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STUDY OF EFFECTIVENESS OF POS DATA IN MANAGING SUPPLY CHAIN

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ABSTRACT

Enticing experience by retailer or wholesaler is the fundamental key to the success of their business and to achieve this experience, there are some requirements of right technologies for competitive marketing. Point of Sale (POS) systems manage the execution of retail transactions, often determining the payment due for products/services to be purchased, recording the receipt of funds, recording the completion of the transaction and issuance of receipts. Clerical cost minimization, reduction in stock out situation, increase in flexibility, improving sales, reduction of time etc. are some basic objectives of a business. In this paper, study of effectiveness of POS data in managing the supply chain is done at retail level. Selected retail stores of Madhya Pradesh (India) are chosen and data is collected using a structured questionnaire. Data thus obtained are analyzed to carry out a comparative study of retail stores. Various benefits of POS data are examined and stores are ranked according to effective utilization of POS data in decision making. Benefits of adopting POS data are 'improved inventory management', 'increase the flexibility of response to customer demands' and 'reduction in costs and times'.

KEYWORDS: Retailing, Point of Sale, Inventory Management, Supply Chain Management, Cost Reduction.

1. INTRODUCTION

The sole purpose of any business is to increase market share and thereby increase its earnings within the market. To accomplish this goal, there is a requirement of market analyser tools. Data that are relevant to their business must be explored and analysed. Nowadays competitive intelligence is one of the popular and a systematic approach for gathering and analysing information for a business decision. Point of sale data is important to develop competitive decision [1].

This research answers the question that how a retailer/wholesaler can benefit from the implementation of point of sale (POS) system. Furthermore, it seeks to discover how POS data can be involved in a business function like ordering, inventory control, the positioning of products, customer services, sales, demand forecasting, marketing effects, seasonal effect of products etc. Finally, this research explores benefits to the customer, retailer and wholesaler by the implementation of POS system [2].

The impact of information technology on the supply chain is increasing day by day [3].Barcode readers and Scanners collect sales data at the point of sale terminal, and these data to be shared immediately with all stages of the supply chain. In many industries especially in grocery industries, time and cost to process an order can be reduced by adopting POS terminal. These technologies can improve supply chain performances [4].

Service management is enhanced by the POS system regardless of the type of a business. POS system mainly contains a computer installed with POS software, barcode reader, card scanner etc. that simplify the checkout process as well as record the information. Installation cost is varied with the size of the organization. Small retailers may avail POS system on rent also [5].

The purpose of this research is to study the effectiveness of POS data collected in grocery stores, apparel stores, electronic stores and bookstores to managing supply chain and utilization of these data by these stores [6].

2. LITERARY BACKGROUND

In spite of the advancement in technology, retailer faces challenges in demand forecast management. A proactive approach called collaborative buyer-managed forecasting is a platform for close association in supply chain to improve demand responsiveness [7].

IT infrastructure costs reduced through business intelligence by eliminating redundant data extraction processes. Business intelligence also reduces the time for data supplier and users by efficiently data delivery [8].

The internet of things (IoT) allows the devices in a smart way. Various areas where its application is manufacturing, health care, transportation, education, infrastructure etc. IoT will promote the different approaches of working [9].

The use of POS data in supply chain management is a relatively modern phenomenon [10]. Some of the supply chain areas where POS data are used are transportation scheduling, procurement, purchase ordering, sales history, customer services etc. [11].

POS applications have been developed for Windows and UNIX since 1990. Retailers were working initially on two POS systems: (a) OPOS and (b) JavaPOS [12]. OPOS (Object linking and embedding for POS) was created by Microsoft, NCR Corporation et al. and was first released in 1996. JavaPOS was developed by IBM et al. in 1996 and first released in 1999 [13].

Unavailability and out of stock, both of these situations may lead to product substitution. However out of stock is due to demand uncertainty or bullwhip effect or inventory decisions and it can

be improved by real-time information sharing [14].

Retailing is often a distribution channel where one organization buys a product and sells it to the customer directly by the motive of profit earning [15].

A major motivator for upgrading systems is the computerization and flexibility that a POS system provides over manual processes. A POS system refers to gather and aggregate sales and transactions data automatically, which can be used to produce numerous sales reports. POS data is also useful for making daily reports with past data, weekly/monthly reports, top selling items, top margin customers, top margin items, customer rank by sales and sales by time of the day [16].

Retailers require to speed-up payment service so that long queue of customer waiting at the checkout counter can be overcome [17]. Thereby checkout time can be minimized.

3. METHODOLOGY

In this section, we explained the method used to analyse the data collected. SPSS software version 16 is used for data processing. A quantitative approach is used to analyse the research problem. 31 samples (respondents) were taken from different stores that used a POS system. We used thirty questions based questionnaire to survey and collect the useful data. The questionnaire contains 30 questions covering five factors. These factors (Fi) are as follows:

- F_1: Clerical cost reduction
- F_2: Stock-out situation reduced
- F_3: Increase in flexibility
- F_4: Boost sales of the popular products
- F_5: Reduced check out time

Where i= 1, 2, 3, 4 and 5.

A response was collected to each question on a 5-point Likert scale (1= Strongly Disagree, 2= Disagree, 3= Somewhat Agree, 4= Agree and 5= Strongly Agree) [18]. Statistical analysis was done using SPSS 16.0 software. According to the importance of POS data in each variable (mean), weightage (W_i) of all factors (F_i) were determined. Weightage of factors were calculated by paired comparison method. After finding the weightage, the score of each respondent is calculated by using the following formula:

$$\text{SCORE} = \sum_{i=1}^{5} Wi.Fi \qquad (1)$$

Where, i = 1, 2, 3, 4 and 5.

Finally, on the basis of the score, the rank of each store was calculated with the help of SPSS 16 software. Thereby we identified which store has most effectively adopted POS system.

4. DATA COLLECTION AND ANALYSIS

In this section, we explain the approach for data collection, method, steps of data analysis etc. in detail. The first step is to identify the area where the POS system can be implemented. Factors were identified by considering the pros and cons of the POS system. A structured questionnaire was used to collect the required data from each respondent (retailer/wholesaler). The questionnaire consists of the following five factors: (a) Clerical cost reduced. (b) Stock out situations reduced. (c) Increase in flexibility. (d) Boost sales of popular products. (e) Reduced check out time.

There are 30 questions in the questionnaire. Each question is provided with five responses based on 5-point Likert scale (1 = Strongly Disagree, 2 = Disagree, 3 = Somewhat Agree, 4 = Agree and 5 = Strongly Agree). Cronbach alpha coefficient was calculated to be 0.649 as shown in Table 1, which shows an acceptable level of internal consistency for our scale with this sample.

Table 1: Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No. of Items
0.649	0.664	5

Mean and standard deviation of all factors (variables) were calculated using SPSS software as shown in Table 2. This table (column 5) shows the value of Cronbach's alpha when a particular item is deleted from the scale. Here result shows that removal of any factor, except factor 4, would result in a lower Cronbach's alpha. So, we would not want to remove this factor. There might be a small improvement in Cronbach's alpha by the elimination of factor 4. We can decide whether we should remove this item.

Table 2: Item Total Statistics

	Mean	Std. Deviation	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Clerical Cost Reduced	3.7849	0.49478	0.473	0.561
Stock-Out Situations Reduced	4.1320	0.36653	0.411	0.601
Increase in Flexibility	3.9078	0.45258	0.576	0.515

Boost Sales of Popular Products	4.1129	0.57314	0.319	0.650
Reduced checkout time	4.2742	0.47590	0.292	0.647

Pearson's correlation coefficients among various factors were calculated using SPSS 16.0 as shown in Table 3.

Table 3: Pearson's correlation coefficients

		Clerical Cost Reduced	Stock-Out Situations Reduced	Increase in Flexibility	Boost Sales of Popular Products	Reduced checkout time
Clerical Cost Reduced	Pearson Correlation	1	0.351	0.426*	0.216	0.300
Stock-Out Situations Reduced	Pearson Correlation	0.351	1	0.459**	0.179	0.150
Increase in Flexibility	Pearson Correlation	0.426*	0.459**	1	0.372*	0.248
Boost Sales of Popular Products	Pearson Correlation	0.216	0.179	0.372*	1	0.127
Reduced checkout time	Pearson Correlation	0.300	0.150	0.248	0.127	1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
The weightage of factors (Fi) was calculated by paired comparison method. And the results were calculated by paired sample t-test in SPSS software.

Table 4: Paired sample statistics

		Mean (F_i)	Paired Differences
Pair 1	Clerical Cost Reduced	3.7849	1
	Stock-Out Situations Reduced	4.1320	
Pair 2	Clerical Cost Reduced	3.7849	2
	Increase in Flexibility	3.9078	
Pair 3	Clerical Cost Reduced	3.7849	2
	Boost Sales of Popular Products	4.1129	
Pair 4	Clerical Cost Reduced	3.7849	1
	Reduced checkout time	4.2742	
Pair 5	Stock-Out Situations Reduced	4.1320	1
	Increase in Flexibility	3.9078	

Pair 6	Stock-Out Situations Reduced	4.1320	2
	Boost Sales of Popular Products	4.1129	
Pair 7	Stock-Out Situations Reduced	4.1320	2
	Reduced checkout time	4.2742	
Pair 8	Increase in Flexibility	3.9078	1
	Boost Sales of Popular Products	4.1129	
Pair 9	Increase in Flexibility	3.9078	3
	Reduced checkout time	4.2742	
Pair 10	Boost Sales of Popular Products	4.1129	3
	Reduced checkout time	4.2742	

Table 4 shows the comparison of all pairs and their differences. Here paired difference was taken as a difference of their importance level between factors. (1= Minor Difference, 2= Medium Difference and 3= Major Difference)

Table 5: Paired comparison method

F2	F3	F4	F5	
F1 (1)	F1 (2)	F1 (2)	F5 (1)	F1
	F2 (1)	F2 (2)	F5 (2)	F2
		F3 (1)	F5 (3)	F3
			F5 (3)	F4

Table 5 shows the paired comparison method. Importance level was identified by the literature reviewed.

Table 6. Calculation of weightage

Total differences:		**Weightage (W_i) = $F_i/\Sigma F_i$**
F1	5+1=6	0.261
F2	3+1=4	0.174
F3	1+1=2	0.087
F4	0+1=1	0.043
F5	9+1=10	0.434
Total	**23**	**ΣW_i= 1**

The weightage was calculated in Table 6 by the following formula as shown in Equation 2:

$$\text{Weightage (Wi)} = \frac{Fi}{\Sigma Fi} \quad (2)$$

Where, i = 1, 2, 3, 4 and 5.

The score was calculated by the given formula in Equation (1) as shown in Table 7.

SCOREj = (0.261*F1+0.174*F2+0.087*F3+0.043*F4+0.434*F5).

Where, j = 1, 2, 3,……, 31.

Table 7: Score and Rank of organizations

Organization	Place	Score	Rank
1. PAKIZA	UJJAIN	4.176	14
2. BIGBAZAAR	UJJAIN	4.456	5
3. VMART	UJJAIN	4.484	3
4. BRANDFACTORY	UJJAIN	4.172	15
5. VMM	UJJAIN	4.340	8
6. GMART	UJJAIN	4.202	13
7. RELIANCE FRESH	UJJAIN	4.158	17
8. NAVKAR MART	UJJAIN	3.556	29
9. INDIAN TERRAIN	INDORE	3.974	22
10. CROSSWORD B	INDORE	4.559	1
11. SKECHERS	INDORE	3.984	21
12. WILDCRAFT	INDORE	4.165	16
13. ONLY	INDORE	3.816	24
14. SUPER99	INDORE	3.646	27
15. NARAYAN NX	INDORE	3.937	23
16. MAX	INDORE	4.419	6
17. AEROPOSTALE	INDORE	4.273	9
18. JACK & JOHN	INDORE	3.457	30
19. NAUTICAL	INDORE	4.255	10
20. GAP	INDORE	4.060	19
21. VEROMODA	INDORE	3.714	25
22. LACOSTE	INDORE	4.011	20
23. UNLIMITD	INDORE	3.643	28
24. BIGBAZAAR	INDORE	4.480	4
25. ADIDAS	INDORE	4.379	7
26. REEBOK	INDORE	4.226	11
27. USPOLO	INDORE	4.207	12
28. UCB	INDORE	3.428	31
29. RELIANCE DIGITAL	INDORE	4.487	2
30. SABHYATA	INDORE	3.659	26
31. MARK & SPENCER	INDORE	4.118	18

5. RESULTS

The maximum score obtained shows the best utilization of POS data and assign 1st rank out of 31 stores. Here CROSSWORD BOOKSTORES-INDORE has got the highest score (4.559) and it has been ranked first, whereas UCB-INDORE has got the lowest score (3.428) and it has been ranked 31st. We categorized the score as WEAK, MODERATE and BETTER. Below 3.5 scores are considered as WEAK, between 3.5 and 4 are considered as MODERATE and above 4 scores as BETTER results. In this research, we observed two stores had WEAK scores and they need to improve the utilization of POS data. They need to utilize the POS data in clerical cost reduction, stock out situations and checkout processes. Nine stores had MODERATE scores. They also need to utilize the POS data in clerical cost reduction. Twenty stores had BETTER scores because they had implemented POS data effectively. They utilize the POS data to the checkout process, boost sales of the popular products, reduced the clerical cost in a better way.

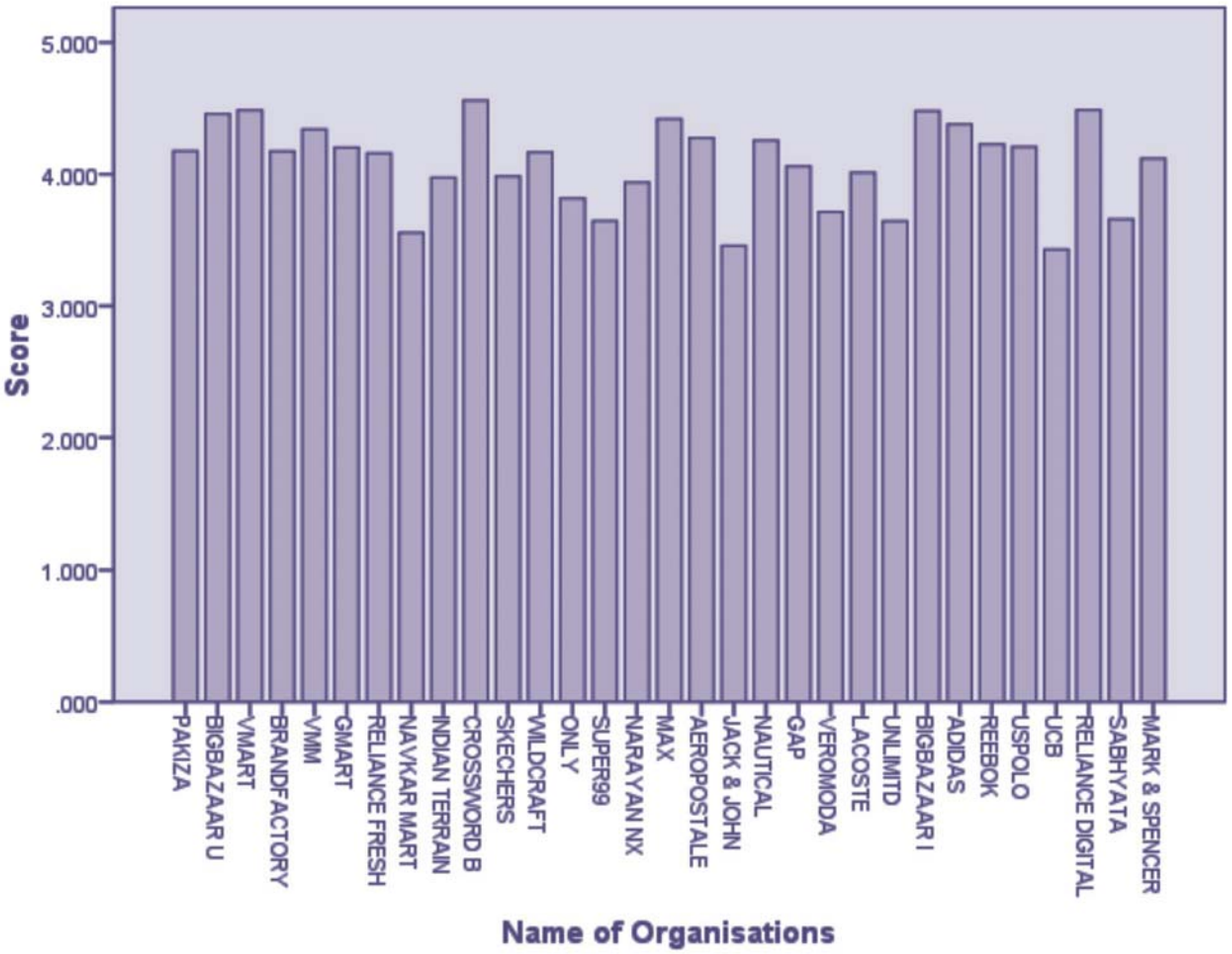

Figure 1: Score of organizations

Figure 1 shows the Bar chart of organization versus score. The poor score shows the poor adoption of POS system while better score shows the better adoption of POS system.

6. CONCLUSION

A POS system provides a systematic and computerized business environment where real-time information available, whereas manual cash register is complex and has limited capacity in terms of storage and information collected. POS system also integrates with order and sales so that better inventory management can be done. With the employee ranking report, one can easily know who is performing well and who isn't, who need an additional training to upgrade their skills and who will receive a reward for their productivity. Supply chain managers get real-time information about inventory and can take better decision to reorder point. Many authors talked about the prediction of the shopping list, the value of shared information, dietary quality of food sales etc., whereas in this paper, comparative utilization of POS data by retailer was studied. Effective POS data in retailing can be used for better supply chain management. One can easily identify the area where POS can be used and benefited from this technology in the competitive market. In this research, we have interviewed more than 30 retailers in central Madhya Pradesh who are using POS data. It has been observed that only few are able to extract potential benefits of POS in managing their supply chain whereas many others though using POS but lack competence and integration to exploit POS data to their benefit.

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