

# **Inventory Management System of Listed Publications**

(A Comparative Study of Gorkhapatra Corporation and  
Kantipur Publications Pvt. Ltd.)

## **A THESIS**

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## **RECOMMENDATION**

**This is to certify that the thesis**

**submitted by**  
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Entitled

Inventory Management System of listed publications  
(A comparative study of Gorkhapatra Corporation and  
Kantipur Publications Pvt. Ltd.)

**has been approved by this Department in the prescribed format of  
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## DECLARATION

I here by declare that this thesis “Inventory Management System. A comparative Study of Gorkhapatra Corporation and Kantipur Publications Pvt. Ltd.” Submitted to Office of the Dean, Faculty of management, Tribhuvan University, is my original work as partial fulfillment of the requirement of the Degree of Master of Business Studies (MBS) which has been prepared under the supervision of Dr. Ram Charitra Pd. Sah, Reader faculty of management R RM Campus.

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# Table of Contents

	<b>Page No.</b>
Viva voce sheet	i
Letter of Recommendation	ii
Declaration	iii
Acknowledgments	iv
List of Tables	v
List of Figures	vi
Abbreviations	vii
<b>Chapter- I: INTRODUCTION</b>	<b>1-8</b>
1. Introduction	1
1.1 Background	1
1.1.1 Function of Inventory Management	2
1.2 Gorkhapatra Corporation	3
1.2.1 Brief	
History of Gorkhapatra Corporation	3
1.2.2 Publications	3
1.3 Kantipur Publications Pvt. Ltd.	3
1.3.1 Brief History of Kantipur Publications Pvt. Ltd.	4
1.3.2 Publications	4
1.4 Statements of the problems	4
1.5 Objective of the Study	5
1.6 Significance of the Study	5
1.7 Limitations of the Study	6
1.8 Chapter Scheme	6

<b>Chapter- II ONCEPTUAL REVIEWS</b>	<b>10-39</b>
2. <b>Conceptual Reviews</b>	10
2.1 Inventory Management	10
2.2 Types of Inventory	10
2.3 Need to hold Inventory	13
2.4 Objectives of Inventory Management	14
2.5 Need and importance of Inventory management	14
2.6 Cost Factors	15
a) Procurement cost or order cost	16
b) Inventory carrying cost	17
c) Capital cost	17
d) Handling and storage cost	18
e) Spoils and shortage cost	18
f) Insurance and taxes	19
g) System cost	19
h) Stock out cost	20
i) Cost trade off	21
2.7 Technical Formulation	22
2.7.1 Inventory Control	22
a) Aggregate inventory control ABC Analysis	23
b) Optimal order size	25
c) System of ordering	27
d) Re-order Level	30
2.8 Inventory Turnover	31
2.9 Review of previous studies on inventory management	32

<b>Chapter III: RESEARCH METHODOLOGY</b>	<b>40-42</b>
<b>Research Methodology</b>	40
3.1 Introduction	40
3.2 Research Design	40
3.3 Nature and Sources of data	40
3.4 Data gathering procedure	41
3.5 Analytical tools used	41
<b>Chapter IV: PRESENTATION AND ANALYSIS OF DATA</b>	<b>43-68</b>
<b>Presentation and Analysis of data</b>	43
4.1 EOQ Analysis	43
4.2 ABC Analysis	52
4.3 Trend Analysis	54
4.4 Ratio Analysis	60
4.5 Correlation Analysis	65
4.6 Summary of major findings	67
<b>Chapter V: SUMMARY, CONCLUSION AND RECOMMENDATION</b>	<b>50-51</b>
<b>Summary, Conclusion and Recommendations</b>	
5.1 Summary	69
5.2 Conclusion	70
5.3 Recommendations	71
Bibliography	i
Appendixes	iv
Annex (Calculations of EOQ, ABC and Correlation)	xii



## List of Tables

<b>Table No.</b>		<b>Page No.</b>
1.1	Production units of Gorkhapatra Corporation	5
1.2	Production units of Kantipur Publications Pvt. Ltd.	6
2.1	ABC Analysis	24
4.1	EOQ Analysis of Newsprint	44
4.2	EOQ Analysis of Ink	46
4.3	EOQ Analysis of Film sheet	48
4.4	EOQ Analysis of Aluminum sheet	50
4.5	ABC Classification of Inventories	53
4.6	Annual usage of Newsprint	54
4.7	Annual usage of Ink	55
4.8	Annual usage of Film sheet	57
4.9	Annual usage of Aluminum sheet	58
4.10	Annual Aggregate Sales	59
4.11	Inventory Turnover Ratio	61
4.12	Inventory Holding Days	62
4.13	Inventory to sales Ratio	63
4.14	Inventory to profit Ratio	64
4.15	Correlation Analysis between Inventory and sales	65
4.16	Correlation Analysis between Inventory and profit	66

## List of Figures

<b>Figure No.</b>	<b>Title</b>	<b>Page No.</b>
2.1	ABC Analysis	24
2.2	EOQ Model	25
4.1	Annual usage of Newsprint	55
4.2	Annual usage of Ink	56
4.3	Annual usage of Film sheet	57
4.4	Annual usage of Aluminum Sheet	54
4.5	Annual Aggregate Sales	55
4.6	Inventory to Sales Ratio	58

## ABBREVIATIONS

ABC	Always Better Control
A/C	Account
B.S.	Bikram Sambat
C.V	Coefficient of Variation
EOQ	Economic Order Quantity
F/Y	Fiscal Year
GPC	Gorkhapatra Corporation
i.e.	That is
JCF	Janakpur Cigarette Factory
KG	Kilogram
KP Pvt. Ltd	Kantipur Publications Private Limited
L/C	Letter of credit
MT	Metric Ton
NFC	Nepal Food Coporation
NOCL	Nepal oil Corporation Limited
RDL	Royal Drugs Limited
ROL	Re-order level
ROP	Re- order point
RS	Ruppees
SD	Standard Deviation
T.U	Tribhuvan University

# CHAPTER -I

## 1. Introduction

### 1.1 Background

Nepal is one of the underdeveloped countries. It is a small landlocked countries covering only 0.033% area of the world. The total area of this country is 147181 sq kilometer. The main occupation of Nepalese people is agriculture and per capita income is US \$ 275. The 42% people are below the absolute poverty, which is not more than subsistent. But after restoration of democracy in 1990. Nepal has implemented liberal economic policy As a result many more companies are established in different sector such as industrial, construction, transportation and publications etc. They bare serving the nation by providing employment opportunities and developing the country through various measures. Every organization require inventory for its smooth operation. Publication houses are no exception.

As the study concentrates over inventory management system followed in Gorkhapatra Corporation and Kantipur Publications 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 a product. Inventory is stores of goods and stocks. In manufacturing organizations, inventory includes raw material, work in progress and finished goods. In trading concerns, inventory consists of merchandise held for sale and office packing and other supplies. Inventory management is the technique of maintaining inventory items (raw materials, work in progress, finished goods, and factory supplies) at desired levels. Inventory management has great significance in almost all types of business enterprises. Inventory constitutes the most signification part of current assets of large majority of companies. Because of the

large size of inventories maintained by a firm, 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 firm neglecting the management of inventories will be losing its long run profitability and may fail ultimately. Hence an optimum level of inventory should be determined on the basis of the tradeoff between costs and benefits associated with the levels of inventory. In this competitive world profit can be earned only by reducing cost. So, the cost should be minimized and production should be maximized.

For strengthening the economy of any country, both the private and public sector should play 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 level of inventories to a considerable degree without any adverse effect in production and sales by using simple inventory planning and control technique.

Modern concepts of inventory management can be traced back to 1915-22 when some leading profounder like R.C Davis, H.S Owen, E.K. Clark and RC Wilson conceived and independently developed an economic lot size equation which minimized the sum of carrying and holding costs 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 minimize investment in inventory required for the attainment of desired objectives.” (Agrawal 1980, page 85)

Another management expert 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, page 65)

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

- Availability of all items required,
- No excessive investment in inventory,
- Purchase at reasonable price,
- Minimum wastage
- Avoidance of spoilage and obsolescence of inventory,
- Regular information about availability of stock to the management,
- Control the misappropriation of 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.
- Establishing time schedules, procedures and lot size of new order.
- Providing proper storage facilities.
- Arranging the receipts, disbursement and procurement of material.
- Developing the forms for recording the transactions.
- Assigning responsibility for carrying out the inventory control functions. and
- Providing the reports necessary for supervising in overall capacity.

## **1.2. Gorkhapatra Corporation.**

### **1.2.1 Brief History of Gorkhapatra Corporation**

During the time of Rana prime minister Dev Shamsheer JBR, the first publication of Newspaper “Gorkhapatra” was published in 1958 B.S. At that time 1000 copies of Gorkhapatra were published. The publication remained weekly till 42 years. But since 2003 B.S. Ashwin 29<sup>th</sup>, it was published two times in a week. Since 1<sup>st</sup> Poush 2003 B.S. it was published three times in a week and since 7<sup>th</sup> Falgun 2003 B.S. it has been publishing daily. The publishing institution turned into a corporation and introduced as a public corporation in 25<sup>th</sup> Ashadh 2020 B.S.

When we look for the publications, Gorkhapatra Corporation once published “the Nepalese perspective” (weekly English Newspaper) but it was dropped out due to the economic reason. The other publications of this corporation are “The Rising Nepal” (English daily Newspaper from 1<sup>st</sup> Poush 2022 B.S.), “Sunday Dispatch” (weekly English Newspaper from 9<sup>th</sup> Baisakh 2047 B.S.) and “Apsara” (monthly magazine from Baisakh 2055 B.S.)

Gorkhapatra Corporation has been providing the sound contribution through the various ways to the nation according to its motto. Now the Corporation is happy to find itself in present condition, and is sincerely grateful to its founders who offered valuable contribution in its establishment process as well as of its welfare in the critical time of “Rana Rule”

## 1.2.2 Publications

Gorkhapatra Corporation has been expanding its publication in a wide range. The present publications of the corporations has been traced out below.

S.N.	publications	Nature	Production unit	Price per unit
1	The Gorkhapatra	Daily	55000(Daily)	Rs. 5
2	The Rising Nepal	Daily	28000(Daily)	Rs.5
3	Madhupark	Monthly	20000(Monthly)	Rs.20
4	Yubamanch	Monthly	50000(Monthly)	Rs.20
5	Muna	Monthly	25000(monthly)	Rs. 10

Table: 1.1 Showing Production units of GPC's Publications

Sources: Unpublished records of GPC

GPC: Gorkhapatra Corporation

## 1.3 Kantipur Publications Private Limited.

### 1.3.1 Brief History of Kantipur Publications Private Limited.

Kantipur publications private limited is one of the renowned and leading publication houses of Nepal. It was established in 2047 B.S. first it started to publish "Kantipur Dailly" and "The Kathmandu post" in 7<sup>th</sup> Falgun 2049 B.S. In the begning, the publication was under Goyanka but later it was replaced by Gyawali and Sirohiya family. From 2050 B.S. Baishak 12, Kantipur started publishing four pages supplement kosheli with an aim of giving entertainment purely. Since 2052/2/5, Sapatahik was printed on every Friday.

For making the 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 time, capable are experienced journalists are kept in the regional offices for the better coverage of regions. From eight pages, Kantipur Daily increased to the pages unto 16, but it was fluctuated according to the time. Due to popularity of



Saptahik, the 16 pages was increased to 24 pages in 2055/11/7. Publications another progress is “Nepal” a bi-monthly magazine published from 2057/4/15. Publication’s latest progress is a women oriented magazine. From sarbottam to “sarbottam Nari” that could be found in market in nepali medium at monthly sceheme. All the publication of kantipur have own types of different news at different headlines for the different countries. Kantipur publication was given “Gorkha Dakshin Bahu” by HMG and many other associations honored it too.

### 1.3.2 Publications:

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

S.N	Publications	Nature	Production Unit	Price per Unit
1	Kantipur Daily	Daily	220000(daily	Rs.5
2	The Kathmandu post	Daily	45000(Daily)	Rs.3
3	Saptahik	Weekly	95000(Weekly)	Rs.10
4	Nepal	Weekly	40000(weekly)	Rs. 25
5	Sarbottam Nari	Monthly	40000(monthly	Rs.35

Table: 1.2 showing production units of KP Pvt. Ltd Publications

Source: Unpublished Records of KP Pvt. Ltd

KP Pvt. Ltd: Kantipur Publications private Limited

### 1.4 Statement of problem:

Inventories generally represent 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. nither too much nor too little of inventory, which maximize the value of the firm and minimize 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 required for publishing various newspapers are found to be estimated 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 shortage of inventory to satisfy its customers demand. Poor performance is the outcome 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, decision making and controlling functions?

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

- 1) Which techniques of inventory management are adopted by sample listed publications?
- 2) Are firms seriously considering about optimum level of inventory?
- 3) Whether or not a publication house gives proper attention to lead time?
- 4) Are publications successful in estimating annual requirement?
- 5) What are the major difficulties in the application of inventory management in these publication houses?

## **1.5 Objectives of the 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 aforesaid objective, the following functional objectives have been embodied in this study.

1. To identify the existing inventory system of publication houses and find out whether the followed system is appropriate or not.
2. To determine optimal inventory level of listed publication houses.
3. To analyze the relationship between inventory material costs and profit.
4. To find out whether inventory management affects profit of these publications or not.
5. To provide appropriate suggestion based on the major findings.

## **6. Significance of Study:**

The recent advanced technology has enabled to manufacture new products and to accelerate the rate of manufacture of existing products faster than ever before. As we make more and many types of goods at a faster rate, we are continually tying up more capital as the goods flow along and fall in the channels of distribution or await usage. Productivity and 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.

### **1.7 limitation of the study:**

1. Most of firms are not interested to provide actual report of their activities. There is lack of detailed information required for research.
2. The study is more specific to Inventory management and do not relate to other areas of management.
3. Most of data are secondary and may not be timely. So there may be reporting error.

4. Out of various enterprises in different sectors, this study has chosen the Kantipur Publications and Gorkhapatra Corporation. As such the study is suggestive rather than prescriptive.

## **1.6 Chapter Scheme**

### **(i) Introduction:**

This part includes introduction, a brief history of Gorkhapatra Corporation and Kantipur Publication Pvt. Ltd., statement of the problems, significance of the study, objective of the study, limitation of the study, chapter scheme.

### **(ii) Review of literature:**

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

### **(iii) Research methodology:**

This part deals with the introduction, research design, nature and sources of data, data gathering procedure and analytical tools and techniques used.

### **(iv) Analysis and presentation of Data:**

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

### **(v) Summary, Conclusion and Recommendations**

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

# **CHAPTER-II**

## **Review of Literature**

### **2. Conceptual Review**

#### **2.1 Inventory Management**

Inventory means all movable items in store in either ready for sale or for consumption in this 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. Inventories form a major part of working capital and requires a considerable investment.

“The term inventory refers to stockpile of the product a firm is offering for sale and component that make up the product.”<sup>1</sup>

“Inventory is a composed of assets that will be sold in future in the normal course of business operation.”<sup>2</sup>

Among the different aspect of management inventory management is also one of the major factor that play significant role in management of materials, part supplies expenses tools, work in progress, finished products. Therefore all types of business enterprises should control inventory. The basic objective 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, increases overall plant capacity, reduces investment in stock and space, in improves customer’s services and provides inventory data and reports.<sup>3</sup>

#### **2.2 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 enterprise are: raw materials, work in progress and finished goods.

1 Bolten, S.E., “Managerial Finance”, Houghton Mifflin Co., 1975 page 426

2 Khan, M.Y.& Jain P.K., “Financial management”, Tata MC-Graw-Hill Publishing, New Delhi 1992, page 726

3 Lal, Jawahar, “Cost accounting”, Tata MC Graw Hill Publishing Company Limited, New Delhi, 1996, page 101

### **(a) Raw Material:**

Raw materials are the basic necessary for production process. Raw material inventories are converted into finished product 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 is generally defined to include all materials and parts that are an integral part of finished product. The publication houses use P/S Developer negative, Tele printer roll, photo graphic film, Agfa paper soft, image remover, offset ink, Anfix, acetic acid etc as raw materials.

### **(b) Work in Process:**

Work in process inventories are semi- manufactured products and they represents that it need more work before they are converted as finished product for sale. Sometimes it becomes very difficult to determine which materials are work in process and which are not because the same material may be a raw material in one industry and the same material may be work in process as well as finished goods in other industry. It depends upon the nature of production. Publication houses do not keep the work in process inventories because of the nature of publication. Publication houses use various raw materials to produce finished products directly i. e. newspapers and magazines etc.

### **(c) Finished product:**

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

A fourth kind of inventory supplies is also maintained by firms. Supplies are also maintained by firms. Supplies include office 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.

<b>Gorkhapatra Corporation</b>	<b>Kantipur Publications</b>
The Gorkhapatra (Daily newspaper)	The Kantipur (Daily newspaper)
The Rising Nepal(Daily English Newspaper)	The Kathmandu post (Daily English newspaper)
The Madhupark(Monthly magazine)	The Saptahik (weekly Newspaper)
The Yuva manch(Monthly magazine)	The Nepal (Bi-monthly magazine)
The Muna (monthly magazine)	The Sarbottam Nari (monthly magazine)

### **2.3. Need to hold inventories**

The question of managing inventories arises only when the company holds inventories. Maintaining inventories involve 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 three general motives for holding inventories.<sup>4</sup>

- 1. The transaction motives:** - This emphasizes the need to maintain inventories to facilitate smooth production and sale operations.
- 2. The precautionary motive:** - Which necessitates holding of inventories to guard against 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 to price fluctuations.

A company should maintain adequate stock materials for a continuous supply to the factory for a uninterrupted production. It is not possible for company to available raw materials whenever it is heeded. 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 at a given time to streamline production. Other factors which may necessitate purchasing and holding of raw materials inventories are quality discount and anticipated price increase. The firm may purchase large quantities of raw materials than needed for desired production and sales levels to obtain quality discount of bulk purchasing at times. The firm would like to accumulate raw materials in anticipation of price rise at the same time.

4 Stam, Martin K David, W. Miller. "Inventory Control" , Theory and practice Englewood Cliffs, N.J. Prentice-Hall, New Delhi 1962, p. 17



## **2.4 Objectives of Inventory Management:**

The basic managerial objectives of inventory control are twofold to avoid over and under investment in inventories and keep the right quality of goods of right quantity at proper time 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 minimized while profit is maximized.
- (c) To maintain adequate accountability in inventory assets.
- (d) To ensure an adequate supply of materials, stores spares etc.

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

The major danger points of excessive inventory:

- (a) The unnecessary tie up of the firm's funds 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.

## **Need and Importance of Inventory Management**

Inventory play pivotal role in any organization. If the organization is not paying attention to Inventory management, it will affect the efficiency and profitability of the various operation in sequence beginning with raw materials extending through all manufacturing operations into finished goods.

## **Importance of Inventory management can be written as follows: 5**

- Inventory helps in smooth and efficient running of business.
- Inventory provides service to the customers immediately or at a short notice.
- Due to absence of stock, the company may have pay high price because of emergency purchasing. Maintaining of Inventory may help to earn discount because of bulk purchasing.
- Inventory also acts as buffer stock when raw materials are received late and many sales orders are likely to be rejected.
- Inventory also reduces product costs because there is an additional advantage of batching a long smooth running production.
- Inventory helps in maintaining the economy by absorbing some of the fluctuations. When the demand for an item fluctuates or is seasonal.
- Pipeline stocks (also called and moment Inventories) are also necessary where the significant amount of time is consumed in the Trans – shipment of items from one localities to another.

### **2.5 Cost factors**

After the great depression in 1903's and before 2<sup>nd</sup> 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 organizations must pay much 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, 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 inventory policy that results in the least cost to inventory management. In this context, three kinds of inventory costs are considered which are mentioned below.

5 Goel, B.S.”Production and operation Management”, Pragati Prakashan, Meerut 1985 page 145

**a. Procurement cost or Order cost.**

Ordering cost are the costs of placing an order if the items are purchased from other or production set up costs if produced within the firm. Ordering cost include the costs of running a purchasing department. Personnel and telephone or letter writing expenses associated with placement of orders and the costs of preparing specifications. Ordering costs would also include the related costs of receiving and inspecting the materials and costs of paying invoices. The important feature of these costs is that they are “onetime costs” and these one may be treated as fixed costs. The larger the order quantity, the smaller these cost on a per unit basis. Therefore there costs are also treated as variable cost.

The economic factor encourages buyers to place few large order rather than many small ones and they receive further encouragement by the trade practice of quantity discounts which helps to reduce cost per unit in production process

Procurement cost or order cost can be calculated with the help of following formula.

$$\text{Ordering Cost} = \frac{\text{Annual Requirement}}{\text{Quantity order size}} \times \text{ordering cost per unit}$$

Symbolically  $\frac{A}{Q} \times O \dots \dots \dots I$

### **b. Inventory carrying cost:**

The second major category of cost are those associated with carrying the inventory itself such as capital cost, handling and storage costs, spoilage and shortage cost, Insurance and payments and system cost. Carrying costs are likely to be in the range of 20 to 25 percent of inventory value. Carrying cost can be calculated from the following formula.

$$\text{Carrying cost} = \text{Average Inventory} \times \text{Carrying cost per unit}$$

Symbolically,

$$\frac{Q}{2} \times C \dots \dots \dots II$$

Total carrying cost generally increases in direct proportion to the average amount of inventory carried. Inventory carried in turn depends upon the Frequency with which orders are placed.<sup>6</sup>

### **c. 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 kept. If the firm has an alternative use for the capital that would return 8 %, then the capital cost of the Inventory is 8 % .<sup>7</sup>

### **d. Handling and storage cost**

The cost associated with maintenance of inventory is storage cost. These costs include expenditure made on inventory staffs, expenditure to provide

various facilities like heating, lighting, cooling etc. These cost generally depend upon the volume to value ratio of inventory.<sup>8</sup> Facilities required to store an inventory create costs such as rent, heat and light etc. 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.

c. Weston J.f.,S. Bisley & E.F. Brigham, “Managerial Finance” , The Dryden press Hinsdale Illinois, Tokyo 1981, page 428.

d. Khan M.Y. & JAIN P.K.,“Financial Management”, Tata MC Graw Hill Publishing, New Delhi 1992,page 728

e. Garrety, L& Silver M, Production Management Analysis, Harcourt Brace Jovanovich Inc, New York 1086 page 418

Beyond a given level of inventory, however, these costs will begin to increase as more items are kept in stock.

### **e. Spoils and shortage cost**

Many products deteriorate overtime in storage. The precise nature of the deterioration varies from product to product but whatever the causes, it represents reduction in company’s assets and a cost of holding inventories. This is termed as spoilage cost.<sup>9</sup>

A common type of spoilage cost occurs when stock is left in inventory after the demand for the product has vanished. This can occur with varying degree 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.

Another type of spoilage cost occurs when products deteriorate physically in storage. For example, food products spoil when they are stored too long.

There are many other ways by which inventories may shrink and spoilage cost arises. In retail department stores, reduction in inventories due to pilferage vary from 2 to 10% per year which can represent a significant cost to the firm.

#### **f. Insurance and Taxes**

Inventories represent a significant investment of a firm's capital. Conservative management practice calls for increased protection. Naturally, the cost of this insurance varies according to the size and the value of inventory. The same is true for taxes. Some states levy inventory taxes example, on various dates, throughout the year, the more inventory a firm has on hand on those dates the higher their tax bill will be. Where such taxes are in effect, prudent inventory management may dictate periodic reduction in inventory to coincide with the dates on which the assessments are made.<sup>10</sup>

9 soemn, Ezra, "theory of financial management" New York, Columbia 1995, page 34

10 Garret, L& silver M, "production management analysis" Harcourt Brace Jovanovich inc. New York, 1986, page 419

#### **g. System cost**

Final type of inventory holding cost is system cost. This is associated with the administration of the inventory system in use such as information gathering costs, supervision costs, physical stock checking costs and record keeping equipment costs. It is difficult to determine whether these expenses will be high or low except by making a comparison among actual inventory system.<sup>11</sup>

## **h. Stock-out cost**

Stock out cost is associated with demand. The depletion in stock results in loss of sales or back order costs. When the sales are lost due to stock out, the firm losses both profit margin or unmade sales and firm's goodwill as well. If the customer uses another business elsewhere, future profit margin may also be lost and back order cost is needed to convince customers to use again after inventories have been replenished. Back order cost includes loss of goodwill, money paid to Re order goods and notification to customers when goods arrived.<sup>12</sup>

Stock out cost is computed from following formula.

Stock out cost = Inventory cycles per year × stock out units × probability of a possible stock out × unit stock out cost

Inventory cycles per year =  $\frac{\text{Annual Usage}}{\text{Quantity order size}}$

When an item is not available to the production department it mean that an entire production line must be shut down. If this happens, idle labour and machine cost as well as startup and shut down cost will be incurred. Both of these costs are generally earlier to calculate than those of a lost sale.

This kind of cost component is difficult to calculate. However, in order to get information about it was the concerned authority of publication houses.

Everest E. Adam, JR Ronald and J. Evert says that inventory costs or cost associated with inventory includes following five types of relevant costs:

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11. Handling, G. and whitin TM "Analysis of Inventory system" Eagle wood diffs New Jersey printer Hall 1975 p 97
  12. Adam, EE & Bert J.E., Production and operation Management, New Delhi prentice Hall of India Pvt. Ltd. 1993, page 412

- Cost of the item or value of the item paid to the supplier to purchase price.
- Cost to procure the item.
- Carrying cost of the item.
- Cost associated with being out of stock when units are demanded but are unavailable (stock out).
- Cost associated with data gathering and control procedures for the inventory system.

### **i. Cost Trade – off**

The optimum inventory size is commonly referred to as economic order quantity. It is that order size at which annual total costs of ordering and holding are the minimum. We can follow three approaches i.e. the trial and error approach, the formula approach and the graphic approach to determine the EOQ. We assume that total annual demand is known with certainty and usage of materials is steady. Ordering cost per order and carrying cost per unit are assumed to be constant.

These costs can be expressed in general cost equation:

Total annual relevant cost = cost of the item + procurement cost + carrying cost + stock out cost

Each cost in equation can be expressed in terms of order quantity and re order 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 calculation.

Operations researchers have developed a wide range of optimal formula, which vary with change in the actual inventory situation. Graphically, minimizing total costs means costs 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 i.e. procurement and carrying cost. The annual carrying cost increase with large volumes of order quantity. When quantity order size is large, fewer orders must be placed during the year so that the annual procurement cost decrease.

## **2.7 Technical formulation.**

### **2.7.1 Inventory control**

Inventory control is a system which insures the provision of the required quantity of inventories of required quantity at the required time with minimum amount of capital investment.

The technique of maintaining the size of the inventory at some desired level, keeping in view the best economic interest of an organization is known as inventory control.<sup>13</sup>

There are basically two approaches to inventory control i.e. unit control and value control. Unit control involves the control over inventories in term of unit while value control entails the control over inventories in term of value. These two approaches seem to be conflicting. Unit control of inventories ensures stock for continuity of operations and sales. Obviously, the greatest insurance against running out of any item at a crucial movement is maintaining huge supplies of everything stored. It will increase the cost of handling. Value control is achieved when the required materials can be obtained at a minimum cost through proper planning, formulation of policies and procedure in order to maintain the inventory level at desired point. John L. Burbidge says “Inventory control is concerned with the control of the quantities and monetary values of these items at predetermined level or within safe limits (John L. Burbidge, 1975, page 310).” Thus the Inventory control management includes the following aspects.

Size of inventory determining maximum and minimum levels establishing time schedules, procedures and lot of sizes for new orders, ascertaining minimum safety levels, coordinating sales, production and inventory policies.

Providing proper storage facilities, arranging the receipts, disbursements and procurement of materials, developing the forms of recording these transactions.

Assigning responsibilities for carrying out inventory. Control functions. Providing for the reports necessary for supervising the overall activity.

It is, therefore, necessary that proper co-ordination must be there in the activities and policies of purchase, production and sales department to affect the better inventory control.

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13. Goel B.S."Production and operation Management" Pragati prakashan, Meerut 1985, pg 141

#### **a. Aggregate inventory control ABC Analysis**

Every business firm however big or small has to maintain some inventories. It is not desirable to keep same degree of control an all the items.

Inventory control is a science based art of ensuring that enough inventory or stock is hold by an organization to meet both its internal and external demand commitments.

Thus the firm should be selective in its approach to control investment in various types of inventories. This analytical approach is called ABC analysis. The term ABC is known as always better control. It has shown following classification as being representation in many industries:

### ABC Analysis

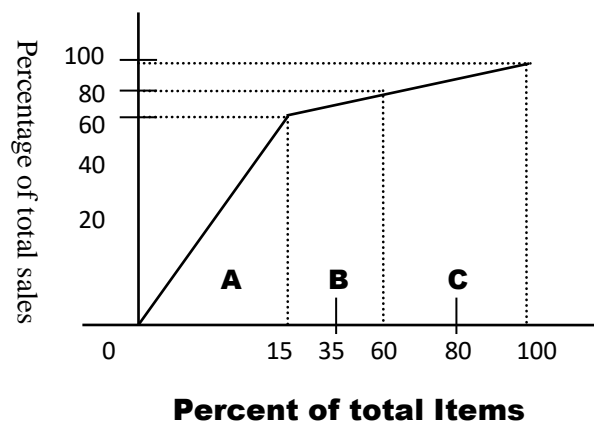
Inventory classification	% of items	% of value
A	10-15	70-75
B	15-35	15-35
C	60-80	10-15

Table: 2.1 showing ABC Analysis

This table shows that item 'A' includes low volume and high cost items with highest level of control. Item 'B' consists moderate volume items and moderate cost items with moderate control and item 'C' consists highest volume and low cost with lower level of control.

#### Graphical presentation of ABC analysis

Figure No.1

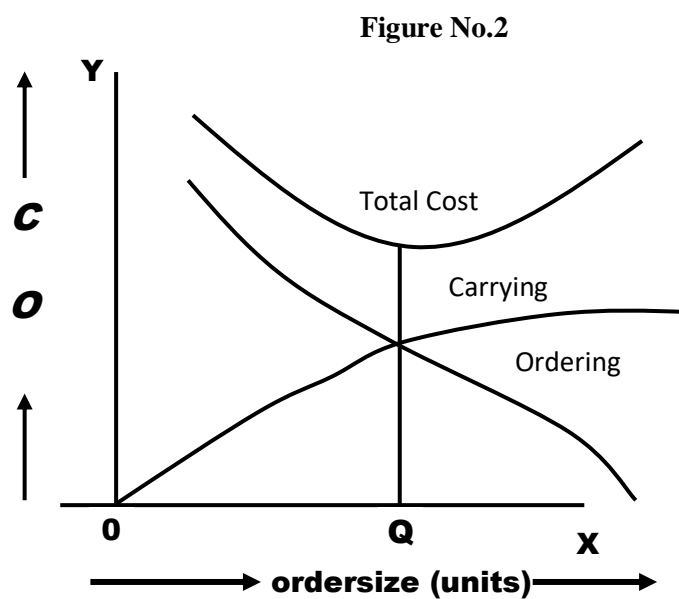


Graph: 2.1 showing ABC Analysis

The above Graph indicates that 'item A' forms a minimum proportion, 15 % of total units, but represents the highest value i.e. 70 % of total units. Items A and B jointly represents 45 % of the total units and 90 % of the investment. Thus highest control should be exercised on 'item A' in order to maximize profitability on its investment. In case of 'item C' simple control will be sufficient.

## Economic order quantity (EOQ) model

Another important inventory control technique is economic order quantity. This technique is widely in use in these days in many countries. A decision about how much to order has great significance in inventory management. The quantity to be purchase should neither be small nor be big because of buying and carrying cost of materials are very high. EOQ is the point at which inventory carrying costs are equal to order costs. In determining EOQ it is assumed that cost of managing inventory is made up solely of two parts i.e. ordering costs and carrying costs.



In the above figure, carrying, ordering and total cost are plotted on OY axis and OX axis is used to represent the order size. The total carrying costs increases as the order size increases because on an average a large inventory level will be maintained and ordering cost decreases with increases in order size. The total cost line is decreasing at first stage, but they start rising when the decrease in average ordering ordering cost is more than offset by the increase in carrying cost. In the same figure, Q represents the economic order quantity where the total cost is minimum, if the size of order increases, carrying cost exceeds ordering cost that are saved. Thus, the firm's operating profit is maximized at point Q.

: EOQ = Q units.

## b. Optimal order size

The Economic Order Quantity (EOQ) model can be used to calculate the order size that minimizes total inventory costs. EOQ model depends on four unrealistic assumptions

- Constant and uniform demand over the planning period.
- Instantaneous delivery of orders.
- Constant cost per unit regardless of the number of units ordered.
- Constant carrying and ordering cost

This model is valid for any time period as long as all variables are defined for the time period considered.

To determine the optimal order quantity  $Q$ , we need to know the per unit carrying cost for one year ( $c$ ), the cost of placing one order ( $o$ ) and the yearly demand for the product ( $a$ ). The economic order quantity is calculated with the following formula.

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

**Where,**

EOQ=Economic order quantity

A=Annual Requirement of product

O=Ordering cost per order

C=Carrying cost per unit

If the company orders EOQ units each time, it will minimize total inventory costs. The following example can be taken.

The large car manufacture, major motor, uses 100000 tires ( $a$ ) a-year to produce their 2238 sports car. The ordering cost ( $o$ ) is Rs. 135 and per order and carrying cost ( $c$ ) is 0.75. Then optimal quantity can be calculated in the following ways:

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

$$= \sqrt{\frac{2 \times 100000 \times 135}{0.75}} = 6000 \text{ units.}$$

Because motors requires 100000 tires, it will be necessary to place 17 orders per year to satisfy the demand (100000/6000=16.7)

### c. System of ordering: When to order

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

The re-order point is a level of inventory at which the firm places an order in the volume of the economic order quantity. If the firm places the order when the inventory reaches the re-order point, then the new goods will arrive before the firms runs out of goods to sell.

As long as delivered is not instantaneous, an order must be placed so that inventory is not depleted till new shipment arrives. The required inventory level is termed as 'transit stock 'and represents the amount of inventory that used (or sold) between the times EOQ.

When an order is placed and timely delivered, transit stock is determined by using following formula.

Transit stock = stock used per time period  $\times$  transit time.

To confirm the validity of this formula, the following example has been quoted:

Major motors uses 400 tyres per day (based on 250 working days, in a year  $100000/250$ ) and five days are required for delivery of new orders. The order point reaches when inventory is reduced to the stock level of 2000 tyres.

$$\begin{aligned}\text{Transit stock} &= 400 \times 5 \text{ days} \\ &= 2000 \text{ tyres}\end{aligned}$$

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

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

$$\text{Optimal re-order point} = 2000 + 800 = 2800$$

Thus, basically there items of information are needed as inputs to design the re-order point.

The safety stock involves two types of cost (i) stock out cost and (ii) carrying cost. Safety stock is necessary under the condition of uncertainty. In such situation, the demand and supply of goods may fluctuate day by day. If the actual usage or sales increase and delivery from the suppliers are delayed in that case the firm would face a stock out problem. The firm would therefore be

advised to keep a sufficient safety margin by having additional inventory to guard against stock out situation. Such stocks are called safety stock.

### **Stock level:**

This stock level subsystem keeps track of goods hold by the firm, the issuance of goods and arrival of orders. It is made up of the records accounting for the good in stock. Thus the stock level subsystem maintains record of the current level of inventory.

### **Minimum stock level:**

The represents the quantity which must be maintained in level at all times. If stocks are less than minimum level then the work may stop due to shortage of materials. Following factors are taken into account while fixing minimum stock level.

#### **Lead time**

#### **Rate of consumption**

#### **Nature of material**

The following formula is for calculating minimum level:

Minimum stock level = re-ordering level –( normal consumption × normal Re-order period )

### **Maximum stock level**

It is the quantity of material which a firm should not exceed its stocks. If the quantity exceeds maximum level limit, then it will be over-stocking. A firm should avoid over stocking because it will result in high material costs. Overstocking mean blocking of more working capital, more space for storing the materials, more wastages of materials and more chances of losses from obsolescence.

The following formula is for calculating maximum stock level:

Maximum stock level = Re-ordering level + Re-order quality



(Minimum consumption × minimum Re-ordering period)

#### d. Re-ordering level

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

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

Three items of information are needed as input to design the re-order point sub system. They are given below:

- a) **Usages Rate:** This is the per day rate at which the item are consumed in production or they are sold to customers.
- b) **Lead time:** This is the length of time between placing an order and receiving the goods.
- c) **Safety stock level:** This safety stock is the minimum level of inventory that the firm wishes to hold as a protection against running out. The demand for goods may fluctuate day by day or from week to week. If the actual usage or sales go up and delivery of goods in delayed, the provision of safety stock makes the organization able to face the problem of stock out.

According to Levis J. Rage “safety quantity which the plant must keep to make sure that the line never runs out of materials which could help up the movement of the production line as a whole. (Lavis J. 1975 page 185)

Here, Re-order level= lead time × average usage + safety stock

#### **d) Average stock level**

Average stock level is calculated as:

Average stock level = minimum stock level + ½ of Re-order quantity,

#### **e) Danger level**

It is the level beyond which materials should not fall in any case. If the danger level arises then immediate steps should be taken to replenish the stocks even if the more cost is incurred in arranging the materials. If the materials are not arranged immediately there is possibility of stoppage of work. Danger level is determined by the following formula:

Danger level = Average consumption × maximum Re-order point for emergency purchase.

### **2.8 Inventory turnover**

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

The liquidity of firm's inventory may be calculated by dividing the cost of goods sold by the firm's inventory.

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

The significance of inventory turnover is that it helps the analyst to 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 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.

## **2.9 Review of previous studies on Inventory management**

As management of any enterprise is that vital point which will determine that whether the enterprise is running towards the objective or not. 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 on inventory management considered relevant, are reviewed below:

1. Mr Surendra Shrestha conducted a research work in the topic of “Inventory management,” A case study of Gorkhapatra Corporation. The main objectives of the study were to assess how the inventories are maintained and their consequence 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 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 recording and maintaining the inventories is not well. Unnecessary cost involved in ordering and carrying be reduced to certain level by the use of models, formula etc.

At the end Mr. Surendra Shrestha 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. Amrit Kumar Sharma Gaire has conducted a research work on the topic of “Inventory management: A case study of Royal Drugs LTD”. The main objective of this study is to identify the problem underlying in inventory management and control system of Royal Drugs Limited. The other objectives are:

- To assess the 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 are as follows:

- When and how much to order are estimated haphazardly and orders quantity fluctuate 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 is able to produce good quality of medicine because of its quality control.
- The company does not use ABC Analysis and pays equal attention for the entire inventory held in the store.

On the basis of study conducted by Mr. Gaire, the following suggestions have 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. Surendra Prasad Yadav 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 objective of this study was to identify the problems in inventory management of Janakpur Cigarette Factory. To achieve this objective the following sub-objectives have been defined by him:

- To study the present practice of collection and procurement procedure 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 basic 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 in 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.

Mr. Yadav has recommended some suggestions to improve the inventory management of JCF. The company should define its objectives and goals. The company should follow all the scientific tools and techniques so that total cost can be minimized. Estimation of demand and lead time etc. should be done regularly. Inventories should be classified according to ABC analysis. Management should be handed over to the skilled and professionally expert person having no political interference. Reliable source of supplier of inputs should be determined.

4. Mr. Liladhar Dhital has conducted the research work on the topic “Inventory Management: A case study of Nepal Food corporation”.

The main objectives of his study were to highlight the NFC's policies and objectives & functions and activities. To analyze the various related variable like purchase, sales, demand and food quota of NFC. To provide suggestions and Re-selling / distribution and functions in accordance with inventory Management.

The major findings of Mr. Dhital are under food grains purchasing, the domestic purchases are more fluctuated and greater than import. Primary market purchase is also less than open market purchase although the primary market purchase is made for paddy, maize, wheat and pulse etc but rice is purchased only in open market. The relationship between edible cereal production and requirement is negative. The total food grains quota is fluctuated year by year because of production fluctuation in Nepalese kingdom.

Mr. Dhital has recommended some suggestions to improve the present inventory management procedure. The NFC should encourage food production by initiating farmers to produce more food grains. It should facilitate farmers by managing various inputs through coordination with concerned agencies. NCF must do timely procurement of food grains. Food grains should be stored during harvesting time and should be supplied in areas where there is food deficit. NFC should be released from interference of government as well as political parties.

**C 5.** Dinesh Kumar Pant conducted a research work in “ 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 causes of wastage and leakage of cost. But there costs are 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 objectives 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 aluminum sheets in GPC, assess the relevant financial ratios, analyze the relationship between inventory/material cost and profit and to provide appropriate suggestion based on the major findings.

The major findings of this study were that the corporation did not use any tools and technique to manage inventory. Inventory turnover ratio is flexible, net profit margin is inconsistent, Regression and correlation analysis have shown the positive relationship between inventory/material cost and profit.

6. Mr. Vibhas Gautam 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, magazine 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 favour of consumer interests and needs.
  - NOCL's inventory control system is weak; therefore the company has always suffered over stock or stockout situations.
  - NOCL is failed to practice basic inventory management techniques and it always maintain rough safty stock for 35 days which is fluctuating every time.
  - NOCL should attempt convenient models and techniques to control and manage the inventory to avoid the over stock, under stock or stock out situation, which lead organization to maintain mutual price level during the right time period.
7. Mr. Sangit Niraula had studied on "Inventory management in Diary Development Corporation (Biratnagar branch)" in april 2003. From his stidy he had conclude the following findings.
- Biratnagar milk supply scheme do not have good pactice for optimum number of order to procure the material.
  - It has utilize low percentage of production capacity then it has.
  - The project has lack of study on effective and efficient inventory



- The factor 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.

8. Mr. purushottam Prasad Dahal has carried out a research study on “ A comparative study on inventory management of dabur Nepal pvt. Ltd and Nepal lever Ltd” in 2005. 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 organizations for the sake of examination and analysis. He used various accounting, financial and stastical tools to analyze the data his findings were:

- Both the organizations use raw material from local, India and third countries where they are unable to practice inventory management.
- Purchasing of 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 do not apply dynamic inventory management system.
- The researcher has suggested that the both companies should apply the control of stock level to get better performance.

## **Research Gap**

These days the new inventory management tools and techniques have been increased dramatically, progress in computer application and software developed

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 organizations. However there has been very little research on the effectiveness of such use. To practice the scientific inventory 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 of such tools as compared to traditional inventory management tools.

# **CHAPTER –III**

## **Research Methodology**

### **3.1 Introduction:**

Research methodology is the process of arriving at the solution of problem through planned and systematic dealing with collection, analysis and interpretation of the facts and figures. The objective of this study is to analyze the inventory management and control system of Gorkhapatra Corporation and Kantipur publications Pvt. Ltd. And forward some measures to improve the situation.

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

### **3.2 Research Design:**

The research design refers to the systematic frame work under which the research is conducted. It is planned structure and it is the strategy for investigation. Research design involves selecting the most appropriate method of techniques to solve the particular problem under investigation. Research design followed for this study is analytical and descriptive.

### **3.3 Nature and sources of Data:**

For the reliability and effectiveness of research work, valid information are necessary because information are the life blood 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 personal observation, informal interview with officials of publication houses.

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

### **3.4 Data Gathering procedure:**

Primary data have been collected through observation and informal Interview. All the gathered data have been used according to the requirement of this study.

Secondary data were directly obtain from the various sources such as Official record of publication houses, published document of publishing houses books, magazine, booklets, management information system of publication houses etc.

### **3.5 Analytical tools used:**

To analyze the collected facts and figures various financial tools are used. The data are managed, analyzed and presented in proper table and Formats. Such table and formats are interpreted and explained as necessary. Various tools used in this study are as follows.

#### **a. Selective inventory control ABC Analysis:**

According to this control system those inventories which have highest value should be paid more attention. The firm should therefore, classify Inventories to identify which item should receive the most effort in Controlling. The high value item is classified as “An items” and would be under the highest control. “Item C” represent relatively least value and should be under simple control. “Item B” falls in between their two Categories and require reasonable attention of management.

#### **b. Economic order quantity (EOQ):**

The economic order quantity is that inventory level which minimizes the total ordering and carrying costs. It attempts to establish the most economic balance between the carrying cost and ordering it determine the quantities to be ordered. The basic objective of this technique is to determine the optimal order size to be placed on the basis of usage, ordering costs carrying costs. The mathematical formula for calculation of EOQ is:

$$EOQ = \sqrt{\frac{2 A O}{C}}$$

Where,

A = Annual usage in units.

O = Ordering cost per order

C = Carrying cost per unit

### **C. Re-ordering level (ROL):**

This refers to the level at which new orders are placed to replenish low stocks. New supplies will be received before the stock reaches the minimum level.

It is set on the basis of:

- **Rate of consumption**
- **Minimum level**
- **Delivery time**
- **Stock out cost**

### **Formula to calculate ROL:**

ROL = Minimum level + Consumption during the time

Required to get the fresh delivery

(i.e. daily requirement × Time required for Fresh delivery).

Another formula is as follows:

ROL = Maximum consumption × Maximum delivery time.

# CHAPTER-IV

## Presentation and Analysis

The main objectives of this study are to examine the existing position of inventory management system of Gorkhapatra Corporation and Kantipur Publications Pvt. Ltd. On the basis of analysis and diagnosis of the collected data and to provide the suggestion and recommendation for the improvement of inventory management of these publications.

In this chapter collected data from the publishing houses are analyzed According to the deterministic as well as probabilistic model or techniques As per the requirement of the study so as to know the real situation of Inventory management system of publishing houses. The study covers the Period of five years from 2060\61 to 2064\56.

### 4.1 EOQ Analysis:

Economic order quantity is an important inventory control technique. This technique is widely used in many countries in these days. Many Organization of Nepal has been using this technique. The Gorkhapatra Corporation and Kantipur Publications pvt. Ltd. has been applying this technique for a 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. The data have been collected for five years starting from 2060\61 to 2064\56.

## 4.1 EOQ Analysis

Annex-1

### Item 'A' Newsprint

FY	2060\61		2061\62		2062\63		2063\64		2064\65	
	GPC	KP	GPC	KP	GPC	KP	GPC	KP	GPC	KP
Annual Requirement(MT)	700	900	688	1000	735	910	620	950	900	1100
Per order quantity (MT)	300	300	300	350	350	400	400	450	400	500
Cost per Metric Ton(Rs.)	35000	38000	38500	40000	42730	45900	45350	48000	49492	55000
No. of order placed within a year	2 times	3 times	2 times	2 times	2 times	2 times	2 times	2 times	2 times	2 times
Ordering cost (in Rs.)	4869500	7054000	5439000	8026000	7090500	8065000	5550200	860100	8580000	10112000
Carrying cost (in Rs.)	1485.71	830	1505.81	795	1596.32	882	1646.45	899	1788.88	1013
EOQ (in MT)	2142.09	3911.24	2229.37	4493.46	2555.27	4079.46	2044.51	4263.55	2938.25	4686.24
Re-order point (in MT)	172	148	170	164	181	150	153	156	222	181

Table: 4.1 EOQ Analysis of Newsprint of GPC and KP Pvt.Ltd

From 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 orders should be placed up to its annual requirement at a time so that various expenses can be minimized. No of orders placed within the year for both publishing houses are almost same i.e. 2 times. Ordering cost of KP is higher than GPC. In the same way carrying cost of KP is lesser than GPC. EOQ of Kantipur publications Pvt. Ltd. is greater than Gorkhapatra Corporation. Re-order point for both organizations have fluctuated comparatively it is seemed that Re-order Point of Gorkhapatra Corporation is higher than Kantipur publications Pvt. Ltd. Therefore Gorkhapatra Corporation should minimize the lead.



## Item 'B' Ink

FY	2060\61		2061\62		2062\63		2063\64		2064\65	
	GPC	KP	GPC	KP	GPC	KP	GPC	KP	GPC	KP
Annual Requirement(KG)	1050	16000	11720	18500	13880	20000	9800	21000	9460	21800
Per order quantity (KG)	4000	4500	3500	5000	4000	6000	3000	7000	3000	7000
Cost per Metric Ton(Rs.)	120	150	150	175	165	190	180	220	200	260
No. of order placed within a year	3 times	4 times	4 times	4 times	4 times	4 times	4 times	3 times	4 times	4 times
Ordering cost (in Rs.)	16380	31200	22854	42088	29773	49400	22932	60060	24596	73648
Carrying cost (in Rs.)	43200	40000	54060	46000	65204	51000	55580	57000	58840	65000
EOQ (in KG)	9148.41	19984	10779.7	25058.44	13275	27837	8903.43	30509.32	8656.59	32833.54
Re-order point (in KG)	862.8	1314.9	963	1520.4	1140.6	2643.7	805.2	1725.9	777.3	1791.6

Table: 4.2 EOQ Analysis of ink of GPC and KP Pvt. Ltd.

From above table it is seemed that annual demand of ink in Kantipur publications Pvt. Ltd. is higher than Gorkhapatra Corporation. Both organizations should order according to EOQ at a time to minimize the total cost. Per order quantity of ink in Kantipur Publications Pvt. Ltd. is higher than Gorkhapatra Corporation. No. of orders placed within the year for both organization is almost same. Ordering cost and carrying cost has been increased per year in both organizations. Re-order point of Kantipur Publications Pvt. Ltd. is higher than Gorkhapatra Corporation. It is seemed that lead time for both publishing house is same i.e. 30 days but daily consumption of ink in Kantipur Publications Pvt. Ltd. is higher than Gorkhapatra Corporation.



From above table it is seemed that annual demand of film sheet in Kantipur Publications Pvt. Ltd. is higher than Gorkhapatra Corporation. EOQ is greater than annual demand of film sheet in both organizations. Therefore orders should be placed up to its annual requirement at a time so that various expenses can be minimized. No. of orders placed within the year for both organization is same but is changed in FY 2063\64 and 2064\65. Ordering cost of Kantipur Publications Pvt. Ltd. is higher than Gorkhapatra Corporation. Carrying cost of Gorkhapatra Corporation is higher than Kantipur Publications Pvt. Ltd. Re-order point for both organizations is almost same. Lead time of Gorkhapatra Corporation should be minimized.

## Item 'B' Aluminum Sheet

<b>FY</b>	<b>2060\61</b>		<b>2061\62</b>		<b>2062\63</b>		<b>2063\64</b>		<b>2064\65</b>	
	<b>GPC</b>	<b>KP</b>	<b>GPC</b>	<b>KP</b>	<b>GPC</b>	<b>KP</b>	<b>GPC</b>	<b>KP</b>	<b>GPC</b>	<b>KP</b>
<i>Annual Requirement(sheet)</i>	5500	9800	6200	10200	6500	9500	7100	11000	7700	1300
<i>Per order quantity (sheet)</i>	2500	4500	3000	5000	3200	4000	3500	5000	3800	6000
<i>Cost per Metric Ton(Rs.)</i>	240	275	270	290	320	340	320	350	350	400
<i>No. of order placed within a year</i>	3 times	3times	3 times	3times	3 times	3 times	3 times	3 times	3 times	3 times
<i>Ordering cost (in Rs.)</i>	22160	47035	27762	51954	33540	54790	36536	64050	42835	82800
<i>Carrying cost (in Rs.)</i>	51400	48475	61480	52790	72100	56150	77440	62250	87900	71000
<i>EOQ (sheets)</i>	5105.93	13660.76	5893.85	14317.89	6270.28	13271.91	6899.08	15919.64	7603.55	19856.62
<i>Re-order point (sheet)</i>	903.6	805.2	1018.8	838.2	1068	780.6	1167	903.9	1265.4	1068.3

Table: 4.4 EOQ Analysis of Aluminum Sheet of GPC and KP Pvt. Ltd.

From the above table it is seemed that annual demand of Aluminum sheet in Kantipur Publications Pvt. Ltd. is higher than Gorkhapatra Corporation. Both organizations should order according to EOQ at a time which enables to minimize the total cost. No of orders placed within the year for both organizations is same i. e. 3 times. Ordering cost of Kantipur Publications Pvt. Ltd. is higher than Gorkhapatra Corporation. Carrying cost of Gorkhapatra corporation is highest than Kantipur Publications Pvt. Ltd. Daily consumption of Aluminum Sheet in Kantipur Publications Pvt. Ltd. is higher than Gorkhapatra Corporation. Lead time of Kantipur Publications Pvt. Ltd. is lesser than Gorkhapatra Corporation. Lead time of Gorkhapatra Corporation should be minimized.

### **Item 'B' Chemicals**

Chemicals have been categorized under the item 'B' i.e. moderate important items in the since of value and weight in both organizations. Under the head of chemicals there are many kinds of chemicals which are used in these organizations. 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 new order for their 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, phosphorus acid, Dunlop, rubber solution, blanket wash solution etc.

Total annual cost incurred for chemicals in the Gorkhapatra Corporation for this fiscal year is Rs. 850000 as record kept in stores department in the same way Kantipur Publications Pvt. Ltd. has kept the record of Rs. 1000000 for chemicals in this fiscal year.

It is seemed that although both organizations use some kind of chemicals, expenses incurred by Kantipur publication Pvt. Ltd. for chemicals are higher than Gorkhapatra Corporation.

## **Item ‘C’ Stationery**

Stationery has been categorizing under the item ‘c’ i.e.as least important items. Stationery contains so many items which cannot be treated individually. Inventories of stationery are checked physically once in every three month to determine new order to be placed in Gorkhapatra corporation. While in Kantipur publication Pvt. Ltd. it is checked in every two months. EOQ calculation is impossible for stationeries.

The stationeries used in both publishing houses are: Timex, Pen, Bullpens calculator, Pencil, stapler and Gum etc. The quantity required of stationery required is relatively small and daily usage could not be found exactly.

According to the Gorkhapatra Corporation’s record, the total cost incurred for stationery during the fiscal year is Rs. 520000. While in Kantipur publication Pvt. Ltd. total cost incurred for stationery during this fiscal year is Rs.430000.

It is seemed that both organizations use same kind of stationery. Total cost incurred for stationery in Gorkhapatra Corporation is higher than Kantipur publications Pvt. Ltd.

## **4.2 ABC Analysis**

It is a method of selective inventory control. The term ABC is known as always better control. The firm should pay maximum attention to those items whose value is the highest. Therefore the firm should classify inventories to identify items that should receive the special attention. These include ‘A’ items. Category B includes lesser important items and category C includes least important items of stores. This 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.

## 4.2 ABC Classification of Inventories in Gorkhapatra Corporation and Kantipur Publications Pvt. Ltd.

Value in %

Fiscal year	Gorkhapatra corporation				Kantipur Publications Pvt.Ltd.			
	A	B	C	Total	A	B	C	Total
2060\61	72.00	16.20	11.80	100	70.30	11.20	12.50	100
2061\62	75.20	18.50	6.30	100	71.50	15.00	13.50	100
2062\63	74.80	15.70	9.50	100	75.10	18.10	6.80	100
2063\64	73.00	19.00	8.00	100	76.30	14.20	9.50	100
2064\65	76.00	19.40	4.60	100	74.60	16.40	9.00	100

Table: 4.5 showing ABC classification of Inventories.

Sources: Unpublished Records of GPC and KP Pvt. Ltd.

Both organizations have categorized its all materials according to its importance and value. In both organizations Category A includes Newsprint, Category B includes Ink, Film Sheet, Aluminum Sheet and Chemicals, and Category C includes Stationary.



### 4.3 Trend Analysis

Annex-2

#### 1. Annual usage of Newsprint

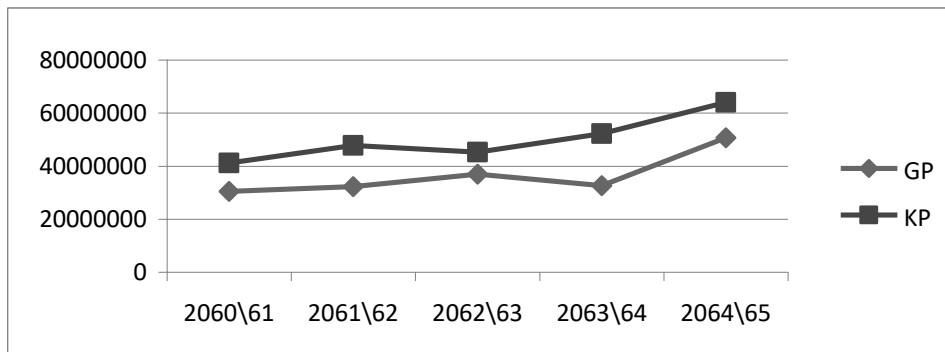
Fiscal year	Gorkhapatra Corporation		Kantipur publications Pvt. Ltd.	
	Total purchase	% Change	Total purchase	% Change
2060\61	30409500	–	41100500	–
2061\62	32275000	6.13	47811000	16.35
2062\63	36928800	24.43	45267000	10.13
2063\64	32611000	7.23	52204750	21.27
2064\65	50690000	66.69	64026000	55.77

Table: 4.6 Annual usage of Newsprint in GPC and KP Pvt. Ltd.

Sources: Unpublished Records of GPC and KP Pvt. Ltd.

From above table it is seemed that GPC has fluctuating trend in collection of Newsprint. The usage of Newsprint in GPC has increased by 24.43% in FY 2062\63, but it is decreased by 7.23% in FY 2063\64. In fiscal year 2064\65 it is increased to 66.69% from the base FY 2060\61 on the other hand KP Pvt. Ltd has fluctuating and high increasing trend in usage of newsprint. It is increased by 16.35% in FY 2061\62 from base FY 2060\61. In FY 2062\63, it is decreased by 10.13% then it is increased by 21.27%, 55.77% in FY 2063\64 and FY 2064\65 respectively from the base FY 2060\61.

## Annual usage of Newsprint



Fiscal year

Graph: 4.1 Showing annual usage of Newsprint

From the above group, it is clear that both organizations have fluctuating trend of usage of Newsprint. Comparatively GPC has highly fluctuated usage of Newsprint. So it is better to purchase according to planning and planning should be according to economic order quantity.

## 2. Annual usage of Ink (value in Rs.)

Fiscal year	Gorkhapatra Corporation		Kantipur Publications Pvt.Ltd.	
	Total purchase	% change	Total Purchase	% change
2060\61	1319580	—	2471200	—
2061\62	1834914	39.05	3325588	34.57
2062\63	2385177	80.75	3900400	57.83
2063\64	1842512	39.62	4737060	91.69
2064\65	1975436	49.70	5806684	134.97

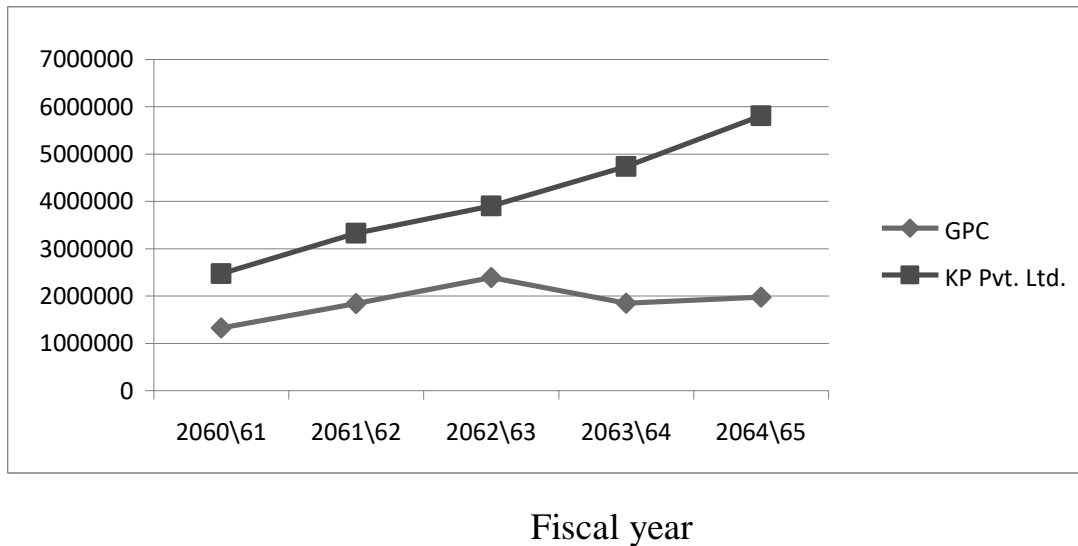
Table: 4.7 Annual usages of Ink in GPC and KP Pvt. Ltd.

Sources: Unpublished Records of GPC and KP Pvt. Ltd.

From above table, it is seemed that GPC has fluctuating trend in usage of Ink. In FY 2062\63 it has highly increased by 80.75% from the base FY 2060\61.

It is increased by 39.62% and 49.70% in FY 2064\65 respectively from the base FY 2060\61. 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 2060\61 to FY 2064\65.

### Annual usage of Ink



Graph: 4.2 showing Annual usage of Ink

From the above graph, it is seemed that GPC has highly fluctuating trend in usage of Ink. On the other hand, KP Pvt. Ltd. has highly increasing trend in usage of Ink. Therefore it is advised to GPC to scan external environments to avoid fluctuation.

### 3. Annual Usage of Film Sheet (value in NRs.)

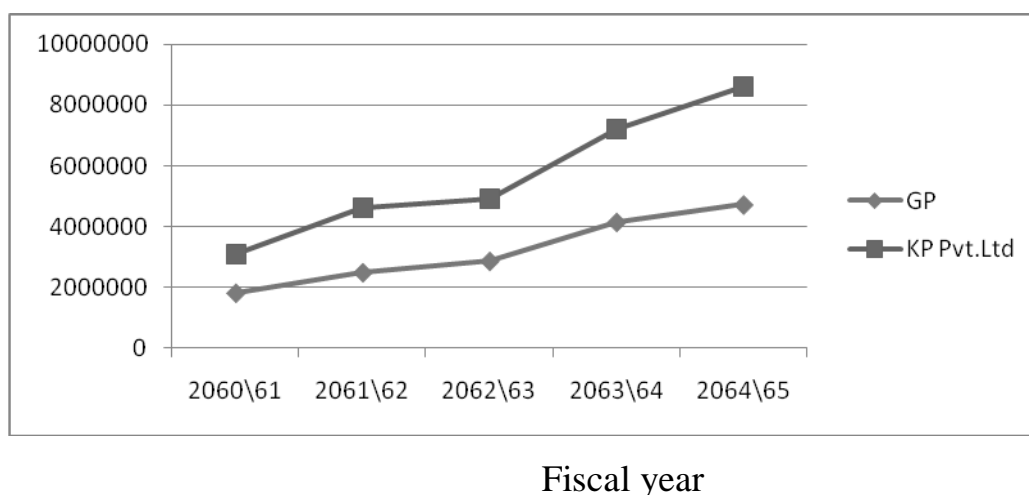
Fiscal year	Gorkhapatra Corporation		Kantipur publications Pvt.Ltd.	
	Total purchase	% change	Total purchase	% change
2060\61	1828750	—	3087000	—
2061\62	2502400	36.83	4620500	49.67
2062\63	2874750	56.65	4925200	59.54
2063\64	4157500	127.34	7200540	133.25
2064\65	4728150	158.54	8600200	178.59

Table: 4.8 Annual usage of Film Sheet in GPC and KP Pvt. Ltd.

Sources: Unpublished Records of GPC and KP Pvt. Ltd.

From above table, it is seemed that both organizations have highly increasing rate in usage of film sheet. In GPC it is increased by 36.83% to 158.54% from the base FY 2060\61 to FY 2064\65. On the other hand, in KP Pvt. Ltd, it is increased from 49.67% to 178.59% from the base FY 2060\61 to FY 2064\65.

#### Annual usage of Film Sheet



Graph 4.3 Showing annual usage of Film Sheet

From the above graph, it is found that both organizations have increasing rate in consumption of Film sheet. Comparatively it is seemed that KP Pvt. Ltd

has highly increasing trend in consumption of Film Sheet. It is advised to both organizations to maintain optimum level of inventory to control the expenses on Film Sheet.

#### 4. Annual usage of Aluminum Sheet (value in NRs.)

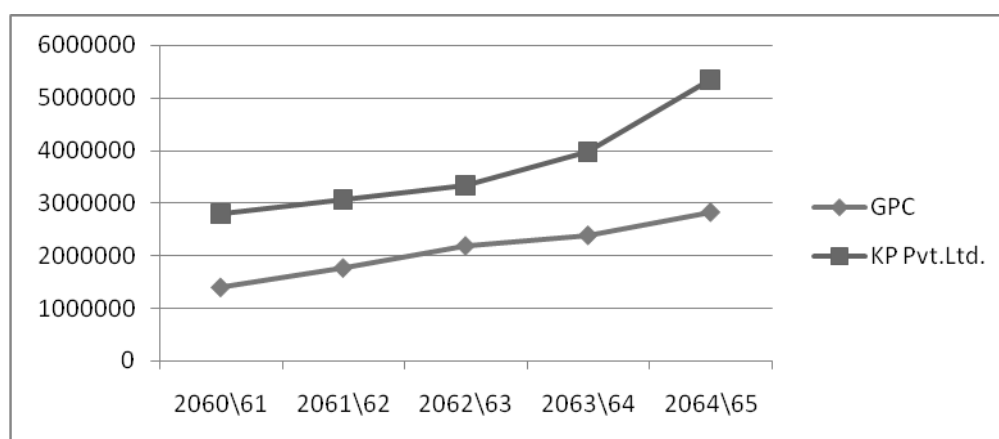
Fiscal year	Gorkhapatra Corporation		Kantipur publications Pvt.Ltd.	
	Total purchase	% change	Total purchase	% change
2060\61	1393560	–	2790510	–
2061\62	1763242	26.52	3062744	9.75
2062\63	2185640	56.83	3340940	19.72
2063\64	2385976	71.21	3975300	42.45
2064\65	2825735	102.77	5353800	91.85

Table: 4.9 Annual usage of Aluminum Sheet in GPC and KP Pvt. Ltd.

Sources: Unpublished Records of GPC and KP Pvt. Ltd.

From above table, it is seemed that both organizations have highly increasing rate in usage of Aluminum Sheet. I GPC it is increased by 26.52% to 102.77% from the base FY 2060\61 to 2064\65. On the other hand in KP Pvt. Ltd., it is increased from 9.75% to 91.85% from the base FY 2060\61 to FY 2064\65.

#### Annual Usage of Aluminum Sheet



Fiscal year

Graph: 4.4 showing annual usage of Aluminum Sheet

From the above graph, it is found that both organizations 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 organizations to control its exp

enses on Aluminum Sheet by ordering optimum level of inventory.

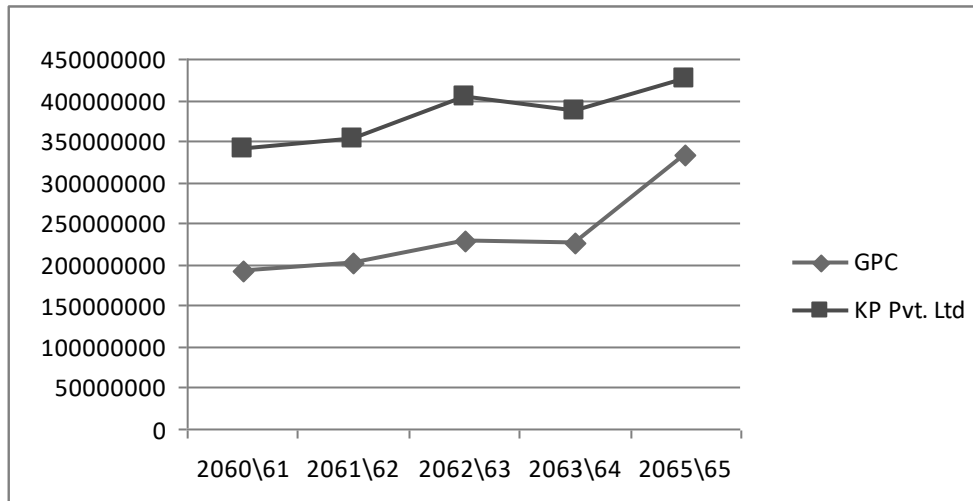
**5. Annual Aggregate sales of GPC and KP Pvt. Ltd. (value in NRs.)**

Fiscal year	Gorkhapatra Corporation		Kantipur publications Pvt. Ltd.	
	Total Sales	% Change	Total Sales	% change
2060\61	192895420	–	340426400	–
2061\62	202866646	5.16	351836000	3.35
2062\63	228737365	18.58	404456340	18.80
2063\64	227021835	17.69	387969870	13.96
2064\65	333817458	42.21	4251110000	24.87

Table: 4.10 Annual Aggregate Sales of GPC and KP Pvt. Ltd.

Sources: Unpublished Records of GPC and KP Pvt. Ltd.

GPC has increment of 5.16%, 18.58%, 17.69% and 42.21% in sales from the base FY 2060\61 to FY 2064\65 respectively. There is decline of sales in FY 2063\64 in comparison to previous fiscal years but it has achieved a great improvement of sales in FY 2064\65. On the other hand, KP Pvt. Ltd. has great incremental till FY 2062\63 but in FY 2063\64 it is declined by 13.96% from the base FY 2060\61. In FY 2064\65 it has improved its sales by 24.87%.



Graph: 4.5 Annual Aggregate sales of GPC and KP Pvt. Ltd.

From the above, it is found that sales revenue growth rate in both organizations is in increasing trends. Both organizations have decreasing sales revenue in FY 2063\64. Comparatively sales revenue of KP Pvt. Ltd. is higher than GPC. It is advised to GPC to increase its sales by utilizing its optimum production capacity and establishing its branch offices in all over Nepal.

#### 4.4 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)

$$\text{Inventory Turnover Ratio} = \frac{\text{Cost of goods sold}}{\text{Average inventory}}$$

Where,

Cost of goods sold (CGS) = opening stock + purchase - Closing stock

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

### Calculation of Inventory Turnover Ratio (Value in NRs.)

Fiscal year	GPC			KP Pvt.Ltd.		
	CGS	AI	Ratio	CGS	AI	Ratio
2060\61	127549260	17662500	7.22	235779188	18507685	12.73
2061\62	138739650	18142320	7.64	253364647	19362400	13.08
2062\63	113564258	16880700	6.72	280378316	20438300	13.71
2063\64	156583400	18438300	8.49	26079772	19880700	13.11
2064\65	167525340	18509875	9.05	323779357	22774280	14.21
<b>Average Ratio</b>			7.82			13.36

Table: 4.11 showing Inventory Turnover Ratios of GPC and KP Pvt. Ltd.

Sources: Unpublished Records of GPC and KP Pvt. Ltd

From above table it is found that both organizations have fluctuating inventory turnover ratios. In FY 2062\63 it has badly decreased in GPC while in KP Pvt. Ltd. it has decreased in FY 2063\64. Comparatively inventory turnover ratio in KP Pvt. Ltd. is higher than GPC.

### 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:

$$\text{DIH} = \frac{\text{Average Inventory} \times 360 \text{ days}}{\text{Cost of goods sold}}$$



## Calculation of Inventory Holding Days

Fiscal year	GPC			KP Pvt. Ltd.		
	AI	CGS	DIH	AI	CGS	DIH
2060\61	17662500	127549260	49.85	18507685	235779188	28.25
2061\62	18142320	138739650	47.07	19362400	253364647	27.51
2062\63	16880700	113564258	53.51	20438300	280378316	26.24
2063\64	18438300	156583400	42.39	19880700	26079772	27.44
2064\65	18509875	167525340	39.77	22774280	323779357	25.44
<b>Average Ratio</b>			46.51			26.95

Table: Showing Inventory Holding Days of GPC and KP Pvt. Ltd.

Sources: Unpublished Records of GPC and KP Pvt. Ltd.

Holding Inventory for long period increases holding costs. On the other hand, holding inventory for short period may create stock out situation. Both GPC and KP Pvt. Ltd. have fluctuating trend in inventory holding days. Average inventory holding days of KP Pvt. Ltd is less than GPC. Thus it is advised to GPC 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 inventory to sales percentage.

$$\text{Inventory to Sales Ratio} = \frac{\text{Inventories (I)}}{\text{Net sales (NS)}} \times 100$$

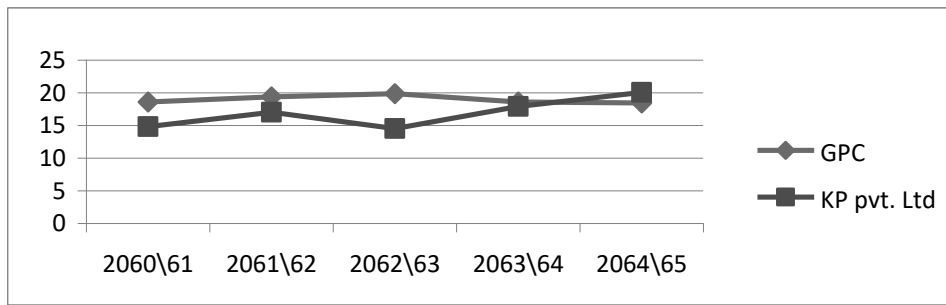
#### Calculation of Inventory to Sales Ratio (value in NRs.)

Fiscal year	GPC			KP Pvt. Ltd.		
	Inventory	Sales	Ratio	Inventory	Sales	Ratio
2060\61	35801390	192895420	18.56	50479210	340426400	14.82
2061\62	39315556	202866646	19.38	59914832	351836000	17.02
2062\63	45404367	228737365	19.85	58613540	404456340	14.49
2063\64	42146988	227021835	18.56	69387650	387969870	17.88
2064\65	61589321	333817458	18.45	85216684	425110000	20.04
<b>Average Ratio</b>			18.96			16.85

Table: 4.13 Showing Inventory to sales Ratio of GPC and KP Pvt. Ltd.

Sources: Unpublished Records of GPC and KP Pvt. Ltd.

## Inventory to Sales



Fiscal year

Graph: 4.6 showing inventory to sales ratio of GPC and KP Pvt. Ltd

Inventory to sales ratio of GPC is between 18.45 to 19.85. Aggregate Ratio is 18.96. In the same way, inventory to sales ratio of KP Pvt. Ltd is between 14.49 to 20.4. Aggregate Ratio is 16.85, From the above graph it is found that inventory to sales ratio of Kp Pvt. Ltd is more fluctuated than GPC, 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.

$$\text{Inventory to profit Ratio} = \frac{\text{Operating profit (OP)} \times 100}{\text{Inventory}}$$

Inventory to profit Ratio =  $\frac{\text{Operating profit (OP)} \times 100}{\text{Inventory}}$

#### Calculation of Inventory to profit Ratio (value in NRs.)

Fiscal Year	GPC			KP Pvt. Ltd.		
	OP	Inventory	Ratio	OP	Inventory	Ratio
2060\61	21218496	35801390	59.26	40851168	50479210	80.92
2061\62	24343998	39315556	61.91	42220320	59914832	70.46
2062\63	27448484	45404367	60.45	44490197	58613540	75.90
2063\64	28377729	42146988	67.33	46556384	69387650	67.09
2064\65	36719920	61589321	59.62	51013200	85216684	59.86
Average Ratio			61.71			70.84

Table: 4.14 showing Inventory to profit Ratio of GPC and KP Pvt. Ltd.

Inventory to profit Ratio of GPC is between 59.26 to 67.33%. Its average ratio is 61.71. In the same way Inventory to profit ratio of KP Pvt. Ltd is between 59.86 to 80.92%. Its average ratio is 70.84%. Both organizations have fluctuating Inventory to profit ratio. Comparatively, it is found that inventory to profit ratio of KP Pvt. Ltd is higher than GPC.

#### 4.5 Correlation Analysis

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

Annex-3

#### Calculation of mean, standard deviation, coefficient of variation, coefficient correlation and probable error (PE) of inventory and sales.

Value in NRs. '0000000'

Description	GPC		KP Pvt. Ltd.	
	Inventory	Sales	Inventory	Sales
Mean	4.48	23.70	6.46	38.19
Standard Deviation( $\sigma$ )	0.89	5.03	1.19	3.17
Coefficient of Variation(CV)	19.86%	21.22%	18.42%	8.30%
Coefficient of correlation( $r_{xy}$ )	0.99		0.80	
Probable Error (r)	0.006		0.108	

Table: 4.15 Showing Correlation Analyses of GPC and KP Pvt. Ltd.  
Between Inventory and Sales

The above table shows that arithmetic mean of inventory and a sale in KP Pvt. Ltd is higher than GPC. Standard deviation of inventory in KP Pvt. Ltd is higher than GPC but SD of sales in GPC is higher than KP Pvt. Ltd. CV of GPC is higher than KP Pvt. Ltd. CV of inventory in KP Pvt. Ltd is nearly about double of sales, which indicates that inventory is high variability nature than sales. Both organizations have positive correlation between inventory and sales. Since  $r_{xy} > r$  in both organizations, sales will go on same direction of inventory cost.

Calculation of mean, standard deviation, coefficient of variation, coefficient correlation and probable Error of inventory and profit.

Description	GPC		KP Pvt. Ltd.	
	Inventory	profit	Inventory	Profit
Mean	4.48	1.98	6.46	3.23
Standard Deviation( $\sigma$ )	0.89	0.35	1.19	0.18
Coefficient of Variation(CV)	19.86%	17.67%	18.42%	5.57%
Coefficient of correlation( $r_{xy}$ )	0.96		0.99	
Probable Error (r)	0.023		0.006	

Table: 4.16 showing correlation Analysis between Inventory and Profit of GPC and KP Pvt. Ltd.

The above table shows that arithmetic means of inventory and profit in KP Pvt. Ltd is higher than GPC. SD of inventory in KP Pvt. Ltd is higher than GPC but SD of profit in GPC is higher than KP Pvt. Ltd. CV of inventory and profit of GPC is not fluctuated while CV of profit is very low than inventory in KP Pvt. Ltd. which shows high variability in profit as compared to inventory. Coefficient of correlation between inventory and profit is positive in both organizations.

Since  $r_{xy} > r$  in both organizations, profit will go on same direction of inventory cost.

#### **4.6 Major findings of the study:**

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

- Both Gorkhapatra Corporation as well as Kantipur Publications Pvt. Ltd. has not been maintaining proper ABC analysis system.
- Annual usage of News print, Ink, film sheets and Aluminum sheets by Kantipur Publications Pvt. Ltd. in the fiscal year 2060\61 to 2064\65 seems highly fluctuated although the normal working days are same. But in Gorkhapatra Corporation, the annual usages of raw materials are not so highly fluctuated.
- Gorkhapatra Corporation as well as Kantipur publications Pvt. Ltd. has not followed proper method of inventory management technique like purchases order, economic order quantity, safety stock, re- order point etc.
- Both publishing co. procure necessary raw materials one time in a year.
- Correlation Analysis has shown the positive relationship between the inventory, cost and profit.
- Kantipur publications Pvt. Ltd. has many branches office scattered over the nation and decision making process is decentralized while Gorkhapatra Corporation has been centralized only in kingdom. Therefore its decision making process is centralized.
- Overall management process of Gorkhapatra Corporation and Kantipur publications Pvt. Ltd. has been influenced by various external factors like government, politics, economy and environment etc.
- There is lack of practice of inventory management tools in both publishing houses. Most of the planning and decision 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 companies have management accounting and finance control department which carry out the process of inventory control.
- Both organizations have adopted traditional inventory record keeping techniques which need more manpower, money and time.
- Both the organizations 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 policies.

# CHAPTER- V

## Summary, Conclusion and Recommendations

### 5.1 Summary:

Public enterprises as well as private enterprises constitute a vital instrument for the socio- economic development of our country. It enjoys a strategic and crucial position in our economy. Public enterprises as well as private enterprises are engaged in public utilities and necessities such as communication, transportation, drugs etc.

Whatever may be the 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 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 obstacles. Inventory management is a part of business management. A business company needs to implement a dynamic inventory management system to have control over its inventories.

The present research study has been undertaken to examine, evaluate and compare the efficiency in practice of inventory management tools in Gorkhapatra Corporation and Kantipur publications Pvt. Ltd. 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, carrying cost, ordering cost, safety stock, all are determined unscientifically by the both organizations and is not given proper attentions to the total cost.

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 not so good so it requires some improvements. To make certain type of inventory management decisions, many financial and mathematical techniques are available to control but these publication houses have not applied any sort of technique.



## 5.2 Conclusion

After the observation and analysis of inventory management tool in Gorkhapatra Corporation and Kantipur publications Pvt. Ltd. the following conclusions are drawn.

- Kantipur publications Pvt. Ltd. have many branches all over the nation and decision making process is decentralized where as Gorkhapatra corporation is centralized only in capital city. Therefore decision making process is centralized. Both the companies purchase raw materials from local market as well as from international market.
- Basically Gorkhapatra Corporation and Kantipur publications Pvt. Ltd. has failed to consider controllable and non controllable variables which can affect the swift control over inventories.
- The study shows that Gorkhapatra Corporation has longer inventory holdings periods which increases inventory holding cost.
- Both the companies are unable to practise comprised inventory management techniques. Both the companies are unable to minimize store keeping and supply costs. Due to this, over all inventory control expenses of both companies are high.
- There is lack of qualified and trained employees to handled the management systems. Both companies are unable to hire experts to manage and guide the overall management operation system. Lack of knowledge about 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 companies.
- There is no well developed system of reward and punishment to employees on the basis of their work performance and qualification.
- Both the establishments fails to analyze its strength and weakness in depth.
- The Gorkhapatra Corporation is not able to maintain a proper co-ordination between various directors as regards to goals, objectives and strategies of the organization.

### **5.3 Recommendations**

Based on the major findings it may be appropriate to make some suggestions. Although 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 organizations.
- Feasibility study, field study and survey, mobilization of available resources and historical analysis should be taken to standardize the procurement system and to control the fluctuation of raw materials collection.
- To determine the effective economic lot size, both organizations 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 the optimum inventory levels of different kinds of materials. Large amount of stock holding cost can be reduced by determining probable safety stock for certain period. It also helps to avoid underlining and stock out situations.
- Both companies use various types of raw materials. ABC inventory management system is useful to cauterize 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 assist to forecast future budgets, therefore these organizations should keep the inventory records up to date. Different filing system 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 companies should have well – experienced and qualified personals to manage the inventory control system; otherwise it should take mgmt services from private consultancies.
- Special workshop, seminar and training etc should be conducted among company's personals, academicians and management experts to light the new and revolving tools of scientific management. Academic concept should be used in practical field of companies.
- Research and development etc 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 its goal.
- Both publishing house are procuring necessary raw materials 3-4 times in a year. Therefore the inventory expenses have increased due to high ordering cost. To reduce this cost, it has to purchase once in a year.
- Gorkhapatra Corporation has failed to achieve the target sales. Corporation has to improve this weakness. Its target can be achieved by producing quality product and supplying at appropriate price. It may be achieved by reducing its management cost.
- Every business organization has own kind of internal and external obstacles, therefore it is better to buildup strategies to tackle them rather than blaming them.

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# Appendix-1

## Research Questionnaire

**Name:** .....

**Position:** .....

**Experience:** ..... **Years**

**1.** What are the newspaper and magazines published by your organization?

**Items/nature**

**Items/Nature**

a. ....

a. ....

b. ....

b. ....

c. ....

c. ....

d. ....

d. ....

e. ....

e. ....

f. ....

f. ....

**2.** What is the circulations of each items published by your organization?

S.No.	Items	Daily No.	Weekly No.	Bi-monthly No.	Monthly No.
1.					
2.					
3.					
4.					
5.					
6.					



3. What are main raw materials used to publish the newspaper and magazine?

**Raw materials**

- a. .... g. ....
- b. .... h. ....
- c. .... i. ....
- d. .... j. ....
- e. .... k. ....
- f. .... l. ....

4. What are the subsidiary raw materials needed to publish newspaper and magazines ?

**Items**

- a. .... g. ....
- b. .... h. ....
- c. .... i. ....
- d. .... j. ....
- e. .... k. ....
- f. .... l. ....

**5. How much is the requirement of each material per year in your Organization?**

FY	Newsprint		Ink		Aluminum sheet		Film sheet		Chemicals		Stationery	
2060\61												
2061\62												
2062\63												
2063\64												
2064\65												

**6. From where your organization purchases raw materials?**

S.no	Materials	GPC		KP Pvt.Ltd	
		Domestic market	Foreign market	Domestic market	Foreign market
1.	News print				
2.	Ink				
3.	Aluminum sheet				
4.	Chemicals				
5.	Film sheet				
6.	Stationery				

**7. Do your Publishing houses apply scientific inventory i.e. economic order quantity (EOQ) while purchasing raw materials?**

- a. Yes
- b. No

**8. What is the inventory management technique followed in your publishing houses?**

- a. Perpetual inventory management
- b. Just in time purchase
- c. Fixed period inventory system
- d. Others

**9. What is the process of purchasing system of your organization?**

- a. Tender
- b. Others

**10. What are the ordering size, lead time and safety stock of each material ?**

Raw materials	Ordering size		Lead time		Safety stock	
Newsprint						
Ink						
Aluminum sheet						
Film sheet						
Chemicals						
Stationary						

**11. What are the components or ordering costs of each year in your publication houses?**

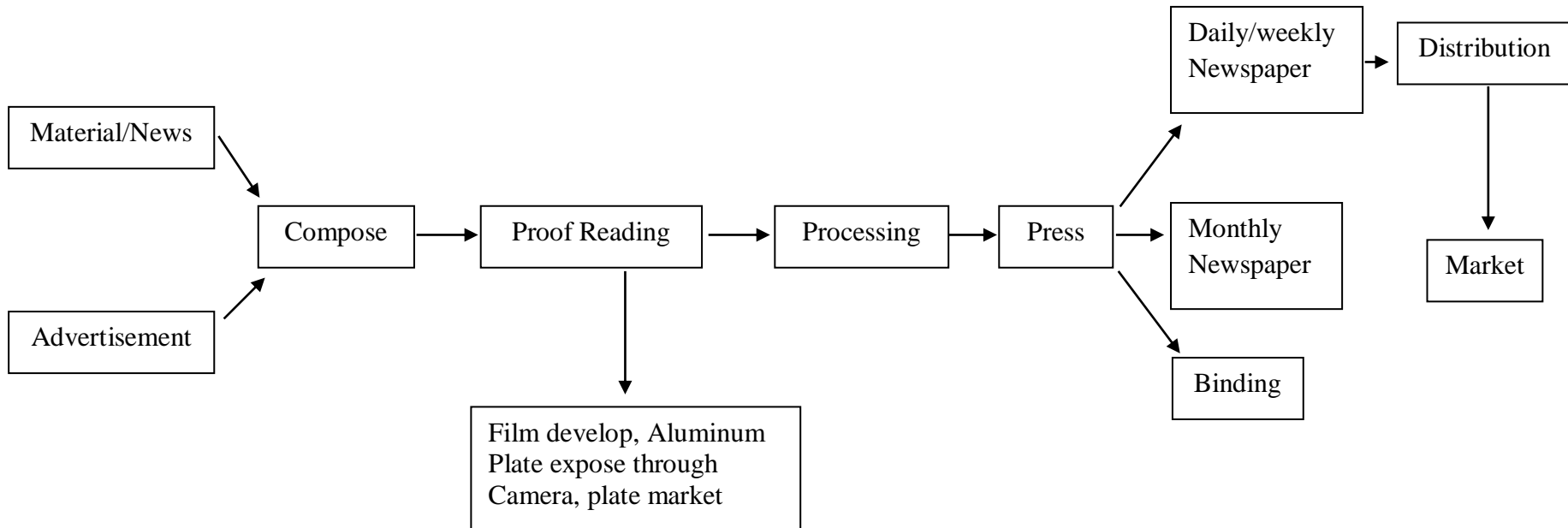
- a. .... g. ....
- b. .... h. ....
- c. .... i. ....
- d. .... j. ....
- e. .... K. ....

**12. What are the components of carrying costs of each year in your publications houses?**

- a. .... g. ....
- b. .... h. ....
- c. .... i. ....
- d. .... j. ....

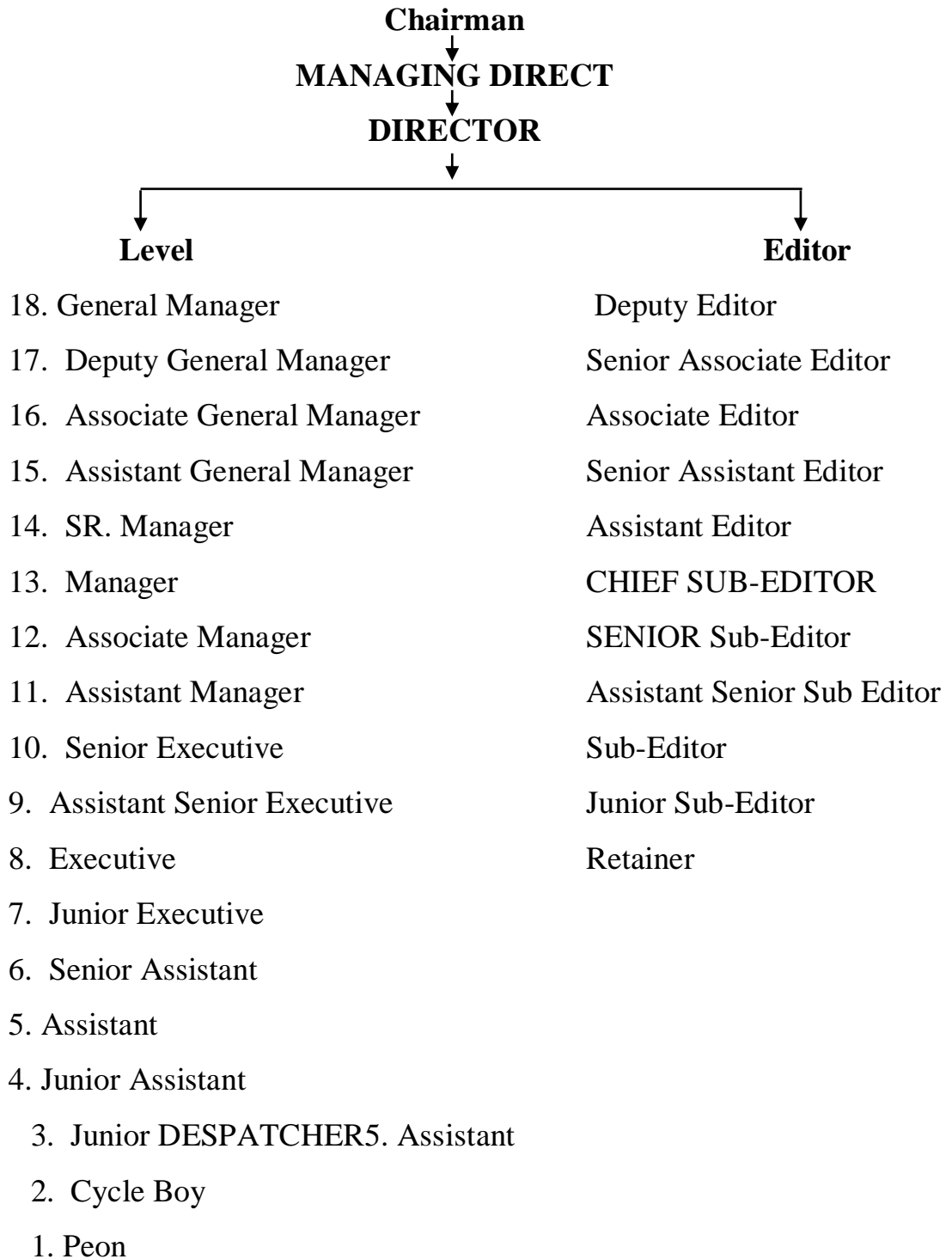
## APPENDIX – II

### Publication/production process



### Appendix-III

#### Organization Chart of Kantipur Publications Pvt. Ltd.

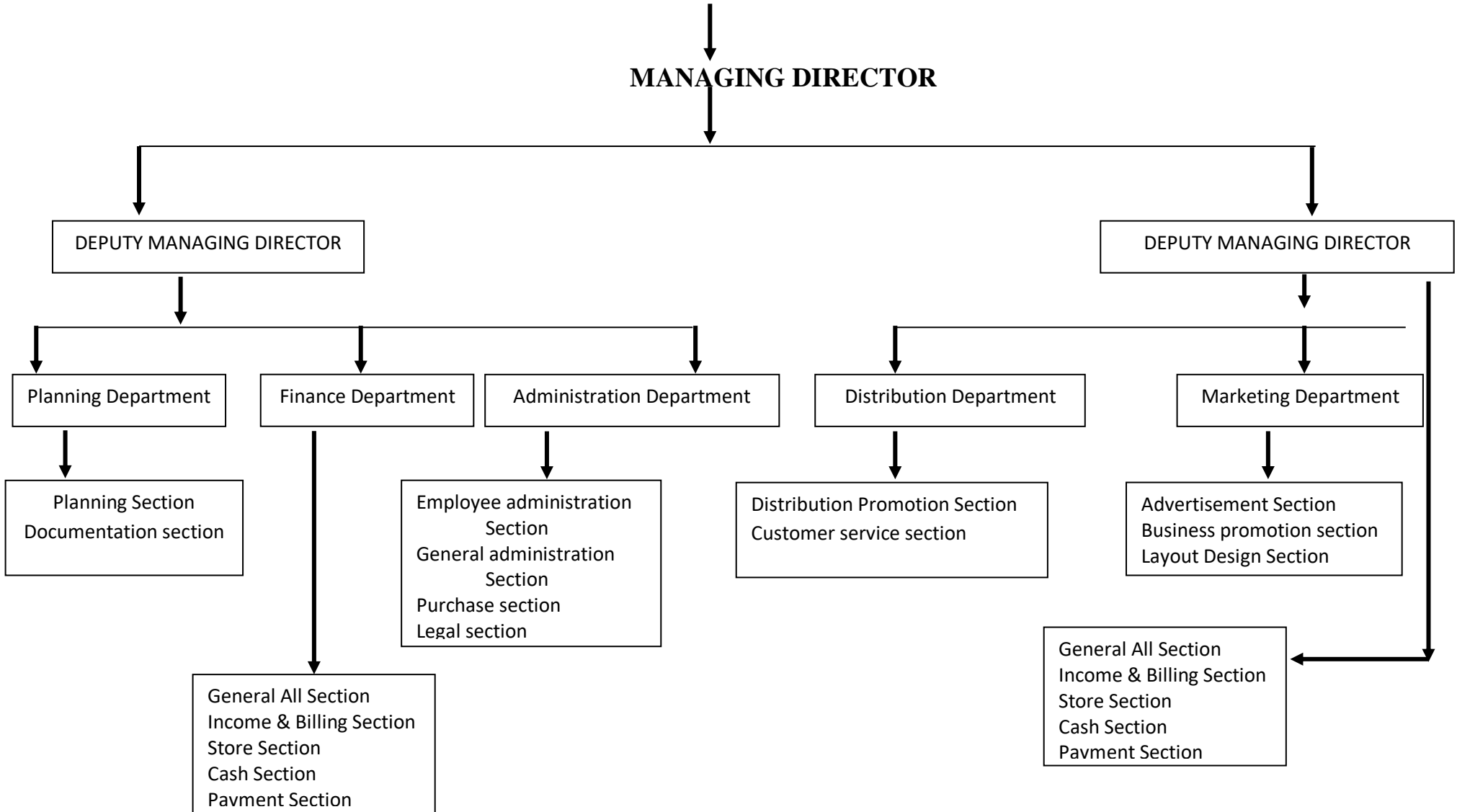


**APENDIX – IV**

**ORGANIZATION CHART OF GORKHAPATRA CORPORATION**

**CHAIRMAN**

**MANAGING DIRECTOR**



**Table: 4.2 EOQ Analysis of ink of GPC and KP Pvt. Ltd.**

**Calculation of EOQ**

**Item A – News Print: Gorkhapatra Corporation.**

<b>FY</b>	<b>2060\61</b>	<b>2061\62</b>	<b>2062\63</b>	<b>2063\64</b>	<b>2064\65</b>
Annual Demand (in MT)	700P	688	735	620	900
Cost per Metric Ton (in Rs.)	35000	37500	39000	42000	45000
<b>Total cost(in Rs.)</b>	<b>24500000</b>	<b>25800000</b>	<b>28665000</b>	<b>26040000</b>	<b>40500000</b>
<b>Ordering Cost (in Rs.)</b>					
Freight Charge	3500000	4000000	4200000	4100000	4500000
Custom Duty	1225000	1290000	1433250	1304000	2025000
Labour Charge	22000	20000	24000	18000	30000
Bank Commission	122500	129000	1433250	130200	2025000
<b>Total Ordering Cost per order (Rs.)</b>	<b>4869500</b>	<b>5439000</b>	<b>7090500</b>	<b>5550200</b>	<b>8580000</b>
<b>Carrying Cost (in Rs)</b>					
Jilla Sahakari sangh Limited & National Trading Corporation	550000	520000	600000	500000	800000
Insurance	122500	129000	143325	130200	202500
Obsolescence	367500	387000	429975	390600	607500
<b>Total Carrying Cost (in Rs)</b>	<b>1040000</b>	<b>1036000</b>	<b>1173300</b>	<b>1020800</b>	<b>1610000</b>
<b>Carrying Cost per MT (in Rs)</b>	1485.71	1505.81	1596.32	1646.45	1788.88
<b>EOQ = <math>\sqrt{\frac{2AO}{C}}</math></b>	$\sqrt{\frac{2 \times 700 \times 4869500}{1485.71}}$ =2142.09 MT	$\sqrt{\frac{2 \times 288 \times 5439000}{1505.81}}$ =2229.37 MT	$\sqrt{\frac{2 \times 735 \times 7090500}{1596.32}}$ = 2555.27 MT	$\sqrt{\frac{2 \times 620 \times 5550200}{1646.45}}$ = 2044.51 MT	$\sqrt{\frac{2 \times 900 \times 850080}{1788.88}}$ = 2938.25 MT



**Item A – News print: Kantipur publication Pvt. Ltd**

<b>FY</b>	<b>2060\61</b>	<b>2061\62</b>	<b>2062\63</b>	<b>2063\64</b>	<b>2064\65</b>
Annual Demand (in MT)	900	1000	910	950	1100
Cost per Metric Ton (in Rs.)	37000	39000	40000	45000	48000
<b>Total cost(in Rs.)</b>	<b>33300000</b>	<b>39000000</b>	<b>36400000</b>	<b>42750000</b>	<b>52800000</b>
<b>Ordering Cost (in Rs.)</b>					
Freight Charge	3700000	4100000	4400000	4300000	4800000
Custom Duty	1665000	1950000	1820000	2137500	2640000
Labour Charge	24000	26000	25000	26000	32000
Bank Commission	1665000	1950000	1820000	2137500	2640000
<b>Total Ordering Cost per order (Rs.)</b>	<b>7054000</b>	<b>8026000</b>	<b>8065000</b>	<b>8601000</b>	<b>10112000</b>
<b>Carrying Cost (in Rs)</b>					
Storage cost	580000	600000	620000	640000	850000
Insurance	166500	195000	182000	213750	264000
<b>Total Carrying Cost (in Rs)</b>	<b>746500</b>	<b>795000</b>	<b>802000</b>	<b>853750</b>	<b>1114000</b>
<b>Carrying Cost per MT (in Rs)</b>	<b>830</b>	<b>795</b>	<b>882</b>	<b>899</b>	<b>1014</b>
<b>EOQ = <math>\sqrt{\frac{2AO}{C}}</math></b>	$\sqrt{\frac{2 \times 900 \times 7054000}{830}}$ =3911.24 MT	$\sqrt{\frac{2 \times 1000 \times 8026000}{795}}$ =4493.46 MT	$\sqrt{\frac{2 \times 910 \times 8065000}{882}}$ = 4079.46 MT	$\sqrt{\frac{2 \times 950 \times 8601000}{899}}$ = 4263.55 MT	$\sqrt{\frac{2 \times 1100 \times 10112000}{1013}}$ = 4686.24 MT

**Item B – Ink: Gorkhapatra Corporation.**

<b>FY</b>	<b>2060\61</b>	<b>2061\62</b>	<b>2062\63</b>	<b>2063\64</b>	<b>2064\65</b>
Annual Demand (in Kg)	10500	11720	13880	9800	9460
Cost per Kg (in Rs.)	120	150	165	180	200
<b>Total cost (in Rs.)</b>	<b>1260000</b>	<b>1758000</b>	<b>2290200</b>	<b>1764000</b>	<b>1892000</b>
<b>Ordering Cost (in Rs.)</b>					
Bank commission	6300	8790	11451	8820	5460
Custom Duty	10080	14064	18322	14112	15136
<b>Total Ordering Cost per order (Rs.)</b>	<b>16380</b>	<b>22854</b>	<b>29773</b>	<b>22932</b>	<b>24596</b>
<b>Carrying Cost (in Rs)</b>					
Storage cost	18000	18900	19400	20300	21000
Obsolescence charge (%)	25200	35160	45804	35280	37840
<b>Total Carrying Cost (in Rs)</b>	<b>43200</b>	<b>54060</b>	<b>65204</b>	<b>55580</b>	<b>58840</b>
<b>Carrying Cost per MT (in Rs)</b>	4.11	4.61	4.69	5.67	6.21
<b>EOQ = <math>\sqrt{\frac{2AO}{C}}</math></b>	$\sqrt{\frac{2 \times 10500 \times 16380}{4.11}}$ =9148.41kg	$\sqrt{\frac{2 \times 11720 \times 22854}{4.61}}$ =10779.7 kg	$\sqrt{\frac{2 \times 13880 \times 29773}{4.69}}$ = 13275 kg	$\sqrt{\frac{2 \times 9800 \times 22932}{5.67}}$ = 8903.43 kg	$\sqrt{\frac{2 \times 9460 \times 24596}{6.21}}$ = 8656.59 kg

**Item B – Ink: Kantipur Publication Pvt. Ltd.**

<b>FY</b>	<b>2060\61</b>	<b>2061\62</b>	<b>2062\63</b>	<b>2063\64</b>	<b>2064\65</b>
Annual Requirement(in kg) Cost per kg (in Rs.) <b>Total cost (in Rs.)</b>	16000 150 <b>2400000</b>	18500 175 <b>3237500</b>	20000 190 <b>3800000</b>	21000 220 <b>4620000</b>	21800 260 <b>5668000</b>
<b>Ordering Cost (in Rs.)</b> Bank commission Custom Duty <b>Total Ordering Cost per order (Rs.)</b>	12000 19200 <b>31200</b>	16188 25900 <b>42088</b>	19000 30400 <b>49400</b>	23100 36960 <b>60060</b>	28340 45344 <b>73684</b>
<b>Carrying Cost (in Rs)</b> Storage Insurance <b>Total Carrying Cost (in Rs)</b> <b>Carrying Cost per kg (in Rs)</b>	25000 15000 <b>40000</b> 2.5	28000 18000 <b>46000</b> 2.48	30000 21000 <b>51000</b> 2.55	32000 25000 <b>57000</b> 2.71	35000 30000 <b>65000</b> 2.98
<b>OQ = <math>\sqrt{\frac{2AO}{C}}</math></b>	$\sqrt{\frac{2 \times 16000 \times 31200}{2.5}}$ =19984 kg	$\sqrt{\frac{2 \times 18500 \times 42088}{2.48}}$ =25058 kg	$\sqrt{\frac{2 \times 20000 \times 49000}{2.55}}$ = 27837 kg	$\sqrt{\frac{2 \times 21000 \times 60060}{2.71}}$ = 30509.32 kg	$\sqrt{\frac{2 \times 21800 \times 73684}{2.98}}$ = 32833.84 kg

### Item B Film Sheet Gorkhapatra Corporation

FY	2060\61	2061\62	2062\63	2063\64	2064\65
Annual Demand (sheet)	10000	12000	11000	12500	13000
Cost per kg (in Rs.)	175	200	250	320	350
<b>Total cost (in Rs.)</b>	<b>1750000</b>	<b>2400000</b>	<b>2750000</b>	<b>4000000</b>	<b>4550000</b>
<b>Ordering Cost (in Rs.)</b>					
Bank Commission	8750	12000	13750	20000	22750
Custom Duty	14000	19200	22000	32000	36400
Labour Charge	6000	7000	6500	7500	8000
<b>Total Ordering Cost per order (Rs.)</b>	<b>28750</b>	<b>38200</b>	<b>42250</b>	<b>59500</b>	<b>67150</b>
<b>Carrying Cost (in Rs)</b>					
Storage cost	15000	16200	17500	18000	20000
Insurance	35000	48000	55000	80000	91000
<b>Total Carrying Cost (in Rs)</b>	<b>50000</b>	<b>64200</b>	<b>72500</b>	<b>98000</b>	<b>111000</b>
<b>Carrying Cost per MT (in Rs)</b>	<b>5</b>	<b>5.35</b>	<b>6.59</b>	<b>7.84</b>	<b>8.53</b>
<b>EOQ = <math>\sqrt{\frac{2AO}{C}}</math></b>	$\sqrt{\frac{2 \times 10000 \times 28750}{5}}$ =10723.80 sheets	$\sqrt{\frac{2 \times 12000 \times 38200}{5.35}}$ =13090.62 sheets	$\sqrt{\frac{2 \times 11000 \times 42250}{6.59}}$ = 11876.32 sheets	$\sqrt{\frac{2 \times 12500 \times 59500}{7.84}}$ = 13774.32 sheets	$\sqrt{\frac{2 \times 13000 \times 67150}{8.53}}$ = 14306.55 sheets

**Item B Film Sheet Kantipur Publications Pvt. Ltd.**

<b>FY</b>	<b>2060\61</b>	<b>2061\62</b>	<b>2062\63</b>	<b>2063\64</b>	<b>2064\65</b>
Annual Demand (sheet) Cost per kg (in Rs.) <b>Total cost (in Rs.)</b>	15000 200 <b>3000000</b>	18000 250 <b>4500000</b>	16000 300 <b>4800000</b>	19000 370 <b>7030000</b>	21000 400 <b>8400000</b>
<b>Ordering Cost (in Rs.)</b> Bank Commission Custom Duty Labour Charge <b>Total Ordering Cost per order (Rs.)</b>	15000 24000 8000 47000	22500 36000 9500 68000	24000 38400 10800 73200	35150 56240 12000 103390	42000 67200 14000 123200
<b>Carrying Cost (in Rs)</b> Storage cost Insurance <b>Total Carrying Cost (in Rs)</b> <b>Carrying Cost per Sheet (in Rs)</b>	25000 15000 40000 <b>2.66</b>	30000 22500 52500 <b>2.91</b>	28000 24000 52000 <b>3.25</b>	32000 35150 67150 <b>3.53</b>	35000 42000 77000 <b>3.66</b>
<b>EOQ = <math>\sqrt{\frac{2AO}{C}}</math></b>	$\sqrt{\frac{2 \times 15000 \times 47000}{2.66}}$ =23023.36 sheets	$\sqrt{\frac{2 \times 18000 \times 68000}{2.91}}$ =29004.08 sheets	$\sqrt{\frac{2 \times 16000 \times 73200}{3.25}}$ = 26846.57 sheets	$\sqrt{\frac{2 \times 19000 \times 103390}{3.53}}$ = 33361.35 sheets	$\sqrt{\frac{2 \times 21000 \times 123200}{3.66}}$ = 37600.13 sheets

**Item B Aluminum sheet Gorkhapatra Corporation**

<b>FY</b>	<b>2060\61</b>	<b>2061\62</b>	<b>2062\63</b>	<b>2063\64</b>	<b>2064\65</b>
Annual Demand (sheet)	5500	6200	6500	7100	7700
Cost per kg (in Rs.)	240	270	320	320	350
<b>Total cost (in Rs.)</b>	<b>1320000</b>	<b>1674000</b>	<b>2080000</b>	<b>2272000</b>	<b>2695000</b>
<b>Ordering Cost (in Rs.)</b>					
Bank Commission	10560	13392	16640	18176	21560
Custom Duty	6600	83700	10400	11360	13475
Labour Charge	5000	6000	6500	7000	7800
<b>Total Ordering Cost per order (Rs.)</b>	<b>22160</b>	<b>27762</b>	<b>33540</b>	<b>36536</b>	<b>42835</b>
<b>Carrying Cost (in Rs)</b>					
Storage cost	25000	28000	30500	32000	34000
Insurance	26400	33480	41600	45440	53900
<b>Total Carrying Cost (in Rs)</b>	<b>51400</b>	<b>61480</b>	<b>72100</b>	<b>44770</b>	<b>87900</b>
<b>Carrying Cost per Sheet (in Rs)</b>	<b>9.35</b>	<b>9.91</b>	<b>11.09</b>	<b>10.90</b>	<b>11.41</b>
<b>EOQ = <math>\sqrt{\frac{2AO}{C}}</math></b>	$\sqrt{\frac{2 \times 5500 \times 22160}{9.35}}$ =5105.93 sheets	$\sqrt{\frac{2 \times 6200 \times 27762}{9.91}}$ =5893.85 sheets	$\sqrt{\frac{2 \times 6500 \times 33540}{11.09}}$ = 6270.28 sheets	$\sqrt{\frac{2 \times 7100 \times 36536}{10.90}}$ = 6899.08 sheets	$\sqrt{\frac{2 \times 7700 \times 42835}{11.41}}$ = 7603.55 sheets

**Item B Aluminum Sheet Kantipur Publications Pvt. Ltd**

<b>FY</b>	<b>2060\61</b>	<b>2061\62</b>	<b>2062\63</b>	<b>2063\64</b>	<b>2064\65</b>
Annual Demand (sheet)	9800	10200	9500	11000	13000
Cost per kg (in Rs.)	275	290	340	350	400
<b>Total cost (in Rs.)</b>	<b>2695000</b>	<b>2958000</b>	<b>3230000</b>	<b>3850000</b>	<b>5200000</b>
<b>Ordering Cost (in Rs.)</b>					
Bank Commission	21560	23664	25840	30800	41600
Custom Duty	13475	14790	16150	19250	26000
Labour Charge	12000	13500	12800	14000	15200
<b>Total Ordering Cost per order (Rs.)</b>	<b>47035</b>	<b>51954</b>	<b>54790</b>	<b>6405</b>	<b>82800</b>
<b>Carrying Cost (in Rs)</b>					
Storage cost	35000	38000	40000	42000	45000
Insurance	13475	14790	16150	19250	26000
<b>Total Carrying Cost (in Rs)</b>	<b>48475</b>	<b>52790</b>	<b>56150</b>	<b>61250</b>	<b>71000</b>
<b>Carrying Cost per Sheet (in Rs)</b>	<b>4.94</b>	<b>5.17</b>	<b>5.91</b>	<b>5.56</b>	<b>5.46</b>
<b>EOQ = <math>\sqrt{\frac{2AO}{C}}</math></b>	$\sqrt{\frac{2 \times 9800 \times 47035}{4.94}}$ =13660.76 sheets	$\sqrt{\frac{2 \times 10200 \times 51954}{5.17}}$ =14317.89 sheets	$\sqrt{\frac{2 \times 9500 \times 54790}{5.91}}$ = 13271.91 sheets	$\sqrt{\frac{2 \times 11000 \times 64050}{5.56}}$ = 15919.64 sheets	$\sqrt{\frac{2 \times 13000 \times 82800}{5.46}}$ = 19856.62 sheets

## Re-order point

Item/FY	2060/61		2061/62		2062/63		2063/64		2064/65	
	GPC	KP	GPC	KP	GPC	KP	GPC	KP	GPC	KP
<b>News print</b>										
Daily consumption (MT)	1.91	2.46	1.88	2.73	2.01	2.49	1.69	2.60	2.46	3.01
Lead time (days)	90	60	90	60	90	60	90	60	90	60
Re-order point (MT)= Lead time × Daily consumption	172	148	170	164	181	150	153	156	222	181
<b>Ink</b>										
Daily consumption (kg)	28.76	43.83	32.10	50.68	38.02	54.79	26.84	57.53	25.91	59.72
Lead time(days)	30	30	30	30	30	30	30	30	30	30
Re-order point(kg)= Lead time Daily consumption	862.8	1314.9	963	1520.4	1140.6	1643.7	805.2	1725.9	777.3	1791.6
<b>Film sheet</b>										
Daily consumption (s)	27.39	41.09	32.87	49.31	30.13	43.83	34.24	52.05	35.61	57.53
Lead time(days)	90	60	90	60	90	60	90	60	90	60
Re-order point (sheet)= Lead time × Daily consumption	2465.10	2465.10	2958.3	2958.3	2711.7	2629.8	3081.6	33123	3204.9	3451.8
<b>Aluminum Sheet</b>										
Daily consumption (s)	15.06	26.84	16.98	27.94	17.80	26.02	19.45	30.13	21.09	35.61
Lead time(days)	60	30	60	30	60	30	60	30	60	30
Re-order point (sheet) = Lead time × Daily consumption	903.6	805.2	1018.8	838.2	1068	780.6	1167	903.9	1265.4	1068.3



**Gorkhapatra Corporation**

Annex-2

**Value in NRs.**

<b>Item/FY</b>	<b>Item 'A'</b>	<b>Item 'B'</b>				<b>Item 'C'</b>	<b>Total</b>
	<b>Newsprint</b>	<b>Ink</b>	<b>Film sheet</b>	<b>Aluminum Sheets</b>	<b>Chemicals</b>	<b>Stationery</b>	
2060/61	30409500	1319580	1828750	1393560	500000	350000	35801390
2061/62	32275000	1834914	2502400	1763240	550000	390000	39315556
2062/63	36928800	2385177	2864750	2185640	620000	420000	45404367
2063/64	32628800	1842512	4157500	2385976	700000	450000	42146988
2064/65	50690000	1975436	4728150	2825735	850000	520000	61589321

**Kantipur publications Pvt. Ltd.**

<b>Item/FY</b>	<b>Item 'A'</b>	<b>Item 'B'</b>				<b>Item 'C'</b>	<b>Total</b>
	<b>Newsprint</b>	<b>Ink</b>	<b>Film sheet</b>	<b>Aluminum Sheets</b>	<b>Chemicals</b>	<b>Stationery</b>	
2060/61	41100500	2471200	3087000	2790510	790000	240000	50479210
2061/62	47821000	3325588	4620500	3062744	820000	265000	59914832
2062/63	45267000	3900400	4925200	3340940	900000	280000	58613540
2063/64	52204750	4737060	7200540	3975300	950000	320000	69387650
2064/65	64026000	5806684	8600200	5353800	1000000	430000	85216684

## Calculation of Correlation

Annex-3

**Calculation of, Mean, standard deviation, coefficient of variation and probable error of Inventory and sales of GPC.**

Value in NRs.

‘00000000’

FY	Inventor y (X)	Sales (Y)	X(x̄ x)	Y(Y-y)	x <sup>2</sup>	y <sup>2</sup>	xy
2060/61	3.58	19.28	-0.9	-4.42	0.81	19.5364	3.978
2061/62	3.93	20.28	-0.55	-3.52	0.3025	11.6964	1.881
2062/63	4.54	22.87	0.06	-0.83	0.0036	0.6889	-0.049
2063/64	4.21	22.70	-0.27	-1	0.0729	1	0.27
2064/65	6.15	33.38	1.67	9.68	2.7889	93.70	16.165
	Σx=22.41	Σy=118.51	Σx=0	Σy=0	Σx <sup>2</sup> =3.9779	Σy <sup>2</sup> =126.6217	Σxy=22.24

### Arithmetic means of Inventory

$$(\bar{X}) = \frac{\sum X}{N} = \frac{22.41}{5} = 4.48$$

### Arithmetic mean of sales

$$(\bar{Y}) = \frac{\sum Y}{N} = \frac{118.51}{5} = 23.70$$

### Standard deviation of inventory

$$S.D (\sigma_x) = \sqrt{\frac{\sum x^2}{N}} = \sqrt{\frac{3.9779}{5}} = 0.89$$

### Standard deviation of Sales

$$S.D (\sigma_y) = \sqrt{\frac{\sum Y^2}{N}} = \sqrt{\frac{126.6217}{5}} = 5.03$$

### Coefficient of variation

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

$$\text{C.V. of Sales, } C.V_y = \frac{\sigma_y}{y} = \times 100 \frac{5.03}{23.70} \times 100 = 21.22\%$$

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

$$\begin{aligned} \sqrt{xy} &= \frac{\sum xy}{\sqrt{\sum x^2} \sqrt{\sum y^2}} = \frac{22.24}{\sqrt{3.9779} \sqrt{126.6217}} \\ &= \frac{22.24}{1.994 \times 11.25} \\ &= \frac{22.24}{122.43} = 0.99 \end{aligned}$$

### Probable Error (PE) coefficient of correlation,

$$\begin{aligned} \text{P.E. (r)} &= 0.6745 \times \frac{1-r^2}{\sqrt{N}} \\ &= 0.6745 \times \frac{1-(0.99)^2}{\sqrt{5}} \\ &= 0.6745 \times \frac{0.0199}{2.236} = 0.006 \end{aligned}$$

**Calculation of, Mean, standard deviation, coefficient of variation and probable error of Inventory and sales of KP Pvt. Ltd.**

Value in NRs.

‘00000000’

FY	Inventor y (X)	Sales (Y)	X(x̄ x)	Y(Y-y)	x <sup>2</sup>	y <sup>2</sup>	xy
2060/61	5.00	34.04	-1.46	-4.15	2.13	17.22	6.05
2061/62	5.99	35.18	-0.47	-3.01	0.22	9.06	1.41
2062/63	5.86	40.44	0.6	2.25	0.36	5.06	-1.35
2063/64	6.93	38.79	-0.47	0.6	0.22	0.36	0.280
2064/65	8.52	42.51	2.06	4.32	4.24	18.66	8.89
	Σx=32.3	Σy=190.9 6	Σx=0	Σy=0	Σx <sup>2</sup> =7.17	Σy <sup>2</sup> =50.36	Σxy=15.28

**Arithmetic means of Inventory**

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

**Arithmetic mean of sales**

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

**Standard deviation of inventory**

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

**Standard deviation of Sales**

$$S.D (\sigma y) = \sqrt{\frac{\sum Y^2}{N}} = \sqrt{\frac{50.36}{5}} = 3.17$$

### Coefficient of variation

$$\text{C.V. of Inventory, C.V}_x = \frac{\sigma_x}{x} \times 100 = \frac{1.19}{6.46} \times 100 = 18.42\%$$

$$\text{C.V. of Sales, C.V}_y = \frac{\sigma_y}{y} \times 100 = \frac{3.17}{38.19} \times 100 = 8.30\%$$

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

$$\begin{aligned} r_{xy} &= \frac{\sum xy}{\sqrt{\sum x^2} \sqrt{\sum y^2}} = \frac{15.28}{\sqrt{7.17} \sqrt{50.36}} \\ &= \frac{15.28}{2.67 \times 7.09} \\ &= \frac{15.28}{18.93} = 0.80 \end{aligned}$$

### Probable Error (PE) coefficient of correlation,

$$\begin{aligned} \text{P.E. (r)} &= 0.6745 \times \frac{1-r^2}{\sqrt{N}} \\ &= 0.6745 \times \frac{1-(0.80)^2}{\sqrt{5}} \\ &= 0.6745 \times \frac{0.36}{2.23} = 0.108 \end{aligned}$$

**Calculation of, Mean, standard deviation, coefficient of variation and probable error of Inventory and profit of GPC.**

Value in NRs. '00000000'

FY	Inventor y (X)	Net Profit (Y)	X(x- $\bar{x}$ )	Y(Y- y)	$x^2$	$y^2$	xy
2060/61	3.58	1.48	-0.9	-0.5	0.18	0.25	0.45
2061/62	3.93	1.82	-0.55	-0.16	0.3025	0.0256	0.088
2062/63	4.54	2.05	0.06	0.07	0.0036	0.0049	0.0042
2063/64	4.21	1.98	-0.27	0	0.0729	0	0
2064/65	6.15	2.57	1.67	0.59	2.7889	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**

$$(\bar{X}) = \frac{\sum X}{N} = \frac{22.41}{5} = 4.48$$

**Arithmetic mean of sales**

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

**Standard deviation of inventory**

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

**Standard deviation of Sales**

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

### Coefficient of variation

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

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

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

$$\begin{aligned} \sqrt{xy} &= \frac{\sum xy}{\sqrt{\sum x^2} \sqrt{\sum y^2}} = \frac{1.527}{\sqrt{3.9779} \sqrt{0.6286}} \\ &= \frac{1.527}{1.99 \times 0.792} \\ &= \frac{1.527}{1.576} = 0.96 \end{aligned}$$

### Probable Error (PE) coefficient of correlation,

$$\begin{aligned} \text{P.E. (r)} &= 0.6745 \times \frac{1-r^2}{\sqrt{N}} \\ &= 0.6745 \times \frac{1-(0.96)^2}{\sqrt{5}} \\ &= 0.6745 \times \frac{0.0784}{2.23} = 0.023 \end{aligned}$$

**Calculation of, Mean, standard deviation, coefficient of variation and probable error of Inventory and profit of KP Pvt. Ltd.**

Value in NRs.

‘00000000’

FY	Inventor y (X)	Sales (Y)	X( $\bar{x}$ - x)	Y(Y-y)	$x^2$	$y^2$	xy
2060/61	5.00	3.06	-1.46	-0.17	2.13	0.028	0.248
2061/62	5.99	3.16	-0.47	-0.07	0.22	0.004	0.033
2062/63	5.86	3.11	0.6	-0.12	0.36	0.014	0.072
2063/64	6.93	3.25	-0.47	0.02	0.22	0.0004	0.0094
2064/65	8.52	3.57	2.06	0.34	4.24	0.1156	0.7004
	$\sum x=32.3$	$\sum y=16.15$	$\sum x=0$	$\sum y=0$	$\sum x^2=7.17$	$\sum y^2=0.162$	$\sum xy=1.06$ 28

**Arithmetic means of Inventory**

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

**Arithmetic mean of sales**

$$(\bar{Y}) = \frac{\sum Y}{N} = \frac{16.15}{5} = 3.23$$

**Standard deviation of inventory**

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

**Standard deviation of Sales**

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



### **Coefficient of variation**

$$\text{C.V. of Inventory, C.V}_x = \frac{\delta x}{x} \times 100 = \frac{1.19}{6.46} \times 100 = 18.42\%$$

$$\text{C.V. of Sales, C.V}_y = \frac{\delta y}{y} \times 100 = \frac{0.18}{3.23} \times 100 = 5.57\%$$

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

$$\begin{aligned} r_{xy} &= \frac{\sum xy}{\sqrt{\sum x^2} \sqrt{\sum y^2}} = \frac{1.0628}{\sqrt{7.17} \sqrt{0.162}} \\ &= \frac{1.0628}{2.67 \times 0.402} \\ &= \frac{1.0628}{1.0733} = 0.99 \end{aligned}$$

### **Probable Error (PE) coefficient of correlation**

$$\begin{aligned} \text{P.E. (r)} &= 0.6745 \times \frac{1-r^2}{\sqrt{N}} \\ &= 0.6745 \times \frac{1-(0.99)^2}{\sqrt{5}} \\ &= 0.6745 \times \frac{0.0199}{2.23} = 0.006 \end{aligned}$$