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The Bull Whip Effect in Supply Chain Management - The Indian Scenario

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Abstract: This Paper tries to explore the Bull whip Effect in the Supply chain Management scenario in India irrespective of the product or sector. Has the Indian scenario for various supply chains seen this phenomenon? Also the paper tries explore this effect on the industry and its implications in the Indian scenario. The major factor that has changed since the time this effect was discussed in the 1960s is the information technology integration across the supply chain management with ERP, automated sales force, and big data. These have changed the face of business altogether especially the supply chain management scenario across the world. The paper tries to explore whether the onset of information technology has reduced the bull whip effect across supply chains which is one of the major objectives of this paper

Key Words: Bull Whip effect, Supply Chain management, Enterprise Resource solutions, Demand Forecasting.

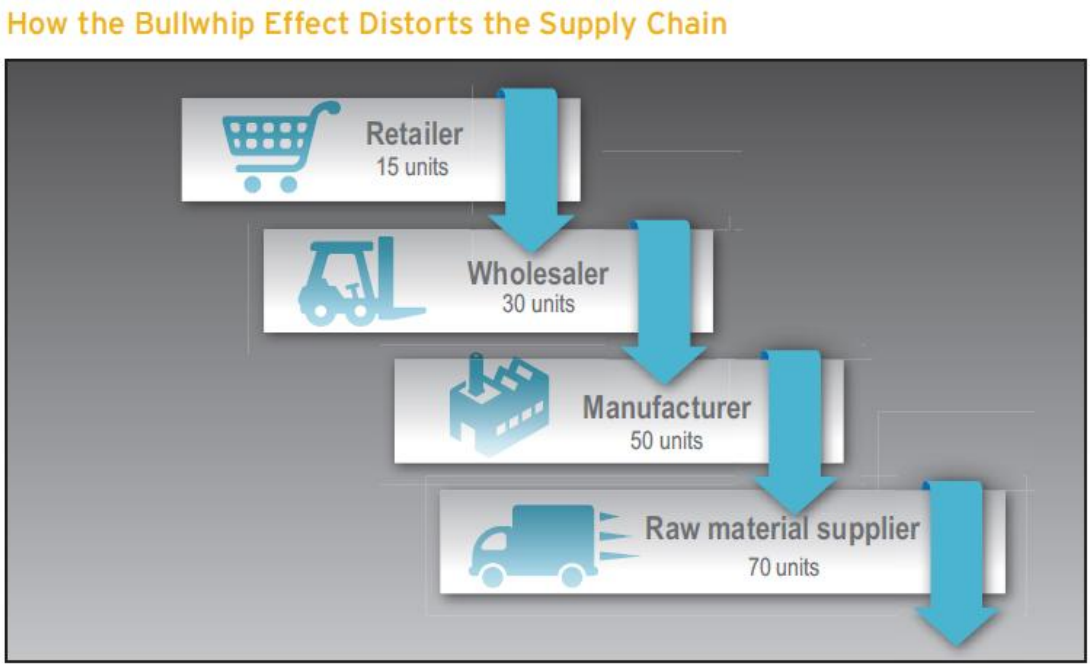
The Bull Whip Effect in Supply Chain Management is the variations in demand, as one moves up the supply chain. Bull Whip Effect in other words, is the distortions in demand in the supply chain due to various operational causes as well as behavioural causes. The effect is seen across various sectors of the industry which was first discussed in a paper on Industrial dynamics by Jay Forrester in 1961. This amplification of variation as we move towards the upstream side of the supply chain is called *a Bullwhip Effect* or *Whiplash Effect*[1].Bull whip is one of the trickiest evils for supply management systems[2].Bull Whip effect is well researched and documented topic in the area of supply chain Management[3].Lee, Padmanabhan, andWhang (1997a, 1997b) [4]define *bullwhip effect* as "thephenomenonwhere orders to the supplier tend to havelarger variance than sales to the buyer (i.e., demanddistortion), and the distortion propagates upstream inan amplified form (i.e., varianceamplification)."Lee, et al. state that the impact of increasedvolatility can cause a lot of issues. They state that, "Distortedinformation from one end of thesupply chain to the other can lead to excessive inventoryinvestment, poor customer service, lost revenues,ineffective transportation, and missedproduction schedules."Since then research has been prevalent to study this phenomenon. The demand variations upstream has been attributed to various factors. Some of the factors explored have been whether such an effect really exists, exploring what the causes this effect and at the same time trying to explore the same analytically.

The Causes: There are many causes to the bull whip effect. They can be summed up under two heads operational and behavioural. The operational causes are demand forecasting which tries to predict trends which might not be realistic. Though supply chain managers use various analytical methods, upstream in the supply chain the demand analysis gets distorted. Lee et all (1977) have given an analytical framework to the bull whip effect and later discussed the implications of this effect on managerial decision making in an article
The various causes of bull whip effect as identified by Chen et all[5] is as follows

1. Demand forecasting
2. Batch ordering
3. Lead times
4. Supply shortages
5. Price Variations

[1]Simchi-Levi, D., Kaminsky, P., &Simchi-Levi, E., 1999, Designing and Managing the Supply Chain.
[2]Modeling the Bullwhip Effect in a Multi-Stage Multi-TierRetail Network by Generalized Stochastic Petri NetsBidyutBimanSarkarAgostinoCortesiNabenduChaki
[3]Managing Bull Whip effect-Two Case Studies-N.Ravichandran W.P.NO.2006-08-01,IIMA
[4] Lee, H., P. Padmanabhan and S. Whang, "The Bullwhip Effect in Supply Chains,"
Sloan Management Review, 38 (1997a), 93-102.
[5] Frank Chent, ZVI Drezner, Jennifer K. Ryan, David Simchi-Levi, "the bullwhip effect: Managerial insights on the Impact of forecasting and Information on variability in a Supply chain".

Demand Forecasting tends to look at trend that are happening in demand patterns and every time a new demand is noted, trend analysis is done which can sometimes distort the actual demand requirement leading to the Bull whip effect. Another factor is batch ordering when the supplier orders larger quantities of stock followed by periods of lull or not ordering this can skew the information up stream causing the effect. Lead times is the time that is taken from placing the order to the order placement. When the lead times are long and sometimes varied, the suppliers up stream can place orders to mitigate the effects of the same and this can lead to lot of demand distortions. In the same way shortages of supply, can rise to speculation and in order to overcome short supplies the intermediaries might order more. Price variations is also another cause where when there are fluctuations in price, the responses to the same can cause demand variations resulting in demand skewness.



Cognizant in its paper on bull whip in 20-20 insights[1] also observed similar factors that are responsible for this effect.

1. Individual fears trump organizational efficiency
2. Lack of timely and adequate information about demand trends
3. Free return policies allow customers to game the system
4. Order batching to cut customer and shipping costs
5. Price fluctuations

Cognizant paper also point to lack of adequate demand related information that can distort the requirement of demand as well as talking about order batching and lead times which tend to be one of the most often identified reason for this effect. Price fluctuations is also a commonly identified reason for the change. Information and lack of the timely information has been one of the main reasons which has been the reason for demand distortions. When timely information is not available to the suppliers they can sometimes make wrong assumptions in product demand. The cognizant paper has identified Individual fears as the first reason. This is a behavioural factor which is very much a reality in the supply chain. The assumptions in shortages, price fluctuations and lead times in the kinds of the intermediaries can result in their judgements which distort the supply chain. Another important factor identified by this paper is the free return policies, these tend to have such a detrimental effect that customers may not be committed to their buying decision but simply gaming because the option of free return is available. This tends to effect the demand patterns badly too causing the effect once again.

[1]Reducing the Bull whip effect via market research gleaned insights , Cognizant , 20-20 insights, June 2014

Bull whip effect in the Indian scenario:

In the world this effect was first reported by Procter and Gamble in the supply chain management its product pampers diapers. Some papers have discussed the bull whip effect in various products , sectors and services . For Instance Bull whip effect in hospitals of Australia was discussed bySethuraman and Tirupati.[1] Bull whip effect has been seen in the Automobile Industry as in the case of Volvo[2].As a result of price cuts and the ensuing increase in demand, Volvo ramped up production of electric cars which resulted in excessive inventory.

The major objective of this paper was to understand how the Bull whip effects is seen in Indian companies and look at all the recorded cases of the same. Much research shows that bull whip effect is seen in Indian companies recorded by researchers. But the body of literature on Bull whip effect observed and recorded in Indian companies is very less. One of the important research is the white paper called, Managing Bull whip effect: Two case studies[3], published in 2008 has recorded the Bullwhip effect in two companies in India, Skittles India Ltd and HOC Hindustan Oil Company (HOC). Prof. Ravichandran has thoroughly investigated these two companies and recorded the bull whip effect faced by these companies in their supply chains. A study was conducted on reducing the bull whip effect in fresh food vegetable supply chain market bySomasekhar ,Raju and Patil.[4].As we can see the recorded data on the bull whip companies is very less. It is therefore suggested that companies can do well to look into the Supply chain Management and try identify if the effect is prevalent.

The Remedial Actions:

Thebullwhip phenomenon has been observed by manyfirms across a numberof diverse industriesthere is a growing body of researchon managing the bullwhipeffect in manufacturingbasedsupply chains (Baganha& Cohen, 1998; Chen,Drezner, Ryan&Simchi-Levi, 2000; Chen, Ryan &Simchi-Levi, 1997; Metter, 1997)[5].For example, Lee,Padmanabhan, and Whang (1997a) suggest that "one remedy is to makedemand dataat a downstream site available to the upstream site."[6]

Some of the possible remedies were summed by SivakumarBalasubramanian,LarryWhitman,Kartik,Ramachandran,RavindraSheelavant[7] which are as follows

1. Reducing uncertainty
2. Reducing variability
3. Lead time reduction
4. Strategic partnership and planning
5. Advanced Information Technology

The future course of action and Conclusion:

It would be feasible for companies and sectors across India to look into the bull whip effect and see if this has a major impact on their supply chain. Companies who rely on a major part in supply chain management systems should make it necessary to introspect if this effect is there in their supply chains and those companies which have identified this [positivelycanhave in the internet of things[8] a remedy. The big data and application of analytics is one of the important remedies that are now available to the companies to manage the bull whip effect.A chain is as strong as its weakest link. The strength of the supply chain is determined by the strength of the information link across it.[9]

[1]Prevalence of Bullwhip Effect in Hospitals, KannanSethuraman DevanathTirupati, IGI clobal, 2008

[2]" Bull whips and Beer: Why supply chain Management is so difficlut",Forio, March 10,2006http:??forio.com?bullwhips and beer/

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Looking at all the research and information available it can be concluded that more data is required about the bull whip effect in India, across companies and sectors. It can also be noted that with more models developed for tackling the bull whip effect, big data and analytical tools, companies can take the bull by its horns.

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