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Impact of Supply Chain Practices on Mitigating the Bullwhip Effect

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Abstract: ***Despite the extant literature on the Bullwhip Effect, traced over half a decade ago, fast-moving consumer goods supply chains continue to haemorrhage from the Bullwhip Effect. Product diversification, a short product lifecycle and a mismatch between demand and supply characterize the FMCG industry. Unilever is an FMCG company that has equally suffered from the blunts of BWE. To mitigate the undesirous BWE, an array of supply chain practices were introduced. Notably, there is collaboration and technology adoption in their supply chain. Since then, to the best of the author's knowledge, no known empirical research has ever been conducted to empirically evaluate the impact of these practices in mitigating BWE. The study was premised on this background. Further, the study adopted a mixed methods approach to conduct exploratory research to conduct an impact evaluation study on the effect of S.C. practices on the mitigation of the BWE. The study adopted a quasi-experimental research design. The study formulated a working hypothesis that guided the study. The sample was selected using snowballing. Recall questions were used to establish the baseline of the study. Primary data was collected using a questionnaire and triangulated with an in-depth interview. A paired sample t-test was used to measure the impact of BWE, and an interview was administered to 32 respondents where the theoretical saturation was reached. Emerging analytical categories were recorded in memos. Given the study's findings, the study concluded that S.C. collaboration and technology adoption greatly impacted the mitigation of the BWE.***

Keywords: Bullwhip Effect; Collaboration; Technology Adoption; Supply Chain Practices

1. Introduction

The Bullwhip effect describes a situation in which sales to the customer are often more stable than orders to suppliers, and the distortion amplifies and spreads upstream (Lee et al., 2007). The whipsaw effect, Forrester effect, and whip splash effect are some names for these characteristics of order fluctuation as one advances up the supply chain. The Systems Dynamic Group developed the beer game at the Massachusetts Institute of Technology's Sloan School of Management. This simulation board game is modelled in a simple supply chain with a retailer, a distributor, and a manufacturer to show how the bullwhip effect develops and gains momentum in a simple supply chain. The game aims to fulfil every customer request with minimal inventory or backlog (Badar et al., 2013).

1.1 The Beer-game Theory & Causes of BWE

The beer game theory simulates how the BWE occurs in a typical supply chain. The beer game begins when retailers notice a slight but unexpected consumer demand spike for a beer brand known as Lover's Beer. Sterman, 2009 Retailers group orders and forward them to the distributor, who delivers the beer. When the distributors' inventory cannot keep up with the initial demand, they ration Lover's beer to the merchants and place even greater orders with the brewery producing it. Since the brewery cannot immediately raise its output, it starts constructing new facilities and rations out the beer it can supply to wholesalers Sterman (2009). When beer is scarce, people initially buy in fear and start hoarding. Orders slowly declined because of panic buying and suddenly fell when the brewery increased its production rate and started sending the goods in bulk.

The excess inventory surpasses the actual demand of the customers and overflows the distributors' warehouses, fulfilling all of the shops' unfulfilled back orders Sterman (2009). The distributors are left with excess inventory, the retailers are left with excess manufacturing capacity, and the retailers are forced to cancel beer orders or discount campaigns to shift the product. All participants in the supply chain bear the expenses of the bullwhip effect as manufacturers increase production capacity to meet an order stream that is significantly more erratic than actual demand. Distributors have excess inventory on hand to compensate for order level fluctuations. Transportation prices rise because more transportation capacity needs to be built to handle peak demand periods. In response to periods of intense demand, labour expenses and transportation costs increase. Retailers need help with product availability, prolonged periods for replenishment, and reduced sales due to low inventory. Sterman (2009). The game lasts for fifty periods or until the bullwhip effect is explained, and the players lose patience with the huge backlogs and inventory.

According to Lee et al. (2007), the Bullwhip effect has five basic reasons: order batching, rationing and short gaming, price fluctuation, and demand forecasting. To achieve economies of scale, downstream supply chain participants

place orders upstream with manufacturers or producers in batches, a practice known as order batching. Another name for this BWE is the Forrester Effect or Whipsaw Effect.

1.2 Manifestation of the BWE

Every player in the Fast-Moving Consumer Goods (FMCG) industry wants an agile and resilient supply chain that is transparent from beginning to end, flows products, and interacts closely with other sectors to create and maintain a competitive advantage. They also want to deliver goods in the right quantities, to the right places at the correct times, using the proper mode of transportation, the suitable contract, and at a reasonable cost (Slack, 2010). Nevertheless, because of the unwanted Bullwhip effect phenomena, this is not the case in most supply chains (Whang, 2009).

A few researchers have also studied this phenomenon after Forrester's groundbreaking contributions (Chen et al., 2010; Cachon & Fisher, 2010; Classen et al., 2008, & Lee et al., 2007). It is interesting to note that supply chains have continued to experience the bullwhip effect for the past 50 years despite significant theoretical advancements in the field. This is because recommended remedies are challenging to implement in real-world situations. Researchers and practitioners agree that there is no perfect or all-encompassing way to manage the bullwhip effect.

One of the top businesses in the fast-moving consumer goods (FMCG) sector, Unilever, experienced the bullwhip effect, which threatened to weaken the company's competitive edge because of erroneous demand forecasts that resulted in inefficiencies in sourcing, production, scheduling, distribution, and revenue generation. These inefficiencies were marked by excess unsold inventory and lower operational service levels (Oxfam, 2008). The company implemented several supply chain strategies to control this bullwhip effect issue. Since the implementation of these procedures, no empirical research has been carried out on the influence of supply chain procedures on bullwhip effect control. To this end, the study aims to evaluate the impact of supply chain practices on the mitigation of BWE.

2. Literature Review

2.1.1Theory of Change

Weiss (1995) describes the Theory of Change (TOC) as a theory of how and why interventions work. TOC describes the assumptions that explain the mini-steps that lead to a long-term goal and the connections between these activities and the outcomes of an intervention. There are five core elements underpinning TOC. In theory, the first step in the process involves identifying the ultimate goal; the second step identifies intermediate outcomes; the third step identifies activities; the fourth step shows the causal links; and the fifth examines the assumptions or the hypotheses. This theory clearly articulates the intended activity, "the If Part," and the expected Change it will bring about the "then" part(s) Weiss, (1995). It offers a clearer picture of the intended result from an intervention, and it explains how program activities and results are connected and contribute to achieving results at different levels. This theory contends that there must be a testable hypothesis regarding how planned interventions will contribute to achieving the desired results for the program Weiss, (1995)

2.1.2 Theory of Change Conceptual Framework

The study adopted working hypotheses as the conceptual framework. According to (Crisp & Richard, 2013), a working hypothesis is a tentative theory or supposition set up and adopted provisionally as a basis for explaining specific facts or relationships and as a guide in further investigating other facts or relationships regardless of whether the hypotheses fail. Patricia (2013) notes that a working hypothesis is constructed as a statement of expectations linked to exploratory research (Shields, 2007) and is often used as a conceptual framework for exploratory qualitative research. Specifically, the study adopts the following working hypotheses;

H1: If Collaborative SCM practices are adopted, then the Bullwhip Effect will be managed.

H2: The Bullwhip Effect will be managed if there is technological adoption.

2.2 Empirical Review

2.2.1 Supply Chain Practices

Supply chain management practices are defined as the approach used in integrating and coordinating supply, demand, and relationships to satisfy customers effectively and profitably (Krause and Scannell (2012)). According to Tan, Kannan, and Handfield (2008), SCM practices refer to a set of actions that an organization takes to improve the effectiveness of its internal supply chain. Scholars have different views on SCM practices. Chin et al. (2011) conceptualize SCM practices as information exchange, customer relationships, strategic supplier partnerships and collaboration along the supply chain, material flow management, and corporate culture. Min and Mentzer (2011) outline seven elements of SCM practices: agreed vision and goals, information exchange, risk sharing, cooperation, process integration, long-term relationships, and agreed supply chain relationships.

Essam and Salama (2017) conducted an empirical study on the impact of knowledge management capabilities, organizational learning, and supply chain management practices on organizational performance. The study used a quantitative research methodology employing a survey research design among manufacturing companies in the Egyptian city of Newborg Al Arab. Specifically, the study found that SCM practices did not have an impact on organizational performance. Rennie. Demirbag Zaim and Bayraktar (2007) investigated the impact of supply chain practices on the performance of SMEs. The study used a quantitative research design among 800 SMEs. The study found that the most commonly used SCM practices were just-in-time philosophy, holding safety stock, and expanding the supply base. The study also found that SCM practices such as outsourcing, 3PL, and e-procurement should be more utilized in SMEs.

Li, Ragu, and Rao (2006) investigated the impact of supply chain management practices on competitive advantage and firm performance. The study found that SCM practices have a statistically significant impact on competitive advantage and organizational performance. Thus, the study provided empirical evidence to support the conceptual and normative

statements in the literature on the effectiveness of S.C. practices. Kime Chwa (2015) conducted a study on the impact of supply chain practices on the performance of Kenyan commercial banks, using the case of Japan Post Bank. A descriptive research design was used in this study. The study found that outsourcing, ICT, strategic partnerships, and globalization were the S.C. practices that "influenced" the bank's performance.

2.2.2 Collaborative Supply Chain Practices

Supply chains typically involve many actors pursuing different goals. Therefore, coordinating the actions of all stakeholders is crucial to ensure the success of the supply chain. Supply chain collaboration refers to the joint efforts of members to achieve a common goal of transforming suboptimal individual solutions from individual links of the supply chain into a comprehensive solution (Seifert, 2003). According to (Holweg et al., 2005), the main goal of supply chain collaboration is to eliminate inefficiencies such as the bullwhip effect caused by uncoordinated operations in the supply chain. Researchers and practitioners have strongly advocated supply chain collaboration with concepts such as vendor-managed inventory, collaborative planning, forecasting and replenishment, and continuous replenishment. (Chen et al., 2013) argue that supply chain collaboration involves transforming suboptimal individual link solutions into comprehensive solutions through the exchange of customer and operational information. Kim et al. (Shang et al., 2016) found that supply chain collaboration slows upstream order fluctuations, reduces inventory costs (Shang et al., 2004), and improves customer service. Hollweg et al. (2005) established two types of collaboration: warehouse collaboration and planning collaboration. Initially, without collaboration, the traditional supply chain is characterized by a scenario whereby each level in the supply chain issues production orders and replenishment stock without considering the situation at either the up or downstream tiers. It is a decentralized supply chain. Each member generates an independent production distribution plan based on incoming orders from direct customers. (Holweg et al., 2005). In planning collaboration, both the retailers and suppliers order independently. However, they share demand information and action plans to coordinate capacity planning and long-term planning forecasts. Planning collaboration is characterized by information exchange. It is a distributed supply chain (Holweg et al., 2005). Inventory collaboration involves the generation of reorder orders by suppliers who are responsible for maintaining the retailer's inventory and, ultimately, the retailer's service levels. Through inventory collaboration, supply chain members work together to develop a centralized inventory distribution plan based on complete visibility of inventory levels, work in process, and market demand. This is also known as supplier-controlled replenishment. Holweg et al. (2005) also suggest that synchronized supply chains are characterized by planning and inventory collaboration, in which suppliers control their customers' inventory replenishment at an operational level and use this visibility to plan their delivery operations. Additionally, supply chain members jointly develop centralized production and distribution plans based on complete visibility of inventory levels, work in process, and market demand.

Richey, Tokman, and Dalela (2010), in a study titled "Examining Collaborative Supply Chain Service Technology: A Study of Intensity, Relationships, and Resources", investigated the impact of collaborative supply chain technology on retailers' logistics services and financial performance and ultimately on the overall performance of the partnership. A quantitative research methodology was used. The survey by the Council of Supply Chain Management Professionals, whose members are companies from all industries and environments, found that technology has little impact on the performance of the companies. They also found that only companies that collaborate heavily on data storage technology have a direct positive impact on performance, and that is only seen at the operational level. Furthermore, Cannella and Ciancimo (2010) conducted a study titled "Bullwhip Avoidance Phase: Supply Chain Collaboration and Order Smoothing" and found that supply chain collaboration has a more significant impact on overall supply chain performance than order smoothing.

Furthermore, the study found that order smoothing reduces the bullwhip effect but has a negative impact on customer service. In addition to positively mitigating the bullwhip effect, the study also found that supply chain collaboration has a positive impact on inventory stability, limiting irregular orders, and improving customer service. A synchronized supply chain had a positive impact on order facilitation. This study used qualitative research methodology, continuous time difference model, discrete time difference equation model, and discrete event simulation system as the research design. (Almeida, Marins, Salgado Santos & Silvia 2015) They conducted a study entitled "Mitigating Bullwhip Effect Considering Trust and Bullwhip Effect in Supply Chain Management: A Literature Review". This study used a systematic literature review as the research methodology and a descriptive analysis of selected papers as the research design. This study found literature suggesting that trust influences the reduction of BWE. This study also found literature suggesting that information sharing among supply chain participants leads to better coordination and has a positive effect on BWE management. As such, companies such as General Motors and Procter and Gamble have heavily invested in information management in their global supply chain.

2.2.3 Technology Adoption Practices

Supply chain management requires advanced use of information technology such as computer applications and I.T. infrastructure to leverage intra- and inter-firm transactions through systems integration (Whang et al., 2009). According to Premkumar (1995) and Ranganathan et al. (2004), technology adoption in the supply chain can be divided into internal assimilation and external diffusion. Internal assimilation refers to the adoption of I.T. to support critical internal organizational operations. Conversely, external diffusion refers to leveraging I.T. to improve inter-firm operations with supply chain partners. Internal assimilation and external diffusion encompass the entire process of technology adoption in supply chain operations (Zhang & Dhaliwal, 2009). Technologies introduced into the supply chain include Electronic Data Interchange (EDI). There are many descriptions of EDI, but all fit the definition of computer-to-computer exchange of structured data for automated processing (Rushton, 2010). Another technology introduced into SCM is Radio Frequency Identification

(RFID), which applies auto-ID technology to identify items for inventory tracking (Schneider, 2013).

Additionally, Enterprise Resource Planning (ERP) systems are enterprise-wide information systems used to automate all activities and functions of a company (Nair, 2016). This list includes warehouse management systems that control all traditional activities of warehouse operations, such as receiving goods, allocating/recording storage locations, replenishing picking locations, creating picking instructions/lists, picking orders, assembling orders, and warehouse rotation (Tonchatto, 2007). There are also transportation management systems that increase the transparency of shipments and orders. It also facilitates decision-making regarding routing and scheduling (Nair, 2016).

A study conducted by Bottani and Rizzi (2010) on the impact of RFID and EPC on the bullwhip effect in the Italian FMCG supply chain used a quantitative research methodology that included a survey of 15 companies (6 manufacturers, five distributors, and four retailers). FMCG was adopted as the research design. This study found that centralizing information and providing updated POS data through exploiting RFID technology and EPC network implementation had a positive impact on reducing the bullwhip effect in the FMCG industry. Al-Fawaeer, Alhunity and Onizat (2013) researched the Impact of Information Technology in Enhancing Supply Chain Performance.

This study adopted a descriptive-quantitative-applied research. This study found that information technology impacted supply chain performance, firm logistics, vendor relationship management, procurement, operation, and customer relationship management. Machuca and Barajas (2004) studied "The Impact of EDI on reducing BWE and Supply Chain Costs." The research methodology for this study was quantitative. A simulation model was used as the research design, and it was found that there was a statistically significant decrease in the values of the variables investigated. It was also found that EDI has a statistically significant positive impact on supply chain management. Ettmeyer, Hoffman, and Hoffman (2016). Conducted a study on the adoption of additive manufacturing technology in supply chain management processes and components. This study found that the Change over to addictive manufacturing impacted not only the internal processes and management activities but also supply chain processes and components relating to the supply and demand side of the firm's supply chain.

3. Methodology

3.1 Research Methodology

This study adopted a quasi-experimental research design since the researcher had no baseline, a control group, or randomization. Yount (2006) asserts that a quasi-experimental research design has all the components of an experimental design except for randomization.

3.2 Target Population

The target population in this study comprised long-serving employees of Unilever Kenya Limited who were on the job before and after adopting the supply chain practices geared towards managing the BWE. Such employees will be drawn from procurement, marketing and manufacturing.

3.3 Sample & Sampling Technique

This study adopted the snowball sampling technique. According to Saunders (2014), the snowball sampling technique is a non-probability sampling procedure in which subsequent respondents are obtained from information provided by initial respondents. This sampling technique facilitated the researcher in establishing the long-serving employees of Unilever who would be able to recall the situation before adopting supply chain practices. This helped the researcher to establish the baseline for this study. The study used a sample size of 40 respondents, from which 32 filled in and returned the questionnaires and whom I administered in-depth interviews, making a response rate of 80%. This response rate was very satisfactory and excellent and representative to make conclusions for the study.

3.4 Data Collection Procedure

The researcher intended to collect both primary and secondary data. As stated, primary data was collected using a questionnaire and an in-depth interview afterwards.

4. Data Analysis

4.1 Reliability of Data Collection Instrument

Cronbach (1951) recommends Cronbach's alpha α, of 0.7, to establish reliability. Cronbach's alpha for each value was established by the SPSS application and gauged against each other at a cut-off value of 0.7, which is acceptable according to Cooper and Schindler (2008). In this study, all the values were above 0.7, which concludes that the quantitative data collection instrument data was reliable.

Table 4.1: Reliability test

Variable	Cronbach's Alpha	No. of Items
Supply Chain Collaborative Practices	.7885	6
Technological Adoption	.7968	6
Supply Chain Risk Sharing	.8363	6
Contract Management	.8177	6

In addition, a test re-test of the questionnaire was done, whereby the questionnaire was administered twice in near equivalent conditions and further triangulated with an in-depth interview with the long-serving employees of Unilever. The study found that there was no statistically significant variance in responses between the first test, second test, and in-depth interview. This leaves no iota of doubt that the data collection tools are reliable.

4.2 Paired Sample t-Test

To assess the impact of the intervention, ideally supply chain practices, a paired sample t-test was undertaken where the

means before and after the adoption of supply chain practices were compared. The means and standard deviations before (M1 SD1) and after (M2 SD2) the adoption of BWE were as follows: M1 2.0045 SD1 0.49684 and M2 2.1563 SD2 0.47318. Before conducting the paired sample t-test, the assumption of normality was examined. The assumption was considered satisfied as the skew and kurtosis levels were estimated at 0.596 and -1.04, respectively, which is less than the maximum allowable values for a t-test (i.e. skew <2.0 and kurtosis <9.0|); Posten (1994). Further, the correlation between the two conditions, before and after the adoption of supply chain practices, was estimated at r=0.85, p<0.001implying that paired sample t-test was appropriate in this case.

The study established that the means for adopting supply chain practices to control the BWE (M2 SD2) were higher than before the adoption of the BWE (M1 SD1). This means that the intervention and adoption of supply chain practices positively impacted the control of BWE. Additionally, Cohen's d was estimated at 1.619, which, in practice, indicates that the adoption of SCM practices had a significant effect on the control of BWE in Unilever. This proposition is based on Cohen's (1992) rule of thumb that a d=<0.2; small impact, d=>0.2<0.8; moderate impact, d=>0.8; enormous impact. Below is a tabulation of the means and adjusted 95% confidence intervals (Loftus & Masson, 1994).

Table 4.2: Paired Sample Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Before the adoption of supply chain practices on control of BWE	2.0045	32	.49684	.08783
	After the adoption of Supply Chain practices on control of BWE	2.1563	32	.47318	.08365

Table 4.3: Paired Sample Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Before adoption of supply chain practices on management of BWE - After adoption of Supply Chain practices on management of BWE	-.15179	.71456	.12632	-.40941	.10584	-1.202	31	.239

4.3 Conceptual Category 1: Manifestation of Bullwhip Effect Before Adoption of Supply Chain Practices

OECD (2013) contends that a well-designed impact evaluation study should be well designed to establish the study's baseline and effectively attribute the outcomes to the intervention. One of the drawbacks the researcher encountered while conducting this study was that he needed a baseline. This drawback notwithstanding, he proceeded to conduct his study. To establish the baseline, he cross-examined the respondents in the face-to-face interviews. In addition to this, there were recall questions in the self-administered questionnaires. Through these enquiries, the researcher established the study's baseline; in the absence of supply chain practices, there was unmatched supply and demand characterized by either excess stocks or stockouts. The following excerpt asserts this position. "Regular stockouts-when consumer demand is lower than you expect, it results in excess inventory, and the direct response is to lower supply on future inventory orders. This leads to stockouts when customer demand jumps." This was due to fluctuations along the supply chain between demand forecasts and actual demand. These fluctuations lead to increased inventories in warehouses. Additionally, failure to fulfil customer orders on time due to inefficiencies in order processing and delays in production/manufacturing aggravated the bullwhip effect because the customers either reduced the quantities of the orders they had initially placed or totally cancelled the orders. The study found that stockouts also existed but less frequently than excess stock. The stockouts occurred when the actual demand exceeded the projected demand. However, this was a rare scenario.

The bullwhip effect negatively affected Unilever's performance. There were reduced profits due to low sales as customers used to cancel some or all of the orders. More so, the BWE resulted in the obsolescence of stock, deterioration of stock and pilferage, and the subsequent high stock holding costs. Unilever ended up with obsolete and redundant stock and idle capacity that compromised its competitiveness in the marketplace. There was customer dissatisfaction as well. The following is an excerpt of a transcript with one of the participants about how BWE manifested itself before adopting SCM practices. "The organization was holding too much safety stock. This stock has a limited shelf life, and most expires on the shelf. Customer complaints were also very regular as the demand and supply did not match. The company needed more warehouse space and had to incur additional storage costs. Stock accuracy became a major concern as too much non-moving and slow-moving stock was held in large volumes. This was due to earlier retrogressive policies such as grouping of orders, price changes, processing of demand induced signals, non-zero main time, deficits and defects in supplies that led to costly reverse logistics" This finding concurs with that of (Lee et al., 1997), who empirically established the causes of bullwhip effect; demand forecast updating, order batching, price fluctuation, rationing and short gaming. They also contend that rational decision-making also creates the BWE. Additionally, the illustrations of the BWE at Unilever are not any different from those of Sterman (1989) in his well-known "Beer Distribution Game".

4.4 Conceptual Category 2: Impact of Collaborative Supply Chain Management

a) Practices on the Control of BWE

In seeking to establish if the study can attribute collaborative SCM practices, the study participants, apart from one individual, indicated that collaborative supply chain practices have an impact on the control of BWE. The participants

indicated that collaborative SCM practices supplement communication across the supply chain, bring about transparency, and help minimize delays in processing customer orders. More so, the participants indicated that through collaboration, information asymmetry is guaranteed among supply chain partners, as noted in this transcript; "With collaboration, accurate information on demand and supply will be shared between the collaborating partners" These findings are in agreement with a study conducted by Almeida, Marins, Salgado Santos & Silvia (2015), that adopted systematic literature review as research methodology and descriptive analysis of selected articles as research design. They established that information sharing among supply chain participants brings about better coordination, hence a positive impact on the management of BWE. This elucidates why companies such as General Motors and Procter and Gamble have heavily invested in information management in their global supply chain.

Again, participants indicated that collaboration helped Unilever reduce the bullwhip effect by enabling the company to adopt a pull supply chain strategy, thanks to the partnership between her customers downstream and her suppliers upstream. "The company was able to track its performance along the supply chain. Also adopt a demand-driven supply chain management approach and collaborate with customers and suppliers". Further, it is through collaboration that information sharing thrives. "Demand exists at every level of a supply chain, but the only demand that really matters is the end customer's demand for the final product. Every tier should be aware of the end customer demand and not just the orders placed by its upper tier. Businesses at each tier should also be aware of the outstanding inventory. This can only be achieved through supply chain collaboration." These excerpts "The company and its partners are taking part in joint planning, process redesign, and sharing some level of risk and reward. The company makes collaborative decisions on issues including improving the accuracy of demand forecasts and strengthening the strategic supply chain." asserts the role of SCM collaboration on the control of BWE. These findings concur with the study by Kim et al. (2016) and (Shang et al., 2004), who found that supply chain collaboration allows to decelerate the order variability in the upstream direction, reduces inventory holding costs, and improves customer service level. More so, these findings are in agreement with those of Cannella and Ciancimo (2010), who jointly conducted a study, "On the Bullwhip Avoidance Phase: Supply Chain Collaboration and Order Smoothing", found that supply chain collaboration had an impact on overall supply chain performance.

5. Recommendations

To address the bottleneck of BWE, firms operating in the FMCG industry need to invest heavily and leverage supply chain management technologies such as EDI, RFID and ERP. Additionally, they should develop robust and dynamic contracts to manage collaboration and risk sharing across the supply chain. This way, firms will have controlled the BWE to a manageable level, and the performance of the firms will surge upwards to record higher profit margins with optimum inventory and accurate information sharing across the supply chain.

6. Areas of Further Research

A similar qualitative study will be conducted with supply chain experts using the Delphi method to validate the research findings and propositions. Since qualitative research is a prerequisite to good quantitive research, quantitative research on the impact of supply chain practices on the control of BWE should be conducted.

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