

MEAN RANKING OF RATIO VARIABLES AFFECTING INVENTORY MANAGEMENT IN SMALL SCALE INDUSTRIES

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ABSTRACT

Inventory costs are the basic costs which influences the whole business design. It connotes the diverse costs involved (Storage, Perishability, safety etc) in managing inventories. The present study divulges the mean rating of inventory variables that affects inventory management in 44 small scale units operating in district Udhampur of J&K State divided into ten lines of operations. The research framework was examined by empirical analysis of primary data collected. Validity and reliability of the scales in the construct were assessed through BTS and Cronbach-alpha. The results of ranking tables revealed that the major variables affecting inventory management are Overall inventory turnover ratio, Raw material inventory turnover ratio, Work-in-process inventory turnover ratio, Finished goods inventory turnover ratio and Out of stock index. The variable Raw material inventory turnover ratio emerged as the main variable affecting inventory management and out of stock index being the least decipherable effectuating variable deployed in managing inventories.

Keywords: Variables, Inventory management, Small Scale Industries (SSIs)

INTRODUCTION

Inventory is the stock of any item or resource used in an organization. An inventory system is the set of policies and controls that monitor levels of inventory and determine what levels should be maintained, when stock should be replenished, and how large orders should be. Inventory generally refers to items that contribute to or become part of a firms product output. Manufacturing inventory is typically classified into raw materials, finished products, component parts, supplies and work-in-process. In distribution, inventory is classified as in-transit meaning that it is being moved in the system, and warehouse, which is inventory in a warehouse or distribution center. Retail sites carry inventory for immediate sale to customers. In services, inventory generally refers to the tangible goods to be sold and the supplies necessary to administer the service. The basic purpose of inventory analysis, whether in manufacturing, distribution, retail or services, is to specify (1) when items should be ordered and (2) how large the order should be. Many firms are tending to enter into longer-term relationships with vendors to supply their needs for perhaps the entire year. This changes the "when" and "how many to order" to "when" and "how many to deliver."

Different Inventory Ratios

The following ratios are associated with inventories:

1. **Raw materials inventory:** Raw material is the items purchased or acquired for using in making finished goods. Such items are known as raw material inventory until used. When raw materials are used, they become the part of work-in-process inventory. The main factors that influences raw materials inventory are the volume of safety stock against material shortages that interrupt production, considerations of economy in purchase, the outlook for future movements in the price of materials, anticipated volume of usage and consumption, the efficiency of procurement and inventory control function, the operating costs of carrying the stocks, the costs and availability of funds for investment in inventory, storage capacity, re-component cycle, indigenous or foreign and the lead-time of supply.

2. **Work-in-process inventory.** Work-in-process inventory includes goods in the process of being produced but not yet completed as finished goods inventory is. When completed, work-in-process inventory becomes finished goods inventory. The factors influencing work-in-process inventory includes the length of the complete production process, management policies affecting length of process time, length of process in runs, action that speed up the production process, e.g. adding second or third production shifts, management's skills in production scheduling and control, volume of production, sales expectations, level of sales and new orders, price level of raw materials used, wages and other items that enter production cost and the value added in production, customer requirements and usual period of aging.
3. **Finished goods inventory.** Finished goods inventory means the goods are produced, completed and are kept ready for sale. The main factors that affects finished goods inventory are the policy of the management to gear the production to meet the firm order in hand, the policy to produce for anticipated orders and stock keeping, goods required or the purpose of minimum and safety stocks, sales policies of the firm, need for maintaining stability in production, price fluctuations for the product, durability, spoilage and obsolescence, distribution system, ability to fill orders immediately, availability of raw material on seasonal basis while customer's demand spread throughout the year and storage capacity.
4. **Out of stock.** The goods which are disposed off or sold become out of stock and are listed in out of stock index.
5. **Overall inventory:** It includes all types of inventories held in by the business over a period of time. It consists of raw material, work-in-process, finished goods.

REVIEW OF LITERATURE

Inventory formulates the awe and sanctity to supply chain management because its only inventory which associates or binds the supply chain members. It remained a subject for discussion in supply chain elasticity, gaining momentum and attraction among academicians, scholars, industrialists and other marketing agencies. Supply chains are recognised on the basis of geographic area covered, transportation modes, political & environmental issues and inventory levels met (Prater et al., 2001 and Christopher & Peck, 2004). The use of inventory is generally recognised as an instrument for risk management (Chopra & Sodhi, 2004), on the contrary Christopher and Peck (2004) state that "the strategic nature of added capacity and/or inventory can be awfully valuable in the creation of elasticity within the supply chain". Lee (2002) stresses on the significance of inventory to meet supply uncertainties. There are thus widely varying views about the role of inventory in the literature and some of these views appear to have conflicting goals. Further the existing literature portrays that the main objective of inventory holdings in traditional times was optimisation of inventory levels which has been reduced to the minimisation of inventory levels as portrayed by lean and agile supply chains of the contemporary era and thinking. The literature even focused on the minimisation of inventory which is widely discussed, this needs to be clear and there is a gratitude that resources can be condensed too much, leading to terms such as "corporate anorexia" (Radnor & Boaden, 2004). Thus, an optimum level of inventory is required to be maintained by the firm in order to operate and capture the market trades. However, the modern concept of minimisation of inventories has been thwarted to a larger extent by understanding of the role of decoupling points and the curiosity that inventory management reveals in risk mitigation strategies. However, the identification of this level needs to engross wider concepts than those just associated with traditional inventory control theory. Inventory holding and management submits an imperative responsibility in modern/contemporary supply chains. A survey conducted in Europe exaggerated that 13 per cent of total logistics costs accrues to inventory costs as it identified it as the main costs of logistics (Establish Inc/AT Kearney, 2004). Another eminent undifferentiated study in USA contoured that 24 per cent of the total costs is associated with inventory costs (European Logistics Association/Herbert W. Davis & Co., 2005). Further it was quoted that effectual inventory management advances the responsiveness of supply chains which in lieu adds to the organisational routines (Khan et al., 2009). An sophisticated supply chain or business chain should be structured to ensure and meet the needs of different products and customer groups so as to ensure effective

inventory turnover. The configuration of supply chain strategy, inventory management and product characteristics are extremely important for the successful management and operations of a company (Srinivas, 2013). The present research empirically reveals the mean rating of inventory ratio variables affecting inventory management of small scale industries from the data collected from 44 small manufacturing firms operating under SIDCO & SICOP in District Udhampur of Jammu & Kashmir State.

TESTABLE HYPOTHESIS

Based on the above review of literature the following hypothesis is framed:

H₀: Effective inventory management leads to effectual inventory turnover ratio.

RESEARCH DESIGN AND METHODOLOGY

Research design and methodology comprises area of research, nature of data/information (Primary or secondary), questionnaire/schedule, research tools applied etc. The research methodology adopted proceeds as follows:

Sampling and data collection

The primary data for the study were collected from 44 functional manufacturing SSIs out of 49 units registered under District Industries Centre (DIC), Udhampur of J&K State. Five units were found to be non functional. The manufacturing units were sub-divided into ten lines of operation comprising cement (8), pesticide (3), steel (3), battery/lead/allo (5), menthol (2), guns (2), conduit pipes (2), gates/grills/varnish (5), maize/atta/dal mills (3) and miscellaneous (11). The miscellaneous category includes small scale units namely M/s Supertech Industry, M/s Luxmi Electronics Works, Shaj Nath Vanaspati Ltd., M/s Aditiya Cables, Poles and Transformers, Shankar Lime Industry, M/s Unique Carbon Industries, M/s B.S Traders, M/s Vijay Candles, Everest Health Care Products, M/s J.K Petro Chemicals, M/s Ajay Ice Factory. Census method was used to elicit response from owners/managers of the SSIs.

The Survey Instrument

Information was collected by administering self developed questionnaire prepared after consulting experts and review of literature which comprised of general information and 37 statements of inventory management. Statements in the questionnaire were in descriptive form, ranking, dichotomous, open ended and five -point Likert scale, where 1 stands for strongly disagree and 5 for strongly agree.

Collection of data

The primary data were collected by making three to four visits for getting response from respondents. Census method was applied for collecting data from the respective respondents. The secondary information was collected from various sources namely books, empirical papers from online & hard copies of journals. Various multivariate tools such as Mean, standard deviation, Ranking tables were used for drawing meaningful inferences.

Reliability and validity of the instrument

Reliability: The alpha reliability coefficients for F₁ (0.802), F₂ (0.823), F₃ (0.829) is higher than the criteria of 0.77 obtained by Gordon and Narayanan (1984) indicating high consistency. F₄ (0.627) and F₅ (0.605) are also at a minimum acceptable level of 0.50 as recommended by Brown et al. (2001) and Kakati and Dhar (2002) thereby obtaining satisfactory internal consistency (Table 1.1).

Validity: The content validity of the scale was calculated by meeting various experts/academicians/eminent research scholars. The five factors obtained alpha reliability higher & equal to 0.50 and satisfactory KMO value at 0.688, indicating significant construct validity of the construct (Hair et al., 1995).

DATA ANALYSIS AND INTERPRETATION

Table 1.2 squeals mean rank of inventory management ratio variables by small manufacturing firms operating in District Udhampur of J&K State. These 44 small manufacturing firms have been divided into ten lines of operations namely cement (8), pesticide (3), steel (3), battery/lead/alloy (5), menthol (2), guns (2), conduit pipes (2), gates/grills/varnish (5), maize/atta/dal mills (3) and miscellaneous (11). The different inventories variables identified by ten groups of functional SSIs are "Overall inventory turnover ratio", "Raw material inventory turnover ratio", "Work-in-process inventory turnover ratio", "Finished goods inventory turnover ratio" and "Out of stock index". On the basis of ranks assigned to mean values, the variable "Raw-material inventory turnover ratio" is accorded rank one by all the firms operating due to immanent need for converting inventory into cash for supporting production cycle, followed by "Work-in-process inventory turnover ratio" with rank two, "Finished goods inventory turnover ratio" as rank three, "Overall inventory turnover ratio" by rank four and "Out of stock index" by rank five by almost all the managers of SSIs. Since, the nature of the firms is manufacturing, so raw material inventory turnover ratio accounts the most to maximum number of firms operating under SIDCO and SICOP i.e small scale industries. The ranking categorization is done as follows:

1) Cements

There are eight cements units working in district Udhampur namely: M/s Associated Cements, Zenith Cement Industry, Shivalik Cements, M/s Continental Cement Industry, Wullar Cements, M/s Shri Nath Industry and Uma Cement Industry. As far as mean ranking related to the different variables constituting inventories in these firms is concerned "Raw material inventory turnover ratio" was accorded rank one by all the units operating under this group. "Work-in-process inventory turnover ratio" was given rank two by cement industry and "Finished goods inventory turnover ratio" was consigned rank three. "Overall inventory turnover ratio" was accorded rank four with subsequent following of "Out of stock index" with rank five. It was clear that the cement industry main inventory turnover ratio lies with raw material inventory turnover ratio, i.e. more of raw material turnover is there in cement industries.

2) Battery/Lead/Alloy

Five firms operating under this category were Radha Industries, Pilot Batteries, Durga Batteries, Suraksha Batteries and Avtar Batteries. "Raw material inventory turnover ratio" was accorded rank one by all the units operating under this group as it was found the main inventory turnover platform of these units. "Work-in-process inventory turnover ratio" was given rank two by these small firms and "Finished goods inventory turnover ratio" was relegated rank three. "Overall inventory turnover ratio" was accorded rank four with subsequent following up of "Out of stock index" with rank five as represented in the table 1.2.

3) Pesticides/Insecticides

Under this category three units are operating namely M/s Dhanuva Agritech Ltd., Safex Chemicals Ltd. and M/s Modern Insecticides. As far as ranking related to variables affecting inventory management of these firms is concerned "Raw material inventory turnover ratio" was accorded rank one by all the units operating under this group. "Overall inventory turnover ratio" was given rank two by these firms and "Finished goods inventory turnover ratio" was assigned rank three. "Work-in-process inventory turnover ratio" was accorded rank four with subsequent following of "Out of stock index" with rank five. It was clear that the main variable affecting inventory control was related to raw material inventory turnover ratio.

4) Conduit pipes

Two units operating under this group were M/s Pee Kay Products and Rukhmani Plastics. As far as ranking related to the different variables affecting inventory management and control by these firms is concerned "Raw material inventory turnover ratio" was accorded rank one by both the units operating under this group. "Work-in-process inventory turnover ratio" was given rank two by conduit pipes and "Finished goods inventory turnover ratio" was consigned rank three. "Overall inventory turnover ratio" was accorded rank four with

subsequent following up of "Out of stock index" with rank five. It was clear that the conduit pipes industry is mainly affected by raw material inventory turnover ratio and least by out of stock index.

5) Menthol

M/s Harikripa Perfumes Pvt. Ltd. and M/s Mahadurga Industries were found to be operating under this category of industries. "Raw material inventory turnover ratio" was accorded rank one by both the units operating under this group as it was found the main variable affecting inventory management. "Work-in-process inventory turnover ratio" was given rank two by these small firms and "Finished goods inventory turnover ratio" was consigned rank three. "Overall inventory turnover ratio" was accorded rank four and "Out of stock index" was designated rank five.

6) Guns

Two competitors namely M/s Gulab Gun Factory and M/s Hunter Gun Factory accorded rank one to "Raw material inventory turnover ratio" and "Work-in-process inventory turnover ratio" was given rank two by both the units. "Finished goods inventory turnover ratio" was accorded rank three by both the units. The other two variables i.e. Overall inventory turnover ratio and Out of stock index were accorded rank four and rank five respectively by the firms.

7) Steel

M/s Maha Luxmi Steel Fabricators, M/s Faqir Chand Sanak Raj and M/s Gupta Furniture are operating under this category. Rank one was assigned to "Raw material inventory turnover ratio" as it was found to be their main variable affecting inventories management, "Work-in-process inventory turnover ratio" ranked two, "Overall inventory turnover ratio" ranked three, "Finished goods inventory turnover ratio" ranked four and "Out of stock index" ranked five.

8) Gates/Grills/Varnish/Paint

Five units are operating under this category namely M/s Balaji Industries, M/s Wazir Engineering Works, ISRO Products, Shakti Engineering Works and M/s Everest Paints. These small scale units assigned rank one to "Raw material inventory turnover ratio". "Work-in-process inventory turnover ratio" was given rank two by these units, "Finished goods inventory turnover ratio" was allotted rank three, "Overall inventory turnover ratio" was aligned rank four and "Out of stock index" ranked five.

9) Atta/Maize/Dal mills

Shalimar Floor Mills, M/s Udampur Dal Mills and M/s Sharda Enterprises are functioning under this class. As far as ranking related to variables affecting inventory management by these firms is concerned "Raw material inventory turnover ratio" was accorded rank one by all the units operating under this group. "Work-in-process inventory turnover ratio" was given rank two by this industry. "Finished goods inventory turnover ratio" was consigned rank three. "Overall inventory turnover ratio" was allotted rank four and "Out of stock index" ranked five. It implies that atta/maize/dal mills are mainly hovered with raw material inventory turnover ratio for inventories management.

10) Others (Miscellaneous)

Eleven units operating under this group were M/s Supertech Industry, M/s Luxmi Electronics Works, Shaj Nath Vanaspati Ltd., M/s Aditya Cables, Poles and Transformers, Shankar Lime Industry, M/s Unique Carbon Industries, M/s B.S Traders, M/s Vijay Candles, Everest Health Care Products, M/s J.K Petro Chemicals and M/s Ajay Ice Factory. As far as ranking related to different variables involved in managing inventories by these firms is concerned "Raw material inventory turnover ratio" was accorded rank one by most of the units and "Work-in-process inventory turnover ratio" was given rank two by almost all the units operating, "Finished goods inventory turnover ratio" was appropriated rank three, "Overall inventory turnover ratio" was allotted rank four and "Out of stock index" rank five respectively

Overall, all the firms operating under DIC were mainly affected firstly by the Raw material inventory turnover ratio, then by Work-in-process inventory turnover ratio, then by Finished goods inventory turnover ratio, then by Overall inventory turnover ratio and at last by Out of stock index as depicted by their respective mean ranks (Table 1.2).

Regression Model Summary

Tables 1.3 shows output from regression analysis to elicit the impact of effective inventory management on inventory turnover ratio. The result of step-wise linear regression analysis (Table 1.3) enticed three independent factors as significant in predicting the dependent variable. These are: "Finished goods inventory turnover ratio", "Raw-material inventory turnover ratio" and "Work-on-process inventory turnover ratio".

The correlation between predictor and outcome is positive with values of R as .746, .798, and .892, which signifies high correlation between predictor and the outcome. In model 1, R is .746 which indicates 74% association between dependent and independent variables. R-Square for this model is .529 which means that 52% of variation in inventory management can be explained from the five independent variables. Adjusted R square (.549) indicates that if anytime another independent variable is added to model, the R-square will increase. Further beta values reveal significant relationship of independent variables with dependent variable. "Finished goods inventory turnover ratio" has emerged as the strongest predictor whereas "Work-on-process inventory turnover ratio" is found to be the weakest as represented by relative t-values. Change in R square is also found to be significant with F-values significant at 5% confidence level. Errors in regression are independent as indicated by Durbin-Watson value (2.213). The aforesaid findings support the hypothesis "***Effective inventory management leads to effectual inventory turnover ratio***".

CONCLUSION

In this paper the mean ranking of variables affecting inventory management in 44 small scale industries is clearly portrayed. The major variables affecting inventory management identified were raw materials inventory turnover ratio which encompasses the volume of safety stock against material shortages that interrupt production, considerations of economy in purchase, the outlook for future movements in the price of materials, Anticipated volume of usage and consumption etc; Work in progress inventory turnover ration which influences the length of the complete production process, management policies affecting length of process time, length of process in runs, action that speed up the production process, e.g. adding second or third production shifts, management's skills in production scheduling and control, volume of production, Sales expectations etc and finished goods inventory turnover ratio which affects sales policies of the firm, need for maintaining stability in production, price fluctuations for the product, durability, spoilage and obsolescence, distribution system, ability to fill orders immediately etc. The results of ranking tables revealed that the major variables affecting inventory management are Overall inventory turnover ratio, Raw material inventory turnover ratio, Work-in-process inventory turnover ratio, Finished goods inventory turnover ratio and Out of stock index. The variable Raw material inventory turnover ratio emerged as the main variable affecting inventory management and out of stock index being the least decipherable effectuating variable entertained in managing inventories. From the practical perspective, the government functionaries must take initiatives to organise trade shows, seminars, workshops, conferences to strengthen supply chain linkages by integrating fragmented Supply chain intermediaries. Sensitizing managers through periodic training & education programmes the need & strategies for profitable inventory management so that effectuate inventory decisions can be taken in order to equilibrium demand and supply.

LIMITATIONS OF THE STUDY

- i. The study is area specific and cannot be generalized for other managers operating in other parts of the country having dissimilar environmental business conditions.
- ii. The conclusions drawn were not completely free from biasness for the responses obtained from the different retailers through surveys. Meaning and concepts of all scale items was explained to the respondents in local dialect as majority of them were neo-literate. Though utmost care was taken to

entire correct information, an element of subjectivity cannot be ruled out as it made little difference in the originality of ideas obtained in the field survey and final interpretation.

DIRECTIONS FOR FUTURE RESEARCH

Some of the dimensions like quality management, shared goals & objectives, SCM ethics, Transportation management, warehousing management, commitment & collaboration, transparency etc. are not included in the existing study. So, future research can be done taking into consideration the manager's attitude towards the above dimensions. Future researches can also be undertaken regarding inventory management from the perspective of wholesalers and retailers for medium & large scale industries.

Table 1.1: Results Showing Factor Loadings and Variance Explained After Scale Purification for Inventory Management

Factor-wise Dimensions	Mean	S.D	F.L	Eigen Value	Variance Explained %	Cumulative Variance %	Communality	α
F1 (Economy & efficiency)	4.17	.482		8.204	17.300	17.300		.8022
Brings potential savings	4.13	.408	.828				.852	
Avoids costly interruptions in operations	4.18	.390	.807				.797	
Facilitates purchase economies	4.22	.522	.711				.742	
Results in effective utilization of human & equipment	4.18	.390	.608				.679	
Inventory is in accordance to the firm size	4.13	.701	.598				.566	
F2 (Service optimisation)	4.18	.391		3.643	15.700	33.000		.8231
Ensures customer confidence	4.27	.450	.386				.844	
Consistent with safety & economic advantage	4.20	.408	.790				.795	
Facilitates cost accounting activities	4.13	.347	.726				.820	
Improves service level	4.13	.347	.563				.735	
F3 (Inventory stabilisation)	3.89	.531		2.923	15.504	48.504		.8293
Price fluctuation	3.90	.520	.888				.897	
Warehousing facilities	3.86	.553	.870				.793	
Inventory catalogue & control	3.90	.520	.744				.761	
F4 (Cost reduction)	4.11	.473		1.646	10.863	59.367		.6273
Reduces storage costs	4.04	.680	.790				.837	
Affects revenue costs	4.15	.370	.734				.831	
Adequate inventories are always there	4.15	.370	.517				.641	
F5 (Competitive ability)	4.19	.425		1.298	9.217	68.584		.6057
Enhances market share	4.20	.461	.873				.791	
Paves for competitive ability	4.18	.390	.718				.654	

Footnotes: KMO Value = .688; Bartlett's Test of Sphericity = 451.76, df = 153, Sig. = .000; Extraction Method Principal Component Analysis; Varimax with Kaiser Normalisation; Rotation converged in 11 iterations; 'FL' stands for Factor Loadings, 'S.D' for Standard Deviation and 'α' for Alpha.

Table 1.2: Unit-wise Mean Ranking of Ratio Variables Affecting Inventory Management in SSIs

Units/Variables	Overall inventory turnover ratio		Raw-material inventory turnover ratio		Work-in-Process inventory turnover ratio		Finished goods Inventory turnover ratio		Out of stock index	
Cement	4	(IV)	1	(I)	2	(II)	3	(III)	5	(V)
Battery/Lead/Alloy	4	(IV)	1	(I)	2	(II)	3	(III)	5	(V)
Pesticides/Insecticides	2	(II)	1.6	(I)	3.6	(IV)	3	(III)	4.6	(V)
Conduit pipes	4	(IV)	1	(I)	2	(II)	3	(III)	5	(V)
Menthol	4	(IV)	1	(I)	2	(II)	3	(III)	5	(V)
Guns	4	(IV)	1	(I)	2	(II)	3	(III)	5	(V)
Steel	3	(III)	1.3	(I)	2.3	(II)	3.3	(IV)	5	(V)
Gates/Grills/Varnish/Paint	4	(IV)	1.4	(I)	1.8	(II)	3	(III)	5	(V)

Atta/Maize/Dal mills	3	(IV)	1.6	(I)	2.6	(II)	2.6	(III)	5	(V)
Others (Miscellaneous)	3.2	(IV)	1.5	(I)	2.3	(II)	2.7	(III)	4.7	(V)
Mean & Rank	3.5	(IV)	1.2	(I)	2.2	(II)	2.9	(III)	4.9	(V)

Note: Where 1 denotes "highest rank" and 5 denotes "lowest rank"

Table 1.3: Regression Model Summary (With Coefficient) of Inventory Control as Dependent Variable (Step-wise Multiple Regression Method)

Model	R	R ²	AdjustedR ²	Std. Error of Estimate	F value ANOVA	Sig. level	β	t	Sig. level	Durbin-Watson
1.	.746	.529	.549	.3732	52.483	.000	.357	9.022	.000	2.213
2.	.798	.538	.578	.2837	49.733	.000	.244	7.876	.009	
3.	.892	.633	.657	.2333	43.553	.000	.138	5.488	.027	

- a) Predictors: (Constant), Finished goods inventory turnover ratio
- b) Predictors: (Constant), Finished goods inventory turnover ratio, Raw-material inventory turnover ratio
- c) Predictors: (Constant), Finished goods inventory turnover ratio, Raw-material inventory turnover ratio, Work-on-process inventory turnover ratio
- d) Dependent variable: Effective inventory management.

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