# Factors Affecting Warehousing Operations in Supply Chains of Small Manufacturing Firms

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## Abstract

*Warehouse provides assistance in terms of weapon that helps to meet competition, incessant supply of goods & services and augments in diversifying markets. The present study explores the factors affecting warehousing operations in 44 small scale units operating in district Udhampur of J&K State. 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 the main factors that affect warehousing operations. Most prominent among them are long lead times, poor warehouse layout, irregular deliveries, improper forecasting of demand.*

**Key Words**: Warehousing, Supply Chain, Small Scale Industries (SSIs)

## Introduction

Warehousing operations in supply chains leads to immense utilities in terms of meeting timely demands and regular supply of goods & services etc. Warehouses are primarily for receiving, storing, picking and shipping goods (Hatton, 1990 & Dawe, 1995) and are synonymous distribution centre, transshipment, cross dock, or platform centre and all types of nodes in a distribution network (Rouwenhorst et al., 2000). De Koster et al. (2007) broaden the ambit of warehouses for storing or buffering products (raw materials, goods-in-process, finished products) at and between points of origin and points of consumption. Supply chain in simple words means sequence of partners/members/intermediaries engaged or involved to supply & manage the flow of manufactured products to the ultimate customers. These partners/members/intermediaries are known as channel functionaries encompassing suppliers, manufacturers, wholesalers, retailers and the ultimate customers.

These members collaborate and work together by forming a chain (to ensure the goods to the markets (customers)) known as supply chain. Supply chain is often known as all the parties/channel members involved in satisfying the end customers. The main factors that affects warehousing operations are long lead times, poor warehouse layout, irregular deliveries, improper forecasting of demand etc.

## Literature Review

The literature related to warehousing management in the context of supply chain is scarce, though few things quoted by eminent authors had been taken care of. Warehouses are the final point in the supply chain for order assembly, value added services and despatch to the customer, represents approximately 20-24 per cent of total logistics costs (Herbert W. Davis & Co., 2005 and Dadzie & Johnston, 1991). Warehouses are critical to the achievement of customer service levels (Frazelle, 2002). Warehousing management in SC attributes for general sales growth by potential improvements in productivity, order accuracy, reduced space requirements, increased volume capacity, control of inventory and increased customer service (Adams et al., 1996)

## Research Methodology

The primary data for the study were collected from 44 functional manufacturing SSIs registered under District Industries Centre (DIC), Udhampur of J&K State sub-divided into ten lines of operation comprising 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). Census method was used to elicit response from owners/managers of the SSIs. Information was collected by administering self developed questionnaire prepared after consulting experts and review of literature which comprised of general information and various statements (19) of warehousing management. Items in the questionnaire were in descriptive form, ranking, dichotomous, open ended and five-point Likert scale. The data collected was further analyzed with the help of SPSS (Version 16.00) for purification, checking validity and reliability. Ranking tables were used to elicit meaningful responses from the data.

**Reliability and validity of the instrument**

**Reliability:** The alpha reliability coefficients for $F_1$ (0.833), $F_2$ (0.853) and $F_3$ (0.846) is higher than the criteria of 0.77 obtained by Gordon and Narayanan (1984) indicating high internal consistency. $F_4$ (0.631) is also at a minimum acceptable level of 0.50 as recommended by Brown et al. (2001) thereby obtaining satisfactory internal consistency.

**Validity**: The four factors obtained alpha reliability higher & equal to 0.50 and KMO value at 0.671which indicate significant construct validity of the construct (Hair et al., 1995).

**Data Analysis and Interpretation**

Factor analysis was applied to the collected data and the suitability of data was examined through Anti-image, KMO value (0.671), Bartlett's Test of Sphercity (456.51) (p-value = 0.000), Principal Component Analysis and Varimax Rotation (Dess et al., 1997 & Field, 2000). The process of R-Mode Principal Component Analysis (PSA) with Varimax Rotation brought the construct to the level of 18 statements out of 19 statements. Therefore, factor loadings in the final factorial design, are consistent with conservative criteria, thereby resulting into four-factor solution using Kaiser Criteria (i.e. eigen value $\geq 1$) with 67.01% of the total variance explained, i.e. 18 items got grouped in four factors. The communality for 18 items ranged from 0.58 to 0.90, indicating moderate to high degree of linear association among the variables. The factor loadings range from 0.621 to 0.892 and the cumulative variance extracted ranges from 20.37 to 67.01 percent. The percentage of variance explained by each factor came out to be $F_1$ (20.37%), $F_2$ (18.94%), $F_3$ (17.93%), and $F_4$ (9.97%) and is displayed in the Table 1.1. A brief description of factors emerged is as under:

**Factor 1 (Competitive strength):** Five items included in this factor are: "Warehouse control can handle multi-stockroom inventories", "It leads to efficient space utilization & flexibility of arrangement", "Warehousing control provides ready availability of stocks", "Effective warehousing control outperforms competitors on customer service" and "Warehousing control leads to minimisation of material deterioration and pilferage". "Warehouse control can handle multi-stockroom inventories" scored good mean value (4.06) with highest factor loading (.823) and communality (.791) which indicates that this variable is significantly contributing towards the factor. The other variables also

significantly contributed towards the factor with mean values ranging from 4.04 – 4.13 and factor loadings .638 - .823. The communalities of the variables are beyond .60 which again proves significance of all the variables contributing towards the factor. The overall mean value scored by the factor is 4.07 which highlight the importance of this factor towards the dimension of warehousing management. So, managers perceive that effective warehousing control can positively meet customers' requirements by providing ready availability of stocks.

**Factor 2 (Enhanced preservation & control):**  Four variables underlying this factor are: "Warehousing planning provides complete storage to various items", "Warehousing planning helps in distribution of goods economically", "Effective warehousing control meets the demands of consuming departments" and "Effective warehousing builds goodwill & invites business". The mean values of all the variables lies between 4.00 to 4.04. Factor loadings varied from .624 - .892 which implies that all the factors are significantly contributing towards the factor. The communalities for all the variables fluctuates within .582 to .867 which connotes that except one variable i.e. effective warehousing builds goodwill & invites business (.582) all the other variables are having positive linear association among them. In all, this factor contributes above average (Mean value = 4.02) towards the domain of warehousing management. So managers regards the services of warehousing to be the root cause of distributing the goods economically and in meeting the demands of different consuming departments.

**Factor 3 (Effective purchase planning):** The five variables that emerged in this factor includes, "Your warehousing techniques supply timely goods to markets", "Warehousing control avoids unnecessary waiting time", "Warehousing planning results in shorter path philosophy", "Warehousing control leads to codification & preservation" and "Warehousing planning assists in effective purchase actions". The mean values of all the variables hovered within 4.06 – 4.22, factor loadings from .621 - .788 and communalities between .683 to .907 which acknowledges that all the variables are significantly contributing towards this factor. The overall mean score of the factor is 4.12 which again prove that the factor is significantly contributing towards the dimension of warehousing management.

The managers perceive that they enjoy lot of benefits from adopting warehousing management techniques which assists them in effective purchasing, ensures shorter path philosophy and supplying timely goods to markets.

**Factor 4 (Overall cost reduction):** This factor divulged two variables namely, "Warehousing planning & control structure reduces overall costs" and "Warehousing control ensures smooth inflow & outflow of goods". The variable "Warehousing planning & control structure reduces overall costs" scored mean value of 4.06 and factor loading .815 with communality .784 which indicates that the variable is contributing significantly towards the factor. The second variable scores mean value of 4.31, factor loading .671 and communality .625 which implies that though mean value is good but factor loading specifies that this variable is contributing less significantly towards the factor. The communality further promulgate that less linear association exists within the variables. The overall mean value of this factor is strongest among all factors with mean value 4.19 which intimates its importance to the dimension of warehousing management. In the nutshell, managers perceive that proper warehousing planning & control reduces the overall costs.

Table 1.2 annunciates the four main factors affecting warehousing operations in 44 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 main factors identified that affects warehousing operations in small manufacturing firms are "Long lead times", "Poor warehouse layout", "Irregular deliveries" and "Improper forecasting of demand". The main factor affecting systematised warehousing operations is long lead times which is accorded rank one by almost all the managers of SSIs. The second factor affecting warehousing operations is improper forecasting of demand. The third factor is irregular deliveries followed by poor warehouse layout that affects warehousing operations. The ranking categorization is done as follows:

As far as long lead time is concerned almost all the group of firms assigned rank one to this factor as it came out to be the main factor that affects warehousing operations in

small scale industries. Only two group of firma i.e guns & conduit pipes accorded rank two & three respectively to the concerned factor. The overall mean score of this factor is also one (Mean = 1.6).

The second factor i.e. poor warehouse layout was allotted rank four by all the group of firms except two groups namely, Battery/Lead/Alloy & Gates/Grills/Varnish/Paint which consigned rank three to the factor. The overall mean score of this factor four.

The third factor was irregular deliveries and as far as this factor is concerned half group of firms accorded rank two to this factor & half accorded rank three to this factor. The group of firms that assigned rank two to this factor were: Battery/Lead/Alloy, Pesticides/Insecticides, Conduit pipes, Gates/Grills/Varnish/Paint & Atta/Maize/Dal mills and those assigned rank three were: Cements, Menthol, Guns, Steel & miscellaneous. The overall mean score of this factor ranked three among all factors.

The last factor taken into consideration was improper forecasting of demand. The overall mean score of this factor is two as represented by its mean score (Mean = 2.2). Two group of firms namely conduit pipes & guns accorded rank one to this factor. Four group of firms namely cement, menthol, steel & miscellaneous assigned rank two to this factor. The firms that consigned rank three to this factor were Pesticides/Insecticides & Atta/Maize/Dal mills. Two groups of firms namely Battery/Lead/Alloy & Gates/Grills/Varnish/Paint allotted rank four to this factor.

**Conclusion**

The research provides an insight about the main factors that affects warehousing operations in supply chains of small manufacturing firms. The main factors that affect warehousing operations are long lead times, poor warehouse layout, irregular deliveries, improper forecasting of demand. The findings of the study is limited to small scale industries of district Udhampur of J&K State, so results drawn cannot be generalized for medium or large scale industries functioning in other parts of country having dissimilar business environment.

**Table 1.1: Results Showing Factor Loadings and Variance Explained After Scale Purification (Rotated Component Method) Regarding Warehousing Management**

| Factor-wise Dimensions | Mean | S.D | F.L | Eigen Value | Variance Explained % | Cumulative Variance % | Comm-unality | α |
|---|---|---|---|---|---|---|---|---|
| **F1Competitive strength** | **4.07** | **.379** | | **6.021** | **20.373** | **20.373** | | **.8333** |
| Handle multi-stockroom inventories | 4.06 | .397 | .823 | | | | .791 | |
| Space utilization & flexibility of arrangement | 4.06 | .333 | .793 | | | | .710 | |
| Ready availability of stocks | 4.06 | .333 | .786 | | | | .750 | |
| Outperforms competitors on customer service | 4.13 | .462 | .664 | | | | .625 | |
| Material deterioration and pilferage | 4.04 | .370 | .638 | | | | .650 | |
| **F2 Enhanced preservation and control** | **4.02** | **.391** | | **2.438** | **18.940** | **39.313** | | **.8533** |
| Complete storage to various items | 4.00 | .373 | .892 | | | | .867 | |
| Distribution of goods economically | 4.02 | .340 | .862 | | | | .803 | |
| Meets demands of consuming departments | 4.04 | .370 | .857 | | | | .874 | |
| Goodwill & invites business | 4.04 | .480 | .624 | | | | .582 | |
| **F3 Effective purchase planning** | **4.12** | **.391** | | **1.769** | **17.732** | **57.045** | | **.8464** |
| Supply timely goods to markets | 4.15 | .428 | .788 | | | | .782 | |
| Avoids unnecessary waiting time | 4.06 | .333 | .783 | | | | .907 | |
| Results in shorter path philosophy | 4.06 | .333 | .780 | | | | .774 | |
| Codification & preservation | 4.11 | .386 | .681 | | | | .867 | |
| Assists in effective purchase actions | 4.22 | .475 | .621 | | | | .683 | |
| **F4 Overall cost reduction** | **4.19** | **.499** | | **1.388** | **9.970** | **67.015** | | **.6317** |
| Reduces overall costs | 4.06 | .399 | .815 | | | | .784 | |
| Ensures smooth inflow & outflow of goods | 4.31 | .601 | .671 | | | | .625 | |

**Footnotes**: KMO Value = .671; Bartlett's Test of Sphercity = 456.511, df = 136, Sig. =.000; Extraction Method Principal Component Analysis; Varimax with Kaiser Normalisation; Rotation converged in 9 iterations; 'FL' stands for Factor Loadings, 'S.D' for Standard Deviation and 'α' for Alpha

**Table 1.1: Unit-wise Mean Ranking of Factors Affecting Warehousing Operations**

| Units/Factors | Long lead times | | Poor warehouse layout | | Irregular deliveries | | Improper forecasting of demand | |
|---|---|---|---|---|---|---|---|---|
| Cement | 1.3 | (I) | 3.1 | (IV) | 2.8 | (III) | 2.6 | (II) |
| Battery/Lead/Alloy | 1 | (I) | 3 | (III) | 2.8 | (II) | 3.2 | (IV) |
| Pesticides/Insecticides | 1 | (I) | 3.5 | (IV) | 2.5 | (II) | 3 | (III) |
| Conduit pipes | 3 | (III) | 4 | (IV) | 2 | (II) | 1 | (I) |
| Menthol | 1 | (I) | 4 | (IV) | 3 | (III) | 2 | (II) |
| Guns | 2.4 | (II) | 4 | (IV) | 2.5 | (III) | 1 | (I) |
| Steel | 2.3 | (I) | 2.6 | (IV) | 2.5 | (III) | 2.3 | (II) |
| Gates/Grills/Varnish/Paint | 1.4 | (I) | 2.8 | (III) | 2.7 | (II) | 3 | (IV) |
| Atta/Maize/Dal mills | 1.6 | (I) | 3.3 | (IV) | 2.3 | (II) | 2.6 | (III) |
| Others (Miscellaneous) | 1.7 | (I) | 3.7 | (IV) | 2.3 | (III) | 2.1 | (II) |
| **Mean & Rank** | **1.6 (I)** | | **3.4 (IV)** | | **2.5 (III)** | | **2.2 (II)** | |

**Note:** Where 1 denotes "highest rank" and 4 denotes "lowest rank"

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