost Per Order (Rs.)	**7054000**	**8026000**	**8065000**	**8601000**	**10112000**
Carrying Cost (in Rs.)					
Storage Cost	580000	600000	620000	640000	850000
Insurance	166500	195000	182000	213750	264000
Total Carrying Cost (in Rs.)	**746500**	**795000**	**802000**	**853750**	**1114000**
Carrying Cost Per MT (in Rs.)	**830**	**795**	**882**	**899**	**1013**
$EOQ = \sqrt{\dfrac{2AO}{C}}$	$\sqrt{\dfrac{2 \times 900 \times 7054000}{830}}$ = 3911.24 MT	$\sqrt{\dfrac{2 \times 1000 \times 8026000}{795}}$ = 4493.46 MT	$\sqrt{\dfrac{2 \times 910 \times 8065000}{882}}$ = 4079.46 MT	$\sqrt{\dfrac{2 \times 950 \times 8601000}{899}}$ 42793.46 MT	$\sqrt{\dfrac{2 \times 1100 \times 10112000}{1013}}$ 4686.24 MT

Item A-News Print:
Kamana Prakashan Samuha Pvt.Ltd.

FY	2061/062	2062/063	2063/064	2064/065	2065/066
Annual Demand (in MT.)	700	688	735	620	900
Cost Per Metric Ton (in Rs.)	35000	37500	39000	42000	45000
Total Cost (in Rs.)	**2450000**	**25800000**	**28665000**	**26040000**	**40500000**
Ordering Cost (in Rs.)					
Fright charge	3500000	4000000	4200000	4100000	4500000
Custom Duty	1225000	1290000	1433250	1302000	2025000
Lobour Charge	22000	20000	24000	18000	30000
Bank Commission	122500	129000	1433250	130200	2025000
Total Ordering Cost Per Order (Rs)	**4869500**	**5439000**	**7090500**	**5550200**	**8580000**
Carrying Cost (in Rs.) Jilla Sahakari Sangh Limited & National Trading Corporation	550000	520000	600000	500000	800000
Insurance	122500	129000	143325	130200	202500
Obsolescence	367500	387000	429975	390600	607500
Total Carrying Cost (in Rs.)	**1040000**	**1036000**	**1173300**	**1020800**	**1610000**
Carrying Cost Per MT (in Rs.)	**1485.71**	**1505.81**	**1596.32**	**1646.45**	**1788.88**
$EOQ = \sqrt{\dfrac{2AO}{C}}$	$\sqrt{\dfrac{2 \times 700 \times 4869500}{1485.71}}$ $= 2142.09$ MT	$\sqrt{\dfrac{2 \times 288 \times 5439000}{1505.81}}$ $= 2229.37$ MT	$\sqrt{\dfrac{2 \times 735 \times 7090500}{1596.32}}$ $= 2555.27$ MT	$\sqrt{\dfrac{2 \times 620 \times 5550200}{1646.45}}$ $= 2044.51$ MT	$\sqrt{\dfrac{2 \times 900 \times 858000}{1788.88}}$ $= 2938.25$ MT

Item B
Ink
Kantipur Publication Pvt.Ltd.

FY	2061/062	2062/063	2063/064	2064/065	2065/066
Annual Requirement (Kg.)	16000	18500	20000	21000	21800
Cost Per kg (in Rs.)	150	175	190	220	260
Total Cost (in Rs.)	**2400000**	**3237500**	**3800000**	**4620000**	**5668000**
Ordering Cost (in Rs.)					
Bank Commission	12000	16188	19000	23100	28340
Custom Duty	19200	25900	30400	36960	45344
Total Ordering Cost Per Order (in Rs.)	**31200**	**42088**	**49400**	**60060**	**73684**
Carrying Cost (in Rs.)					
Storage Cost	25000	28000	30000	32000	35000
Insurance	15000	18000	21000	25000	30000
Total Carrying Cost (in Rs.)	**40000**	**46000**	**5100**	**57000**	**65000**
Carrying Cost Per MT (in Rs.)	**2.5**	**2.48**	**.5.5**	**2.71**	**2.98**
$EOQ = \sqrt{\dfrac{2AO}{C}}$	$\sqrt{\dfrac{2 \times 16000 \times 31200}{2.5}}$ $= 19984 \text{ Kg}$	$\sqrt{\dfrac{2 \times 18500 \times 42088}{2.48}}$ $= 25058.44 \text{ Kg}$	$\sqrt{\dfrac{2 \times 20000 \times 49400}{2.55}}$ $= 27837 \text{ Kg}$	$\sqrt{\dfrac{2 \times 21000 \times 60060}{2.71}}$ $= 30509.32 \text{ Kg}$	$\sqrt{\dfrac{2 \times 21800 \times 73684}{2.98}}$ $= 32833.84 \text{ Kg}$

Item B
Ink
Kamana Prakashan Samuha pvt.Ltd.

FY	2061/062	2062/063	2063/064	2064/065	2065/066
Annual Requirement (Kg)	10500	11720	13880	9800	9460
Cost Per Kg (in Rs)	120	150	165	180	200
Total Cost (in Rs)	**1260000**	**1758000**	**2290200**	**1764000**	**1892000**
Ordering Cost (in Rs)					
Bank Commission	6300	8790	11451	8820	9460
Custom Duty	10080	14064	18322	14112	15136
Total Ordering Cost Per Order (Rs)	**16380**	**22854**	**29773**	**22932**	**24596**
Carrying Cost (in Rs)					
Storage Cost	18000	18900	19400	20300	21000
Obsolescence Charge (%)	25200	35160	45804	35280	37840
Total Carrying Cost (in Rs)	**43200**	**54060**	**65204**	**55580**	**58840**
Carrying Cost Per MT (in Rs)	**4.11**	**4.61**	**4.69**	**5.67**	**6.21**
$EOQ = \sqrt{\dfrac{2AO}{c}}$	$\sqrt{\dfrac{2 \times 10500 \times 16380}{4.11}}$ $= 9148.41$ Kg	$\sqrt{\dfrac{2 \times 11720 \times 22854}{4.61}}$ $= 10779.7$ Kg	$\sqrt{\dfrac{2 \times 13880 \times 29773}{4.69}}$ $= 13275$ Kg	$\sqrt{\dfrac{2 \times 9800 \times 22932}{5.67}}$ $= 8903.43$ Kg	$\sqrt{\dfrac{2 \times 9460 \times 24596}{6.21}}$ $= 8656.59$ Kg

Item B
Film Sheet
Kantipur Publication Pvt.Ltd.

FY	2061/062	2062/063	2063/064	2064/065	2065/066
Annual Requirement (Sheet)	15000	18000	16000	19000	21000
Cost Per Kg (in Rs)	200	250	300	370	400
Total Cost (in Rs)	**3000000**	**4500000**	**4800000**	**7030000**	**8400000**
Ordering Cost (in Rs)					
Bank Commission	15000	22500	24000	35150	42000
Custom Duty	24000	36000	38400	56240	67200
Labour Charge	8000	9500	10800	12000	14000
Total Ordering Cost Per Order (Rs)	**47000**	**68000**	**73200**	**103390**	**123200**
Carrying Cost (in Rs)					
Storage Cost	25000	30000	28000	32000	35000
Insurance	15000	22500	24000	35150	42000
Total Carrying Cost (in Rs)	**40000**	**52500**	**52000**	**67150**	**77000**
Carrying Cost Per MT (in Rs)	**2.66**	**2.91**	**3.25**	**3.53**	**3.66**
$EOQ = \sqrt{\dfrac{2AO}{C}}$	$\sqrt{\dfrac{2 \times 15000 \times 47000}{2.66}}$ $= 23023.36$ Sheet	$\sqrt{\dfrac{2 \times 18000 \times 68000}{2.91}}$ $= 29004.08$ Sheet	$\sqrt{\dfrac{2 \times 16000 \times 73200}{3.25}}$ $= 26846.57$ Sheet	$\sqrt{\dfrac{2 \times 19000 \times 103390}{3.53}}$ $= 33361.35$ Sheets	$\sqrt{\dfrac{2 \times 21000 \times 123200}{3.66}}$ $= 37600.13$ Sheets

Item B
Film Sheet
Kamana Prakashan Samuha Pvt.Ltd.

FY	2061/062	2062/063	2063/064	2064/065	2065/066
Annual Requirement (Sheet)	10000	12000	11000	12500	13000
Cost Per Kg (in Rs)	175	200	250	320	350
Total Cost (in Rs)	**1750000**	**2400000**	**2750000**	**4000000**	**4550000**
Ordering Cost (in Rs)					
Bank Commission	8750	12000	13750	20000	22750
Custom Duty	14000	19200	22000	32000	36400
Labour Charge	6000	7000	6500	7500	8000
Total Ordering Cost Per Order (Rs)	**28750**	**38200**	**42250**	**59500**	**67150**
Carrying Cost (in Rs)					
Storage Cost	150000	16200	17500	18000	20000
Insurance	35000	48000	55000	80000	91000
Total Carrying Cost (in Rs)	**50000**	**64200**	**72500**	**98000**	**111000**
Carrying Cost Per MT (in Rs)	**5**	**5.35**	**6.59**	**7.84**	**8.53**
$EOQ = \sqrt{\dfrac{2AO}{C}}$	$\sqrt{\dfrac{2 \times 10000 \times 28750}{5}}$ = 10723.80 Sheet	$\sqrt{\dfrac{2 \times 12000 \times 38200}{5.35}}$ = 13090.62 Sheet	$\sqrt{\dfrac{2 \times 11000 \times 42250}{6.59}}$ = 11876.32 Sheet	$\sqrt{\dfrac{2 \times 12500 \times 59500}{7.84}}$ =13774.32 Sheets	$\sqrt{\dfrac{2 \times 13000 \times 67150}{8.53}}$ = 14306.55 Sheets

Item B
Aluminum Sheet
Kantipur Publications Pvt.Ltd.

FY	2061/062	2062/063	2063/064	2064/065	2065/066
Annual Requirement (Sheet)	9800	10200	9500	11000	13000
Cost Pre kg (in Rs)	275	290	340	350	400
Total Cost (in Rs)	**2695000**	**2958000**	**3230000**	**3850000**	**5200000**
Ordering Cost (in Rs)					
Bank Commission	21560	23664	25840	30800	41600
Custom Duty	13475	14790	16150	19250	26000
Lobour Charge	12000	13500	12800	14000	15200
Total Ordering Cost Per Order (Rs)	**47035**	**51954**	**54790**	**6405**	**82800**
Carrying Cost (in Rs)					
Storage Cost	35000	38000	40000	42000	45000
Insurance	13475	14790	16150	19250	26000
Total Carrying Cost (in Rs)	**48475**	**52790**	**56150**	**61250**	**71000**
Carrying Cost Per MT (in Rs)	**4.94**	**5.17**	**5.91**	**5.56**	**5.46**
$EOQ = \sqrt{\dfrac{2AO}{C}}$	$\sqrt{\dfrac{2 \times 9800 \times 47035}{4.94}}$ $= 13660.76$ Sheets	$\sqrt{\dfrac{2 \times 10200 \times 51954}{5.17}}$ $= 14317.89$ Sheets	$\sqrt{\dfrac{2 \times 9500 \times 54790}{5.19}}$ $= 13271.91$ Sheets	$\sqrt{\dfrac{2 \times 11000 \times 64050}{5.56}}$ $= 15919.91$ Sheets	$\sqrt{\dfrac{2 \times 13000 \times 82800}{5.46}}$ $= 19856.62$ Sheets

Item B
Aluminum Sheet
Kamana Prakashan Samuha Pvt.Ltd.

FY	2061/062	2062/063	2063/064	2064/065	2065/066
Annual Requirement (Sheet)	5500	6200	6500	71000	7700
Cost Per Kg (in Rs)	240	270	320	320	350
Total Cost (in Rs)	**1320000**	**1674000**	**2080000**	**2272000**	**2695000**
Ordering Cost (in Rs)					
Bank Commission	10560	13392	16640	18176	21560
Custom Duty	6600	9370	10400	11360	13475
Labour Charge	5000	6000	6500	7000	7800
Total Ordering Cost Per Order (Rs)	**22160**	**27762**	**33540**	**36536**	**42835**
Carrying Cost (in Rs)					
Storage Cost	25000	28000	30500	32000	34000
Obsolescence	26400	33480	41600	45440	53900
Total Carrying Cost (in Rs)	**51400**	**61480**	**72100**	**44770**	**87900**
Carrying Cost Per MT (in Rs)	**9.35**	**9.91**	**11.09**	**10.90**	**11.41**
$EOQ = \sqrt{\dfrac{2AO}{C}}$	$\sqrt{\dfrac{2 \times 5500 \times 22160}{9.35}}$ = 5105.93 Sheets	$\sqrt{\dfrac{2 \times 6200 \times 27762}{9.91}}$ = 5893.85 Sheets	$\sqrt{\dfrac{2 \times 6500 \times 33540}{11.09}}$ = 6270.28 Sheets	$\sqrt{\dfrac{2 \times 7100 \times 36536}{10.90}}$ = 6899.08 Sheets	$\sqrt{\dfrac{2 \times 7700 \times 42835}{11.41}}$ = 7603.55 Sheets

Re-order Point

Item/FY	2061/062		2062/063		2063/064		2064/065		2065/066	
	KP	KPS	KP	KPS	KP	KPS	KP	KPS	KP	KPS
News print Daily Consumption (MT)	2.46	1.91	2.73	1.88	2.49	2.01	260	1.69	3.01	2.46
Lead time days	60	90	60	90	60	90	60	90	60	90
Re- Order Point (MT) = Lead time x Daily consumption	148	172	164	170	150	181	156	153	181	222
Ink Daily consumption (kg)	43.83	28.76	50.68	32.10	54.7	38.2	57.53	26.84	59.72	25.91
Lead time days	30	30	30	30	30	30	30	30	30	30
Re-order Point (Kg) = Lead time x Daily consumption	1314.9	862.48	1520,4	963	1643.7	1140.6	1725.9	805.2	1791.6	777.3
Film Sheet Daily consumption (S)	41.09	27.39	49.31	32.87	43.83	30.13	52.05	34.24	57.53	35.61
Lead time days	60	90	60	90	60	90	60	90	60	90
Re-order Point (Sheet) = Lead time x Daily consumption	2465.4	2465.10	2958.6	2958.3	2629.8	2711.7	3312.3	3081.6	3451.8	3204.9
Aluminum Sheet Daily consumption (S)	26.84	15.06	27.94	16.98	26.02	17.80	30.13	19.45	35.61	21.09
Lead time days	30	60	30	60	30	60	30	60	30	60
Re-order Point (Sheet) = Lead time x Daily consumption	805.2	903.6	838.2	1018.8	780.6	1068	903.9	1167	1068.3	1265.4

APPENDIX - V
Calculation of ABC
Kantipur Publication Pvt. Ltd.

Item /FY	Item 'A'	Item 'B'				Item 'C'	Total
	News Print	Ink	Film Sheet	Aluminum S.	Chemical	Stationery	
2061/062	41100500	2471200	3087000	2790510	790000	240000	50479210
2062/063	47821000	3325588	4620500	3062744	820000	265000	59914832
2063/064	45267000	3900400	4925200	3340940	900000	280000	58613540
2064/065	52204750	4737060	7200540	3975300	950000	320000	69387650
2065/066	64026000	5806684	8600200	5353800	1000000	430000	85216684

Kamana Prakashan Samuha Pvt. Ltd.

Item /FY	Item 'A'	Item 'B'				Item 'C'	Total
	News Print	Ink	Film Sheet	Aluminum S.	Chemical	Stationery	
2061/062	30409500	1319580	1828750	1393560	500000	350000	35801390
2062/063	32275000	1834914	2502400	1763240	550000	390000	39315556
2063/064	36928800	2385177	2864750	2185640	620000	420000	45404367
2064/065	32611000	1842512	4157500	2385976	700000	450000	42146988
2065/066	50690000	1975436	4728150	2825735	850000	520000	61589321

APPENDIX - VI

Calculation of correlation

Calculation of means, standard deviation, coefficient of variation and probable error of Inventory

And sales of KP Pvt. Ltd.

Value in NRs. '00000000'

FY	Inventory (X)	Sales (Y)	X $(x-\bar{x})$	Y $(y-\bar{y})$	x^2	y^2	xy
2061/062	5.00	34.04	-1.46	-4.15	2.13	17.22	6.05
2062/063	5.99	35.18	-0.47	-3.01	0.22	9.06	1.14
2063/064	5.86	40.44	-0.6	-2.25	0.36	5.06	-1.35
2064/065	6.93	38.79	-0.47	0.6	0.22	0.36	0.280
2065/066	8.52	42.52	2.06	4.32	4.24	18.66	8.89
	$\sum x = 32.3$	$\sum y = 190.96$	$\sum x = 0$	$\sum y = 0$	$\sum x^2 = 7.17$	$\sum y^2 = 50.3$	$\sum xy = 15.28$

Arithmetic means of Inventory

$(\bar{x}) = \frac{\sum x}{N} = \frac{32.3}{5} = 6.46$

Arithmetic means of sales

$(\bar{y}) = = \frac{\sum y}{N} = \frac{190.96}{5} = 38.19$

Standard deviation of Inventory

$$\text{S.D. } (\sigma\ x) = \sqrt{\frac{\Sigma x^2}{N}} = \sqrt{\frac{7.17}{5}} = 1.19$$

Standard deviation of sales

$$\text{S.D. } (\sigma\ y) = \sqrt{\frac{\Sigma x^2}{N}} = \sqrt{\frac{5036}{5}} = 3.17$$

Coefficient of variation

C.V. of Inventory, $C.V._{\cdot x} = \frac{\sigma x}{x} \times 100 = \frac{1.19}{6.46} \times 100 = 18.42\%$

C.V. of Sales, $C.V._{\cdot y} = \frac{\sigma y}{y} \times 100 = \frac{3.17}{38.19} \times 100 = 8.30\%$

Coefficient of correlation using Karl Pearson's Correlation coefficient between X and Y

$$\sqrt{xy} = \frac{\Sigma xy}{\sqrt{\Sigma x^2}\sqrt{\Sigma y^2}} = \frac{1528}{\sqrt{7.17}\sqrt{5036}} = 0.80$$

Probable Error (PE) coefficient of correlation,

$$\text{P.E. (r)} = 0.6745 \times \frac{1-r^2 xy}{\sqrt{N}} = 0.6745 \times \frac{1-(0.80)^2}{\sqrt{5}} = 0.108$$

Calculation of means, standard deviation, coefficient of variations and probable error of Inventory and Sales of KPS Pvt. Ltd

Value in NRs. '00000000'

FY	Inventory (X)	Sales (Y)	X $(x-\bar{x})$	Y $(y-\bar{y})$	x^2	y^2	xy
2061/062	3.58	19.28	-0.9	-4.42	0.81	19.5364	3.978
2062/063	3.93	20.28	-0.55	-3.52	0.3025	11.6964	1.881
2063/064	4.54	22.87	-0.06	-0.83	0.0036	0.6889	-0.049
2064/065	4.21	22.70	-0.27	-1	0.0729	1	0.27
2065/066	6.15	33.38	1.67	9.68	2.7889	93.70	16.165
	$\sum x = 22.41$	$\sum y = 118.51$	$\sum x = 0$	$\sum y = 0$	$\sum x^2 = 3.9779$	$\sum y^2 = 126.621$	$\sum xy = 22.24$

Arithmetic means of Inventory

$$(\bar{x}) = \frac{\Sigma x}{N} = \frac{22.41}{5} = 4.48$$

Arithmetic means of sales

$$(\bar{y}) = \frac{\Sigma y}{N} = \frac{118.51}{5} = 23.70$$

Standard deviation of Inventory

$$\text{S.D. } (\sigma x) = \sqrt{\frac{\Sigma x^2}{N}} = \frac{3.9779}{5} = 0.89$$

Standard deviation of sales

$$\text{S.D. } (\sigma y) = \sqrt{\frac{\Sigma y^2}{N}} = \frac{126.6217}{5} = 5.03$$

Coefficient of variation

C.V. of Inventory, $C.V._x = \frac{\sigma x}{x} \times 100 = \frac{0.89}{4.48} \times 100 = 19.86\%$

C.V. of Sales, $C.V._y = \frac{\sigma y}{y} \times 100 = \frac{5.03}{23.70} \times 100 = 21.22\%$

Coefficient of correlation using Karl Pearson's correlation coefficient between X and Y

$$\sqrt{xy} = \frac{\sum xy}{\sqrt{\sum x^2}\sqrt{\sum y^2}} = \frac{1.527}{\sqrt{3.9779}\sqrt{126.6217}} = 0.99$$

Probable Error (PE) coefficient of correlation,

$$\text{P.E. (r)} = 0.6745 \times \frac{1-r^2 xy}{\sqrt{N}} = 0.6745 \times \frac{1-(0.99)^2}{\sqrt{5}} = 0.006$$

Calculation of mean, standard deviation, coefficient of variations and probable error of Inventory

And profit of KP Pvt. Ltd.

Value in NRs. '00000000'

FY	Inventory (X)	Net Profit (Y)	X $(x-\bar{x})$	Y $(y-\bar{y})$	x^2	y^2	xy
2061/062	3.06	3.06	-1.46	-0.17	2.13	0.028	0.248
2062/063	5.99	3.16	-0.47	-0.07	0.22	0.004	0.033
2063/064	5.86	3.11	-0.6	-0.12	0.36	0.014	0.072
2064/065	6.93	3.25	-0.47	0.02	0.22	0.0004	0.0094
20 65/066	8.52	3.57	2.06	0.34	4.24	0.1156	0.7004
	$\sum$x = 32.3	$\sum$y = 16.15	$\sum$x = 0	$\sum$y = 0	$\sum x^2$ = 7.17	$\sum y^2$ = 0.162	$\sum$xy = 100628

Arithmetic means of Inventory

$$\bar{X} = \frac{\Sigma x}{N} = \frac{32.3}{5} = 6.46$$

Arithmetic means of sales

$$\bar{Y} = \frac{\Sigma y}{N} = \frac{16.15}{5} = 3.23$$

Standard deviation of Inventory

$$\text{S.D. } (\sigma x) = \sqrt{\frac{\Sigma x^2}{N}} = \sqrt{\frac{7.17}{5}} = 1.19$$

Standard deviation of sales

$$\text{S.D. } (\sigma y) = \sqrt{\frac{\Sigma y^2}{N}} = \sqrt{\frac{0.162}{5}} = 0.18$$

Coefficient of variation

C.V. of Inventory, $C.V_x = \frac{\sigma x}{x} \times 100 = \frac{1.19}{6.46} \times 100 = 18.42\%$

C.V. of Sales, $C.V_y = \frac{\sigma y}{y} \times 100 = \frac{0.18}{3.23} \times 100 = 5.57\%$

Coefficient of correlation using Karl Pearson's Correlation coefficient between X and Y

$$\sqrt{xy} = \frac{\Sigma xy}{\sqrt{\Sigma x^2}\sqrt{\Sigma y^2}} = \frac{1.0628}{\sqrt{7.17}\sqrt{0.162}} = 0.99$$

Probable Error (PE) coefficient of correlation,

P.E. (r) $= 0.6745 \times \frac{1-r^2 xy}{\sqrt{N}} = 0.6745 \times \frac{1-(0.99)^2}{\sqrt{5}} = 0.006$

Calculation of means, standard deviation, coefficient of variation and probable error of Inventory and Profit of KPS Pvt. Ltd.

Value in Nrs.'00000000'

FY	Inventory (X)	Net Profit (Y)	X $(x - \bar{x})$	Y $(y - \bar{y})$	x^2	y^2	xy
2060/061	3.58	1.48	-0.9	-0.5	0.81	0.25	0.45
2061/062	3.93	1.82	-0.55	-0.16	0.3025	0.0256	0.088
2062/063	4.54	2.05	0.06	0.07	0.0049	0.0049	0.0042
2063/064	4.21	1.98	-0.27	0	0	0	0
2064/065	6.15	2.57	1.67	0.59	0.3481	0.3481	0.9853
	$\sum x = 22.41$	$\sum y = 9.9$	$\sum x = 0$	$\sum y = 0$	$\sum x^2 = 3.9779$	$\sum y^2 = 0.6286$	$\sum xy = 1.527$

Arithmetic means of Inventory

$$(\bar{x}) = \frac{\sum x}{N} = \frac{2241}{5} = 4.48$$

Arithmetic means of sales

$$(\bar{y}) = \frac{\sum y}{N} = \frac{9.9}{5} = 1.98$$

Standard deviation of Inventory

$$\text{S.D. } (\sigma x) = \sqrt{\frac{\Sigma x^2}{N}} = \sqrt{\frac{3.9779}{5}} = 0.89$$

Standard deviation of sales

$$\text{S.D. } (\sigma y) = \sqrt{\frac{\Sigma y^2}{N}} = \sqrt{\frac{0.6286}{5}} = 0.35$$

Coefficient of variation

C.V. of Inventory, $C.V_x = \frac{\sigma x}{x} \times 100 = \frac{0.89}{4.48} \times 100 = 19.86\%$

C.V. of Sales, $C.V_y = \frac{\sigma y}{y} \times 100 = \frac{0.35}{1.98} \times 100 = 17.67\%$

Coefficient of correlation using Karl Pearson's Correlation coefficient between X and Y

$$\sqrt{xy} = \frac{\Sigma xy}{\sqrt{\Sigma x^2}\sqrt{\Sigma y^2}} = \frac{1.527}{3.9779\sqrt{0.6286}} = 0.96$$

Probable Error (PE) coefficient of correlation,

P.E. (r) $= 0.6745 \times \frac{1 - r^2 xy}{\sqrt{N}} = 0.6745 \times \frac{1 - (0.96)^2}{\sqrt{5}} = 0.023$