Supply and Demand (SAD) analysis of Producers and Seller in Market under OOS Conditions in Supply Chain Management.

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Abstract

Product accessibility is a serious feature of client package for sellers and industrialists. While product being out of stock (OOS), both sellers and manufacturers may agonize relying on demand-side features, such as whether customers are extra dependable to the store. Though together sellers and producers contribute to OOS conditions, the supply-side features, like whether seller or producer is accountable for in-store contentment might effect OOS situation. Direct store delivery (DSD) includes the producer sidestepping the seller’s delivery center and transporting product straight to the seller’s distinct warehouses. This article presents the Supply and Demand (SAD) concerns concurrently to define the insinuations of stock outs for both sellers and producers using an agent-based simulation. An agent-based simulation permits reflection of such concerns under recurring OOS circumstances to define the general and complete effect to seller and producer performance.

Keywords: Supply and Demand, Producers, Agent based simulation, product reliability, Out of Stock (OOS).

I. Introduction

Solar In market, OOS situation institutes failure of service. It disappoints customers and hot stock have a OOS rate of 15 to 20% faster than normal stuff. Noteworthy that the market competition today is severe, sellers are left with only choice refining customers’ experience for the sake of their brand name. OOS situations defames brand and store which brings high loss and control in competitive market. Remedial steps that can destructively influence the seller comprise the customer determining to change supplies or suspending the procurement. This give arise also to alarming situation of customer to go for the product of competing brand hence damaging the producer market control [VIII]. Producers likewise face significant contests in today’s situation assuming amplified rivalry from seller’s
particular store-brands and commoditization of product brands [V]. As sellers and producers face likely undesirable outcome of OOS, there are some situations where both undergo for possible solutions. As for Sellers point of view, the possible solution of OOS is alternate brand product according to which is executed sellers’ reliability increases but this situation has adheres the producers market as competitive brand establishes more. This can be simplified as that sellers intention is to gain customer store loyalty while for producers its brand loyalty. However, producers and sellers could advantage by teaming up together, avoiding their own self-interests and equally refining product accessibility. This is principally factual that “OOS continually is inadmissible in high retail and customer goods business” [V]. There are two considerations while addressing OOS conditions also known as SAD. S indicates supply concerns and D concerns customer or Demand concern. Accordingly to [I-II] the attempt to overcome individual concerns has led to a significant gap. This article attempts to fill this gap by investigating both demand-side and supply-side issues, concurrently, in understanding the inferences of stock outs to both sellers and producers. This paper analyzes and formulates OOS situations for both sellers and producers using SAD scenarios on repetitive basis using agent based simulations as OOS not just only limits current but future product reliability [IV]. In this article for supply issues are discussed by investigating the OOS cases firstly under distribution channeling. Channeling is termed as the responsibility of supplying the stock from factory to the inventory. This significantly defines the OOS case as traditionally producer is bound to channel stock to inventory/warehouse of sellers which size is yet to be defined. This impacts producers market as sellers is responsible to individually supply to its branches. This situation of OOS can be improved if the producers could have sellers’ shelf access which can be termed as direct store delivery (DSD) [XI, XII]. The distributing policy points the possible individual interests between sellers and producers given “the retail store is the last but one stage of a supply chain” [V]. Sellers and producers frequently team up in planning demand-side matters like promotions, product assortment, and product introductions. However, under traditional distribution, the seller is eventually accountable for in-store supply side matters. As the product accessibility defines store excellence in the trade division, OOS occurs frequently [III]. Failing to find product and asking associates for it devalues and demoralize shopping experience and affects customer satisfaction and customer usually prefer then alternative solutions. The choice of action is wedged by factors such as loyalty to the brand and store [XIV]. This acmes the status of SAD issues and their influence in product obtainability and customer satisfaction.

I.i. Concerning issues at Customer Side:

When OOS situation occurs, a customer is left with a decision of exchanging brand or the store. Research articles [VI, XI, VIII, XIII] have shown that usually four outcome occurs:

- Change store in order to find product of same brand
- Buying alternate brand
- Delaying Purchase
- Not to purchase at all.
These decisions are generally depended on product cases. For example an ordinary housewife will go for alternate brand when it comes to paper towels or kitchen knife but an Engineering firm manager when examining batteries bank for system control room will definitely go out for another store rather than exploring alternates.

**I.i. Concerning issues at Supply Side:**

Contentment complications producing OOS can arise in the following two scenarios:
1) Pre-store, where the producer had concerns transporting as anticipated to seller or the seller had difficulties managing replenishment to separate branches.
2) In-store, whereby not enough product was ordered or in-store inventory complications occurred [VI].

Figure 1 shows both scenarios. Pre-store and In-store both. In-store replenishment issues can be difficult to explain because a store’s inventory system may not be able to differentiate between inventories in the store’s backroom versus inventory on the shelf meaning, in the system, there is inventory available, but on the shelf the inventory could be out of stock [IX] [IV].

By analyzing figure 1 it can easily be simplified that the producer/manufacturer can improve DSD by supplying to each store individually rather than supplying all the product to inventory of Sellers Company.

**II. Agent Base Simulation Case**

An agent-based simulation approach has been used which allows multifaceted and collaborating systems to be modeled such that agents can be automated to act in definite means and acquire from interfaces within the situation.

The framework comprises Producers A and B, Sellers 1 and 2, and customers, acting as agents in the simulation model. Producer A transports Product A to both Sellers 1 and 2.
Under assumption that Producer A makes and transports substitute products. Similarly, Producer B launches Product B with auxiliary products, which are spread through Sellers 1 and 2. As in [VIII] assumption of strong impact of a product has been set up to 70% for any of the product. We consummate Product B to characterize all possible opponents for Product A, as an outcome, demand for Product B represents the sum of the demand for all products that compete with Product A. Sellers 1 and 2 satisfy customer demand in the simulation models assuming 70% of the market has a strong preference for a particular store, remaining 30% is uncaring. In presenting consumer place one thousand agents are assigned in simulation capable of purchasing in which 70% have strong purchasing preference. And remaining 30% will be uncaring, the ones with heavy purchasing power and urge will have the highest probability of 1 and the rest with 0.5. Since product and store purchasing preferences are randomly assigned customer purchasing can differ in terms of product as compare to store loyalty. Fig. 2 displays a flowchart diagram demonstrating how agents are shaped and prepared before starting simulation.

Figure 2: Simulation model and framework
Figure 3: Preferences set up for simulation model.

Figure 3 shows the preference of brand and store set in simulation while encountering OOS situation whether to go for same brand, purchase with another competitor or delay. Table 1 shows the value in percentage of customer agent preferring brand or store.

Table 1: Customers Preference for the brand

| Decision           | Preferred Brand (%) | Preferred Store (%) |
|--------------------|---------------------|---------------------|
| Substituting same Brand | 30                  | 21                  |
| Alternate          | 20                  | 29                  |
| Delay              | 15                  | 10                  |
| No Purchase        | 19                  | 22                  |
| Alternate store    | 16                  | 28                  |

Since 70% of the market has a stout fondness for a precise store, Original Seller 2 acquiring partiality values measured are 50%, 35%, and 20%. The diverse worth measured for Demand, Original Product A acquiring predilection, and Early Seller 1 buying preference resulted in a total of 27 different situations ($3^3 = 27$). We run each of these 27 setups in our four agent-based simulation models developed in order to test each scenario under each possible grouping of delivery channel and customer faithfulness for a total of 108 set-ups tested ($27 \times 4 = 108$). For simulation data is gathered of both product in terms of sales with sellers’ data and we analyze the OOS situation faced by agents while changing in preferences of purchasing. For simulation data is gathered of both product in terms of sales with sellers’ data and we analyze the OOS situation faced by agents while changing in preferences of purchasing. We attempt to analyze and understand the influence of
SAD concerns on producer and seller sales in the occurrence of frequent OOS conditions. In order to do this, for both imitated cases, Final Product A market share and Final Seller 1 market share is captured which is then changed as we subtract initial share from final one and modify in Seller 1 market share as the difference in market share from initial to final. Positive values of DMSA DMS1 means higher market and in OOS conditions they will decrease.

II. Results and Discussions:

(a) Traditional Distribution (b) DSD Distribution.

Figure 4: Changes in market share (ΔMSA and ΔMS1) with changes in Initial Seller 1 Preference (a) Traditional Distribution (b) DSD Distribution.

Figure 4a and 4b shows the change in market share in traditional and DSD distribution and from these results loyalty of customers can be analyzed. Fig. 4a demonstrates values attained under traditional distribution running three set ups (i.e.,
demand level of 60, Initial Product A purchasing preference of 0.35, and fluctuating stages of Initial Seller 1 acquiring preference, 0.2, 0.35, 0.5, respectively) using all four of the simulation models developed. Fig. 4b demonstrates values attained under DSD distribution for the same three scenarios across the four simulation models developed. These value shows that the product is highly effected by purchasing power of customers in the market. Table II covers regression models acquired by simulated data through which we can approve Customers have a noteworthy effect on Final Product A market share.

Table 2. Results for Market Change.

|                         | MSA Regression Coefficient | MS1 Regression Coefficient |
|-------------------------|----------------------------|----------------------------|
| Intercept               | 0.0199                     | 0.0298                     |
| Distribution Channel    | 0.0387                     | 0.0520                     |
| (DSD1/Trade 0)          |                            |                            |
| Consumer Loyalty        | 0.0264                     | -0.0118                    |
| (Brand 1/Store 0)       |                            |                            |
| Demand                  | 0.0005                     | -0.0005                    |
| Initial Product A Market| 0.0662                     | -0.125                     |
| Share                  |                            |                            |
| Initial Seller 1 Market | 0.1054                     | -0.08010                   |
| Share                  |                            |                            |
| R-Square                | 0.84                       | 0.90                       |

The positive coefficient acquired for Customer Loyalty for DMSA (0.0264) in Table II specifies that, under repeated stock outs, Final Product A market share will be higher when product A is purchased by brand-(store) devoted customers. In distinction, the negative coefficient achieved for Customer Devotion for DMS1 (0.0118) designates that, under recurrent stock outs, Final Retailer 1 market share will be low when customers are brand (store) devoted.

So then best policy for producer looking for enhancement in market share is to emphasize on OOS development exertions first on products bought by store-loyal customers. The seller, on the other hand, should first focus any OOS development exertions on products acquired by brand-loyal customers.

IV. Conclusion

This article attempts to seal the gap by concentrating on the integration of demand and supply problems at OOS conditions. It was found that the producer’s market share is more crushed by frequent OOS situations when products are bought by store-loyal customers, providing inspiration to concentrate on refining OOS circumstances at the retailer’s shelf for this type of products. In contrast, the retailer’s market share is more crushed by frequent OOS circumstances when products are purchased by brand-loyal customers, providing inspiration to focus on refining OOS conditions at the retailer’s shelf for this type of products. This suggests that sellers and producers must work together to grow jointly useful policies to diminish the influence of OOS conditions.
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