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BULLWHIP EFFECT AND RFID IN SUPPLY CHAIN**HIMABINDU M****ASSOCIATE PROFESSOR****DEPARTMENT OF BUSINESS MANAGEMENT****AMJAD ALI KHAN COLLEGE OF BUSINESS ADMINISTRATION****HYDERABAD****ABSTRACT**

Bullwhip effect in supply chain management poses a lot of challenges to the managers in optimizing supply chain performance. Distorted demand information is a major factor causing bullwhip effect. Ensuring accurate information sharing can reduce if not totally eliminate a lot of problems in a supply chain, including the bullwhip effect. Radio Frequency Identification (RFID) is a technological innovation that has made accurate information sharing easier and faster than ever before. This paper is a review work highlighting the link between bullwhip effect and RFID by connecting extant research in these areas.

KEYWORDS

RFID, bullwhip effect, order batching, lead time.

INTRODUCTION

Demand volatilities combined with supply uncertainties pose optimization challenges. Bullwhip effect – the increase in demand variations from downstream end to the upstream end of the supply chain – is one such challenge that firms are increasingly facing. Given the era of ‘global village’ firms are required to coordinate and integrate global network of suppliers and customers so as to be proactive to such demand and supply uncertainties. Technological advancements have dramatically changed the way firms do such coordination in supply chain. Radio Frequency Identification (RFID) is a technological innovation in identifying and tracking products using electronic tags or chips. Deployment of this technology makes demand and supply information more visible, thus reducing the bullwhip effect in supply chain.

OBJECTIVE

The objective of this study is to throw light on the existing research on Bullwhip Effect and understand the link between Bullwhip Effect and RFID in Supply Chain Management.

METHODOLOGY

This paper is based on secondary data analysis. The work has been compiled by extracting inputs from various online publications and studies by eminent authors in this area.

THE BULLWHIP EFFECT

Bullwhip effect, also known as Forrester effect, is amplification of demand and order variations as one moves up the supply chain, including increasing swings in inventory in response to such demand variations.

Proctor & Gamble observed this phenomenon for its best-selling brand of diapers, Pampers. Although the consumption of diapers by babies remained more or less steady, it was observed that the retailers’, wholesalers’ and distributors’ demand for the same increased manifold. This increase in demand order variability was identified as bullwhip effect. It is also known as whiplash effect or whipsaw effect in certain other sectors. Similarly, Hewlett Packard noticed that there were demand variations for one of its printers at the retailer level. But the orders placed by the retailer for the same printer showed bigger swings. There was even higher variability in orders from the printer division to the company’s integrated circuit division. Volvo’s marketing team developed a promotion program to clear excess inventory of their green cars. This generated the required market pull to sell the stock. Manufacturing department increased its production reading this increase in sales as increase in demand as it did not know about the promotional programme.

There is distortion in the supply chain as the entities in the chain order a higher quantity based on forecasted consumer demand rather than actual consumer demand. Thus, demand variations oscillate and amplify up the supply chain resulting in piling up of inventory across the supply chain. (i) Demand forecast updating – more fluctuations in order quantities than those in demand data (ii) order batching – accumulation of orders (iii) price fluctuation due to promotions which result in forward buying and (iv) rationing and shortage gaming – resellers place phantom orders due to expected shortages - have been identified as the four major factors causing bullwhip effect. (Hau L Lee, 1997).

ROLE OF ‘INFORMATION’

Effective decision making in supply chain requires availability of right information at the right time and at the right place. Extant research shows that to optimise performance of supply chain, information flows in supply chain must be improved. Geary et al. noted in ‘information transparency principle’ that if all the players can access up-to- minute data free of noise and bias then information delays and double guessing by other players can be significantly reduced. (Geary S, 2006). In a study done by Frank et al., it was concluded that centralising customer demand information can significantly reduce bullwhip effect. (Frank Chen, 1999). Elaborating on process redesign, Ackere Van et al. concluded that change of design of physical process, change of design of information channels and change of design of decision process will minimise bullwhip effect. (Ackere Van, 1993).

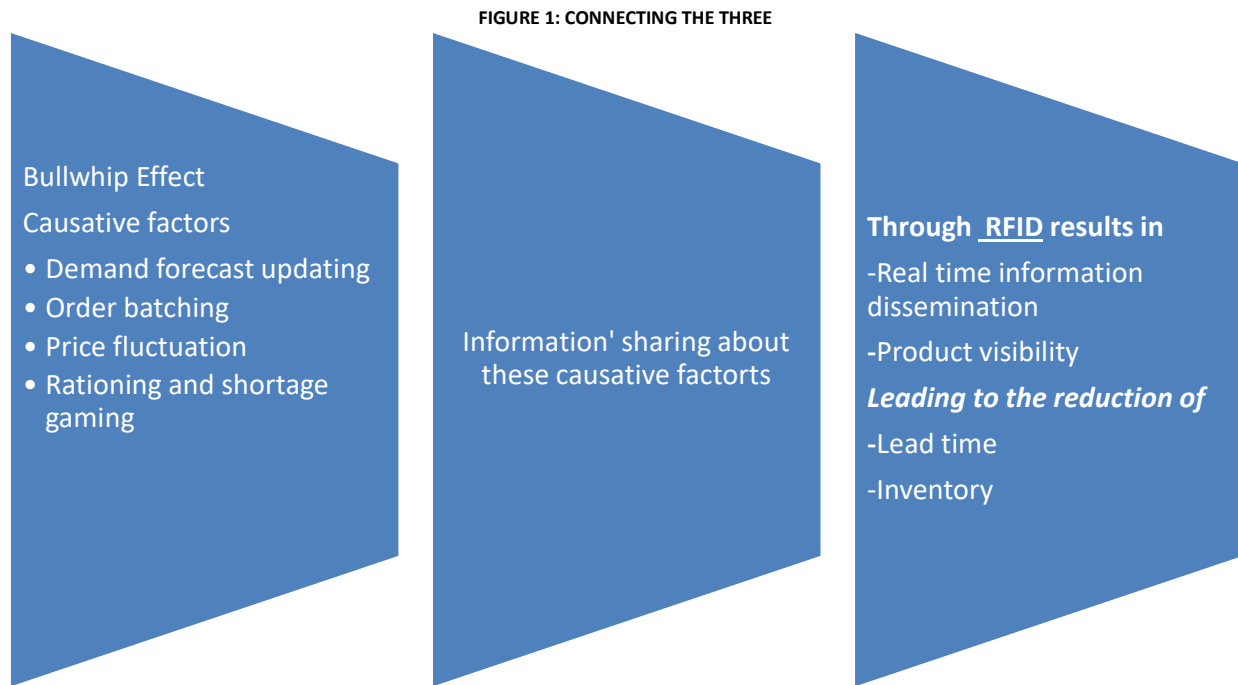
RFID

Radio Frequency Identification (RFID), a technology that works using radio waves, consists of radio frequency tag attached to the item being tracked and a radio frequency reader/emitter. “Radio Frequency Identification is a technology that enables large amount of data to be stored on chips (tags/transponders) that can be read at a distance by readers without requiring line of sight scanning” (Wisner, 2012). By linking an item to a digital ID all entities of the supply chain linked to a centralised information system can have instant access to the information about its location. RFID makes it possible to track in real time movement of items along the supply chain. (Glover Bill, 2006).

RFID has applications ranging from manufacturing and distribution of physical goods to minting bank notes, oil exploration, shipping, pharmaceutical packaging, etc. RFID frees human labour from certain work flows and gives information visibility to all the participants in the supply chain. (Angels, 2005).

A study done in an FMCG supply chain in Jiangsu, China showed that successful deployment of RFID will provide real time visibility of supply chain and reduces the bullwhip effect to a great extent, thus increasing the profitability of the chain. (Zhigang). Another study done on an Italian FMCG supply chain also proved the same that real-time visibility of the supply chain, brought in by RFID can dramatically reduce the bullwhip effect. (Eleonara Bottani, April 2010). RFID can improve the efficiency of total product lifecycle management extending to manufacturing and after sales support. (Ozer, 2007).

CONNECTING THE THREE



Source: Secondary data analysis

Information sharing can be effective and less disruptive when done using technology tools. RFID enables tracking of all the required information in real time i.e., as and when it is happening. It produces accurate information about in-transit inventory as well as finished goods inventory. This helps in reliable demand planning as human errors are eliminated.

Visibility means fully knowing the status of a shipment at every step of its journey – where, when and how. The attached electronic tags or chips make it easier and super-fast to access any kind of information related to the shipment be it at the customer level, retailer level, manufacturer level or at the supplier level. Such information is updated to the collaborative participants of the supply chain in real time.

Quality of information shared greatly influences the performance of inventory management techniques.(Sahin, 2002). Quality here means the degree to which information represents reality. RFID technology enables capturing of such real time data from the point where it is generated and instant dissemination of the same to the concerned supply chain participants who will update their inventories accordingly. Thus, lead time required to replenish inventory is reduced.

LIMITATIONS OF RFID

RFID by itself is not a panacea for all the information related problems of a supply chain. Information sharing using RFID is subject to the willingness of the supply chain partners to part with information. Once consensus is reached regarding information sharing the next hurdle in RFID adoption is the cost factor. Although it provides long term benefits firms may be required to forgo their current profits to invest in initial technological set up. Also, there are a number of vendors offering end to end solutions as there is no standard 'one-size-fits-all' kind of RFID solution to information problems in a supply chain. As with all other technological innovations, security and privacy threats are a big concern unless a foolproof system is developed and tested.

CONCLUSION

Clear understanding of factors causing bullwhip effect will direct supply chain partners towards mitigating the effect. Sharing customer demand information at the downstream end with the upstream end of the supply chain will reduce repetitive processing of demand data.

RFID is surely a better and smarter way to share such information and minimise bullwhip effect. It can be successfully deployed to track shipments, schedule product deliveries, maintain appropriate inventory levels and to reduce lead times. Supply chain partners can achieve higher levels of optimization through RFID.

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