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Research Article

Optimizing Inventory for Stocking-up Medical Drugs in the Goa Pharma Retail Industry

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ABSTRACT

Drug retail outlets are mushrooming and when it comes, the need to stock up drugs for the society. Many drugstores are in a quandary as to how much they must stock up to meet the patients requirements. The study was conducted to determine which factors were found to responsible or most needed when it came to stocking up medicines. The factors selected were demand for the product, storage conditions, supplier reliability, storage capacity, capacity to pay the suppliers and expiries of drugs. Around 300 retailers and their staff from various drugstores around Goa were selected by a convenience sampling method. The results were as follows; demand for the product was ranked as number one, followed by capacity to pay the supplier, expiries of the drug, storage capacity, storage conditions and supplier reliability. Pearson's coefficient of correlation was also conducted wherein two above variables were checked for correlation. It was found that there was a high positive correlation between capacity to pay the supplier and demand for the product. Secondly there was a medium positive correlation between capacity to pay the supplier and storage capacity.

Keywords: Expiry date, Supplier reliability, Storage conditions, Drug demand, Space constraints, Credit availability

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INTRODUCTION

Today a retail store or pharmacy has to stock up huge quantities of pharma products. This stems from the fact that with the increase in pharma companies, there has been a rapid increase in the number of different brands available too. The doctor is the king and with a number of medical representatives visiting him he has the option to choose from any of them. This results in the retail store many a time having to stock up different brands of the same molecule because the doctor changes his brand just as one may change his/her clothes.

The retail store is thus left with the dilemma if to stock a particular brand and the doctor changes it, then will it not expire. The number of brands stocked does not do justice of their movement at times. If a brand expires then it has to be returned at a particular time frame. Some companies are ready to accept within 3 months while others are ready to accept only if the medical representative gives a note stating to take it back. Because here the medical representative is the one who introduces the brand to a pharmacy and as such, he is responsible for liquidating it from the drug store (Gebicki M, *et al.*, 2014).

The retailer is also in the dilemma whether to stock up a lot of boxes or few boxes or strips. This depends on the supplier reliability. In urban areas the reliability is good and no problem is seen. If one runs out of stock, one can easily go to the outlet or wholesaler and purchase whatsoever he desires. However, in rural areas where the supplier reliability is questionable and the visits are few and not frequent, stocking up is a necessity. The fast-moving brands are required to be stocked up in large quantities as compared to the slow-moving brands where in the demand is not so much (Nematollahi M, *et al.*, 2018).

Then the storage conditions too have to be ascertained. As such most pharma products require cool and dry conditions. Moist, wet and damp storage conditions hasten the deterioration of drugs and companies are not ready to accept drugs returned in such condition. If proper storage conditions are unavailable then it may be prudent not to store excess of drugs. Moreover the food and drug administration too will not give the license to the retail outlet to function if such conditions are prevalent (Ansari FA, 2017).

It is very nice to have a desire to stock up a lot of products, but one must also see if the space is available. Cramped drugstores are not the best. It is difficult to find the brand and it also difficult to store. Some retail stores store their drugs alphabet wise whereas others store them depending on the disease or ailment. Storing in any of these ways is good but it should be stored well. If space is unavailable then all these techniques are of no use. If one wastes the time of the customer searching for a drug then, it can irritate the customer, resulting in him or her going to another drugstore to purchase the drug. At times while searching it could also result in medicine bottles toppling over resulting in damage or breakage. Well placed shelves, display areas, and counter space is required if aesthetics is to be seen. A person going into a cramped drugstore and a neat and clean drugstore can see the difference. Of course one will see also if they get what they went for but the environment also plays a part and should be taken into consideration in the same (Singh AK and Kapoor R, 2013).

The retail store owners may also not have the capacity or capability to pay off the wholesalers/companies when they purchase goods. If their creditworthiness if not good, then one may not entertain them too. Creditworthiness is the ability to pay back the wholesaler or company within the particular time frame. Scoring less on creditworthiness means that the ability to get credit is less. This may result in the retail store storing lesser and being thereby unable to serve the customers well. A dissatisfied customer will move to another pharmacy, resulting in loss of sale (Bonnet D and Westerman G, 2020).

And last and most importantly is the customer demand. Stocking up drugs will depend if there is a demand for the same. If the number of doctors around the drug store is in abundance, if there is a lot of customer traffic near your drugstore, if the drugstore is near a residential area, or if the drugstore has a well-connected roadways or railways line, then the demand for drugs will also increase and stocking up of the same is a requirement (Cho H and Fiorito SS, 2010).

LITERATURE REVIEW

The study was conducted to ascertain the need for optimum inventory levels of medical stock in a pharma retail store in Goa. Six parameters were developed and on them the study was conducted.

The first was adequate quantity of drugs to be stocked up so that it was not too low and neither too high. Nematollahi M, *et al.*, 2018 felt that drug shortage would compromise patient safety and increase the vulnerability of the overall healthcare system. They were of the opinion that "Improving patient service level in the pharmaceutical industry context is a major endeavor towards a socially responsible supply chain. However service levels are difficult to achieve as retailers and wholesalers look towards their own interest.

Chakraborti R, *et al.*, 2021 felt that during the COVID-19 pandemic the anticipatory shortages of drugs led to an increase of hoarding of drugs leading to shortages in many a drug store. The question of how much of inventory levels have to be maintained did not arise in this case as may retail outlets were without any stock.

India is the second largest country in terms of consumer markets and seventh largest in terms of retail markets in the world. Pick D and Muller D, 2011 feel that with the liberalization of the economy in India, the retail industry has grown and as a result the retail pharma industry is thriving. They feel that the numbers of retail drug stores are increasing and with that the stocking of drugs too is on the rise.

Nigah R, *et al.*, 2010 felt that ABC analysis and VED techniques could be used to a great effect in retail stores around the world. Both techniques predict the optimum inventory levels to be maintained. According to them, "ABC analysis revealed 13.78%, 21.85% and 64.37% items as A, B and C category items, respectively, accounting for 69.97%, 19.95% and 10.08% of ADE of the pharmacy. VED analysis showed 12.11%, 59.38% and 28.51% items as V, E, and D category items, respectively, accounting for 17.14%, 72.38% and 10.48% of ADE of the pharmacy.

Pharmacists are also in a dilemma as to how much to stock with the fear of the product expiring. According to Gebicki M, *et al.*, 2014, stocking up optimum amount of drugs is a necessity in order to be a successful drug store. The safety factor also comes into play and having systems whereby one can keep a track on the drugs and their expiries can benefit the patients in terms of safety concerns.

In agreement is Guido G, *et al.*, 2011 who felt that credibility and trust of a pharmacist were very important. This stemmed from the fact that drugs dispensed were not expired. Managing a retail store with optimum inventory is thereby a necessity so that the patients are not subjected at any point of time with expired medication.

Greenberg J, 2017 is of the opinion that with online drug supply many a time, one does not keep track of drugs and expired drugs too may be dispensed. He feels that a proper inventory system must be maintained wherein all the expiry dates are mentioned.

Agada P and Ugar K, 2017 also feel that holding of inventory stock, especially the buffer stock is expensive and many a time could be a factor for expiries too. They feel that one must maintain adequate stock through different techniques and thereby decrease the probability of drugs expiring in a retail outlet.

When it came to space constraints, Singh AK and Kapoor R, 2013 felt that assortment planning could be useful. According to them, "Assortment Planning (AP) is a process of selecting types and number of products to be kept from a given product line and also to determine the optimal level of inventory of these products.

Chang TS, 2021 is of the opinion that space constraints could have an adverse effect on movement of traffic in a drugstore. With COVID 19 fresh in one's mind, it is imperative that adequate space be present for movement of customer traffic within the drugstore.

On the other hand Grewal D, *et al.*, 2009 say that one has to pay attention to the customer shopping experience. They say that "Customer experience management represents a business strategy designed to manage the customer experience. It represents a strategy that results in a win–win value exchange between the retailer and its customers. Several ways (e.g., promotion, price, merchandise, supply chain and location) to deliver a superior customer experience are identified which should result in higher customer satisfaction, more frequent shopping visits, larger wallet shares, and higher profits.

Machleit KA, *et al.*, 2000 feel that crowding in a retail store decreases customer satisfaction. The results of two field studies by them indicate that "whereas emotions only partially mediate the relationship, the decrease in shopping satisfaction due to crowding is moderated by expectations of crowding and personal tolerance for crowding".

Then there is the storage conditions which have to be ascertained. Ansari FA, 2017 is of the opinion that there are a lot of storage conditions written on the labels of products which are not understood and thereby also not properly implemented. This can have an impact on the potency of the drug and then on the efficacy and safety of the drug on the patient. He further states, "It becomes the moral responsibility of pharmacist at retail outlet to follow the required storage condition mentioned on the pharmaceuticals products to insure that quality is not compromised".

In agreement to Muttaqi SSSA, *et al.*, 2016 who conducted a study on pharmacies in Karachi, Pakistan. According to them they felt that pharmacies were not being maintained well, and below standard. They say, "Only a few drugs stores have adequate facilities to protect the drugs from extreme temperature, sunlight and provision of refrigeration". Very few of the drug stores carry out drug sales under the supervision of qualified pharmacist. They therefore feel that if pharmacies have to run in Karachi, they have to follow the regulatory standards laid down by the drug regulatory authority of Pakistan.

Muttaqi SSSA, *et al.*, 2016 also stated that medicinal products require proper temperature in order that the efficacy and potency is maintained. Strong monitoring of storage conditions and storage regulations is needed to ensure that the drugs do not deteriorate and quality is maintained. They feel that training should be given to community pharmacist especially in the rural areas to learn about maintaining proper temperatures of medicinal products.

Subzwari M and Nasir SZ, 2015 state that the, protecting the efficacy of temperature-sensitive drugs is a real challenge especially for the countries with hot climates. Over-the-counter medicines have recommended storage-temperature of around 20°C-30°C, while temperature in most metropolitan areas of Pakistan reach around 40°C-50°C in summers, even under the shade. Other temperature-sensitive medicines require storage at around 4°C-8°C. With frequent power cuts that feel that pharmacies must be equipped with alternate power supply in cases when the power goes off.

Stocking up is easy but having the capacity to pay the manufacturer is also important. The trust between the manufacturer and retailer is important as it on this basis that a deal can be struck. It states that "To build a trusting relationship with their weaker partners, powerful companies can build systems that strive both to compensate their partners fairly for their contributions and to resolve differences in a manner that their partners perceive as fair.

Samiee S, 1993 on the other hand feels that local suppliers, who are the wholesalers should give liberal credit terms to the retailers who many a time will pass on credit to their patients who are in need for medicines.

The power of digital transformation is shown by Bonnet D and Westerman G, 2020 who feel that digital technology rapidly improves performance. Executives across industries are using digital technology to do payments,

insurance, tax, and other financial services. ERP can keep track of the amount one has and the amount one has to use up for paying creditors on a daily basis.

Last but not the least is the human traffic at your drugstore. How does one ensure that a person will repeatedly return to a specific drugstore? This will depend on the services offered by the drugstore. Vandermerwe S and Rada J, 1988 are of the opinion that one can incorporate a bundle of services which are customer demand driven and will provide the store with a competitive edge. This can include goods, services, knowledge and support services. Donner J and Tellez CA, 2008 are of the opinion that mobile networks allow users to transfer airtime between accounts. In this manner one can keep tab on how much money one has and how much money one wishes to give to the suppliers of medicines.

The concept of self service is brought about by Cho H and Fiorito SS, 2010 wherein they advocate self-service as a means of attracting customers to a retail outlet. In the case of a drugstore it is applicable for over the counter products which are do not require a prescription by the doctor. They go on to say that successful implementation of a self-service design can be profitable to the retail store as well as bring satisfaction and convenience to the customers.

Fox EJ and Sethuraman R, 2009 feel that if earlier a customer was required to stand in a queue for his prescription to be dispensed; nowadays there are a number of ways in which it can be done. For example in the USA, they go on to state that one can get his prescription filled at a drugstore, in a supermarket, in a supercenter or even online. They say that the increased number of options arise due to the increased competition existing among drugstores. These different options are termed as retail formats, which are stores which offer the same or almost the same type of product or service.

Bennett D and Yin W, 2014 speak about chain stores and the improvement in the quality as well as in the prices. Chain drugstores provide the much-needed service to society and act as a social welfare organization. By bringing down the prices it can help the economically weaker society to procure drugs.

Harrigan KR, 1988 advocates joint ventures to give the competitive edge to retail outlets. According to him joint ventures benefits the retail outlets because of globalization, technological changes can make a retail outlet redundant, initial investment of a retail store will not be able to be recovered and joint ventures give value to customers apart from increase in shareholders earnings.

Research design

Exploratory design is a design used for acquiring information needed to structure or solve problems. It is used to determine the unknown.

Type of sampling

Convenience sampling-The sample was selected depending on the convenience of the researcher who felt that the sample selected was representative of the population in question" (P.E. Green and D.S. Tull (1990), Research for Marketing Decisions (4th edition)

Sample size and sample area

300 drug retailers and their staff from Goa.

Type of interview

Personal-The researcher personally interviewed the respondents.

Techniques used to analyze the data

Thurstone case V scaling and Karl Pearson's coefficient of correlation. Methods of both techniques are described in the findings.

Type of questionnaire

Structured direct-A formal questionnaire wherein non disguised questions are asked.

Type of questions

Multiple choice (several set of alternatives from which the respondent has to rank them) and open-ended questions (questions having no limit of words in answering) were asked" (Research for Marketing Decisions (4th edition)).

DISCUSSION AND CONCLUSION

Hypothesis of the study

- H1: There is no correlation between having capacity to pay the suppliers and demand for the product.
- H2: There is a correlation between having capacity to pay the suppliers and demand for the product.
- Ho2: There is no correlation between having capacity to pay the suppliers and storage capacity.
- Ha2: There is a correlation between having capacity to pay the suppliers and storage capacity.

Demographic analysis

The number of retailers and their staff selected was 300. The age group selected was from 25-60 years. Of the individuals interviewed, 200 were men and the balance was women.

Thurstone case V scaling technique

"Thurstone case V method is a popular method to be used with ordinal data. It permits construction of a uni-dimensional interval scale using responses from variability data collection procedures such as paired comparison", Research for Marketing Decisions (4th edition). "It involves deriving an interval scale from comparative judgements of the type "X is fancier than Y", or "X is preferred to Y". Thurstone case V scaling was also used in the study whereby the 6 variables were compared with one another. These values are then divided by the sample size and the fractions are then read on a table. The columns were added together and the lowest value is then added or subtracted to itself to make the lowest value zero and this value is added to the other variables. The resulting values are potted on a one-dimensional scale. If the order of the parameters differed by the Thurstone case V scaling, then we could conclude that a difference exists. The study gave insights as to which factors were considered as the most important in terms of product and non-product centric factors for doctors in Goa. (Research for Marketing Decisions (4th edition)). Six variables were selected, namely A-demand for the product, B-expiries of the product, C-supplier reliability, D-storage conditions, E-capacity to pay, and F-supplier reliability. Thurstone case V scaling method was used to analyze the various variables (*Tables 1-4*).

Table 1: Most preferred and 6 least preferred

	A	B	C	D	E	F
A	0.5	95/300	105/300	150/300	135/300	110/300
B	205/300	0.5	190/300	140/300	145/300	120/300
C	195/300/	110/300	0.5	210/300	215/300	190/300
D	150/300	160/300	90/300	0.5	130/300	220/300
E	165/300	155/300	85/300	170/300	0.5	100/300
F	190/300	180/300	110/300	80/300	200/300	0.5

Table 2: Results of Thurstone case V scaling

	A	B	C	D	E	F
A	0	-0.47	-0.39	0	-0.13	-0.33
B	0.47	0	0.36	-0.1	-0.05	-0.25
C	0.39	-0.36	0	0.52	0.58	0.36
D	0	0.1	-0.52	0	-0.15	0.64
E	0.13	0.05	-0.58	0.15	0	-0.41
F	0.33	0.25	-0.36	-0.64	0.41	0

Table 3: Addition of each variable from the result of Thurstone case V scaling

A	B	C	D	E	F
1.32	-0.43	-1.49	-0.07	0.79	-0.01

Table 4: Addition of 1.49 to each variable from the result of Thurstone case V scaling

A	B	C	D	E	F
2.81	1.06	0	1.42	2.28	1.48

Pearson's coefficient of correlation

Karl Pearson's coefficient of correlation method which is as follows was also used-"Whenever two variables of the same group are related so that the increase or decrease correspond to the increase or decrease to another or conversely, they are said to be correlated. In Pearson's the coefficient of correlation is r". Source: (S. P Gupta and M. P. Gupta (2005), Business Statistics) "The formula for computing Pearson's r is-

r (correlation coefficient)= $\frac{\Sigma X1Y1}{\sqrt{\Sigma X_I^2 \times (\Sigma Y_I^2)}}$

Where r=Pearson's coefficient of correlation

X_i=x_i-mean and Y_i=y_i-mean

x_i= value of the individual variable from 1-100 y_i= value of the individual variable from 1-100" (S. P Gupta and M. P. Gupta (2005), Business Statistics)

"The values which lie between less than or equal to 0.5 or greater than or equal to 0.9 can be interpreted as follows-

≤ 0.50-very low, 0.51 to 0.79-low, 0.80 to 0.89-moderate and ≥ 0.90-high (Good)"

It was conducted on the following:

To find out if any correlation existed between capacity to pay the supplier and demand for the product-

$$r(correlation\ coefficient) = \frac{\sum X_I Y_I}{\sqrt{(\sum X_I^2 \times \sum Y_I^2)}}$$

Where mean of capacity to pay the supplier=4.31 mean of demand for the product=4.61

=35.02/(36.18 × 49.02)

=35.02/√1773.5

=35.02/42.11=-0.82

Further, to find out if any correlation existed between capacity to pay the supplier and storage capacity-

$$r(correlation\ coefficient) = \frac{\sum X_I Y_I}{\sqrt{(\sum X_I^2 \times \sum Y_I^2)}}$$

Mean of capacity to pay the supplier=4.31 Mean of storage capacity=2.47

=28.14/√40.18 × 51.02

=28.14 /√2049.9

=28.14/45.20=0.61

Thurstone case V scaling:

- A or demand of the product was ranked as number 1, indicating that retailers will stock a product only if there is a demand or customer traffic in the drugstore.
- E or capacity to pay was ranked number 2, which meant that only if the drugstore owner or retailer had the capacity to pay off the suppliers then he would stock up a product. As such suppliers also have their limitations and if the creditworthiness or capacity to pay is not seen in the retailer, the supplier will cease to supply him with medicines.
- F or expiries of medicines was ranked as number 3, which meant that retailers were not ready to stock up products which were not fast moving and the chances of it expiring were high.
- D or storage capacity was ranked as number 4 indicating that adequate space was desired by retailers who did not want the space to be all cramped up and to be unable to find products when asked for.
- B or Storage conditions was ranked as number 5, indicating that retailers were conscious of storage conditions and the need for refrigeration or air conditioning was also present. However, they did not take it very seriously as they ranked it low.
- C or supplier frequency was ranked as number 6, indicating that retailers did not consider this as a cause for concern. With even rural drugstore owners having bikes/cars of their own, they do not hesitate to travel to the city if the need arises in emergencies to purchase the required medicines.

Pearson's coefficient of correlation:

- There was a high positive correlation between capacity to pay the supplier and demand for the product. This signified that greater the ability to pay the supplier, the higher will be the ability to stock goods and thereby the demand too will rise.
- There was a medium positive correlation between capacity to pay the supplier and storage capacity. This indicated that greater the ability to pay the supplier, the greater amount of goods could be stocked up, irrespective of the storage conditions which remain constant.

Implications of the study:

The Goa pharma retail industry can benefit greatly from optimizing inventory for stocking medical drugs, which can benefit both enterprises and the general population. It entails taking a strategic approach to managing drugs, which may enhance patient care, save costs, and boost industry-wide productivity.

- By maximizing inventories, stockouts are prevented and important medical medications are always available. As a result of which the risk of giving patients expired or ineffective medications is significantly reduced by proper inventory management.
- Through effective inventory management can lower carrying costs brought on by having too much stock thus pharmacies can free up money that can be invested back into the company or used to increase service offerings.
- Pharmacies can lessen the amount of expired or unused medication that needs to be thrown away by monitoring and replenishing pharmaceuticals more effectively. This reduces waste in terms of money and the environment.
- Increasing sales and improving profit margins might result from optimizing inventory as a result of which pharmacies can adjust their

inventory to meet customer demand, which boosts sales.

- Customers value pharmacies that regularly carry the prescription drugs they require in stock. In doing so customer loyalty may rise as a result of better customer satisfaction.
- Compliance with legal requirements for pharmaceutical storage, handling, and dispensing is improved through better inventory management.
- Pharmacies can react to shifting consumer expectations by making informed judgments based on data analysis and trends.
- Pharmacies that manage their inventory well are better positioned to compete in a pharmaceutical retail sector that is continually changing.
- Research can benefit from the information gathered throughout the inventory optimization process, which could lead to improvements in pharmaceutical supply chain management.
- The study might promote the use of technological tools, including inventory management software, to simplify procedures and boost effectiveness.
- The study's conclusions can inspire cooperation between drug stores, medical professionals, and policymakers to improve Goa's pharmaceutical supply chain management.
- As demand is ranked high, retailers must stock up adequately to prevent stock out conditions, resulting in the customers choosing another retailer to purchase medicines.
- Retailers must give importance to their finances as if they stock up unnecessary, they can be run out of money.
- A keen eye must be kept to ensure that the products do not expire. Whenever a product nears its expiry date it should be immediately returned to the wholesaler.
- The retail store should not be cramped up. Proper aesthetics must be maintained to ensure that the retail store is a refreshing experience to the customers.
- Storage conditions must be looked into to prevent deterioration of products.
- Supplies must be adequately stocked up if supplier frequency to the retail store is far and few.
- Greater amount of goods can be stocked up if capacity to pay is there as well as the storage capacity and demand for the goods.

Implications with respect to recent studies:

- Nematollahi M, *et al.*, 2018 felt that drug shortage would compromise patient safety and increase the vulnerability of the overall healthcare system. According to them optimum levels of inventory have to be maintained. The study also proved that demand for the product ranked as number 1.
- The power of digital transformation is shown by researchers who feel that digital technology rapidly improves performance in terms of payment on time and creditworthiness of a drugstore. In the study too the ability to pay the supplier was ranked number 2 showing how much the retailers valued this variable.
- Agada and Ugar k, 2017 felt that holding of inventory stock, especially the buffer stock is expensive and many a time could be a factor for expiries too. They felt that one must maintain optimum stock through different techniques and thereby decrease the probability of drugs expiring in a retail outlet. The findings in our study also proved that expiries were a cause for concern and hence it was ranked number 3.

LIMITATIONS OF THE STUDY

Only Thurstone case V scaling and coefficient of correlation were used in the study. No other technique was used as it was found to be sufficient to make use of only these two techniques. Further, the sampling was based upon convenience technique rather than going in for simple random sampling or any other technique because of the convenience of this technique.

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