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Epitome of Optimum Information Sharing in a Selected Retail Firm in South Africa

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Abstract

Promotion-driven retail businesses are susceptible to demand order variability upstream and supply order variability downstream of the supply chain network. Supply chain partners across extended enterprises are deemed an effective coordination network for improved supply chain integration and real-time information sharing. This study examined the extent to which optimised information sharing enhances integrated supply chain activities across the extended enterprise. The study further examines the role of electronically-enabled information sharing tools and collaboration, planning, forecasting and a replenishment (CPFR) model in value-added performance and an effective supply chain structure.

A quantitative approach was employed to elicit the views of 143 respondents drawn from a selected retail firm in South Africa on the variables that contribute to improved supply chain performance in a CPFR model. The findings suggest that optimised information sharing across the extended enterprise is dependent on the availability of information systems and technological tools for value-added performance underpinned by a CPFR model across functions and enterprises. The managerial implications of this study depict the promotional nature of the retailer and it requires quasi-real-time and effective information sharing underpinned by modern technological tools. The frequencies to order fulfilment depend on functional CPFR system and better alignment across the extended enterprise.

Key phrases

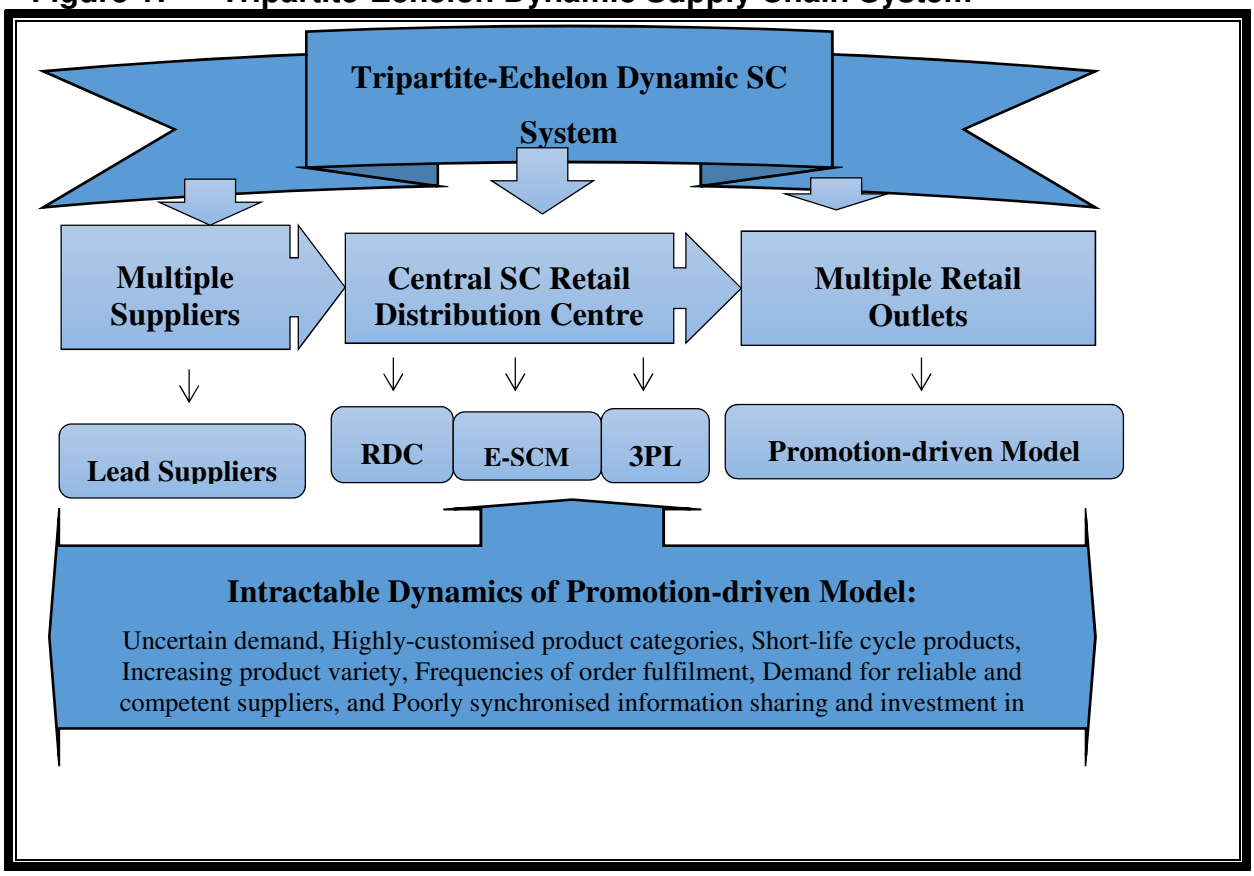
CPFR model; information sharing and retail promotion-driven

1. INTRODUCTION

In the modern context of innovative short-life cycle products and increasing product variety, supply systems comprise of a dynamic, agile trilogy. This includes optimised integration of business decisions, and information sharing and technology as well as optimised processes along the supply chain. A supply chain is "a network of interconnected entities, such as suppliers, manufacturers, distributors, retailers and customers, which have different functions ranging from procurement of raw materials, transformation of raw materials into products, and distribution of final products to customers" (Chopra & Meindl 2016:13). Supply chain management comprises "the integration of key business processes from end user through original supplier that provides products, services, and information that add-value for customers and other stakeholders" (Marshall 2015:10). It aims to maximise the flow of quality, synchronised information to enable suppliers to ensure a precisely timed flow of products to customers.

This article examines the optimisation of supply chain information sharing through collaborative, forecast-based performance outcomes and electronically-shared information tools across extended enterprises. Optimisation implies that a company strives to portray its supply chain and business processes as effective integrated, synchronised efficient, flexible and responsive as possible in order to achieve fully functional decision on underlying constraints and feasible competitive advantage (Mbhele 2016). Information sharing refers to an effective coordination mechanism which integrates activities and eventually improves a business' profitability and growth opportunities (Ghosh 2012:6). Ali and Frew (2013:94) note that process co-ordination in supply chains is achieved by means of information management and optimised information sharing between retailers and their upstream suppliers (Szymczak 2013; Plennert 2014). The study focused on a retail promotion-driven business experiencing variability upstream and downstream to establish the cause of out-of-stocks at stores and dissatisfied customers. Information sharing optimisation aims to ensure that optimal economic information is available to every enterprise in a tripartite-echelon dynamic supply chain network to enhance supply chain integration and technological innovation and provide excellent customer service. Figure 1 illustrates the three-part supply chain system from multiple suppliers to distribution centre and ultimately multiple retail outlets as goods move to the downstream site.

Figure 1: Tripartite-Echelon Dynamic Supply Chain System



Source: Designed by the authors

In the promotion-driven model, multiple suppliers that are part of the tripartite-echelon dynamic supply chain deliver to a central supply chain retail distribution centre for individual retail outlets. The intractable dynamics of this model were the subject of this study.

2. RESEARCH PROBLEM AND OBJECTIVES

Effective supply chain partnerships across extended enterprises within the retail promotion-driven business model require efficient information. Long, silo-oriented forecasting periods (eight weeks), oversimplified point of sale (POS) data and a poorly synchronised pull/push supply chain distribution strategy result in large volumes of inventory at distribution centres and poor in-stock numbers and product shelf availability. The study examined the optimisation of supply chain information sharing through collaborative, forecast-based performance outcomes and electronically-shared information tools across extended enterprises. Its objectives were, firstly, to examine the extent to which optimised information sharing enhances integrated supply chain activities across extended enterprises; and

secondly to determine the role played by electronically-enabled information sharing tools and a CPFR model for value-added performance outcomes and an effective supply chain structure.

3. THEORETICAL FRAMEWORK

The social exchange theory (SET) posits that individuals or groups seek to interact and collaborate with others in order to generate improved rewards and benefits (Cao & Zhang 2011:163). In the value-chain management context, sales forecasting may be the responsibility of one department or multiple departments, which share information via systems or manual methods. Integrated supply relationships between retailers and manufacturers require extensive planning, collaborative forecasting and frequencies of replenishment on the underlying CPFR model. The business model asserts a relationship in terms of goals, defining the scope, and assigning checkpoints, escalation procedures and roles and responsibilities. The myriad of suppliers in a supply chain distribution system poses challenges to real-time delivery, product availability and product positioning. The SET is based on the premise that joint business planning for new and existing product listings, dynamic store activities, and changes in inventory policy and promotional activities (the retailer's task is category management and the manufacturer's task is market planning) would address these challenges. Effective collaboration and concerted planning should improve frequencies of product replenishment.

4. LITERATURE REVIEW

4.1 The Retail Business Model

Contemporary business models seek to promote prompt and accurate information sharing. They thus become more complex as process flows are integrated across trading partners (Liu 2006: 1-8). The process mechanisms in a supply chain must be synchronised in order to establish an intra- and inter-organisational network. According to Szymczak (2013:16-18), a supply chain is "the network of organisations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the eyes of the ultimate consumer". The case used for this study involved the logistics division of a retail group that consists of three regional distribution centres (RDCs) within South Africa, seven large item depots (LIDs) and a national team which aims to enhance visibility and resolve supply chain inefficiencies. Suppliers deliver

their products to RDCs for final delivery to stores. “The RDC is managed by the retail chain and third-party logistics service providers are contracted to deliver products to all retail stores” (Rushton, Croucher & Baker 2014:52-54). The retail business is highly promotion driven and the marketing division creates advertising campaigns and drives promotional initiatives. Products are advertised in weekly community newspapers and e-catalogues as the price and product information contained in these advertisements is driven by the buyer. The store operations division consists of approximately 122 stores across Africa as well as other corporate divisions which manage store operations. Stores receive stock from RDCs as well as from direct-store delivery suppliers. In order to achieve successful promotional campaigns, supply chain partners should jointly manage planning processes and share information.

4.2 Demand Order Management

Supply chain integration comprises of two key processes: alignment of objectives and incentives, and integration of processes up-, mid- and downstream of the supply chain (Waters 2010:195-197). Acton (2013:319-320) advocates that, to promote transparency of information between trading partners, information technology (IT) should be harnessed to assist supply chain members to establish partnerships for better supply chain performance. These partnerships tend to mitigate the deficiencies associated with decentralised control by reducing the bullwhip effect. Tanweer, Li, Duan & Song (2014:289) describe the bullwhip effect as “a continuous conundrum, addressing the shift of a seemingly steady inventory demand into enhancing demand fluctuation in an upstream supply chain”. Ireland and Crum (2005:159) caution that “internal business collaboration is far more difficult than external collaboration”. The challenge lies in the lack of visibility of improvements in this space. Hence, effective internal visibility is a prerequisive for an organisation that seeks to colloborate with external trading partners. The optimal set of supply chain strategies to mitigate the bullwhip effect should facilitate both internal and external collaboration in a fast moving consumer goods (FMCG) business. In a typical supply chain network system, integrated activities are associated with a highly interconnected value-adding demand order system moving upstream and frequencies of order replenishment to enable vendors, distributors (manufacturer- or retailer-based) and retailers to effectively serve the final consumer.

4.3 The Collaboration Planning Forecasting and Replenishment (CPFR) model

The CPFR is characterised by integration among business partners, information sharing, supply chain efficiencies, and product availability at retail stores while costs remain minimal. CPFR "is a business practice that combines the intelligence of multiple trading partners in the planning and fulfilment of customer demand" (Mendes 2011:59). The CPFR model seeks to reduce inventory for the retailer while increasing stock turns for the supplier (Qi, Shen & Dou 2013:1325). The CPFR systems "are information systems that enable partnering firms to integrate their inventory planning, forecasting and replenishment processes by sharing information, developing joint forecasts and jointly creating replenishment plans (Yao, Kohli, Sherer & Cederlund 2012:2). In the planning phase, internal requirements and capabilities are evaluated, trading partners' roles and responsibilities are assessed and an implementation strategy is formulated, while forecasting emanates from a jointly developed plan to forecast sales and orders, and exception handling, which is an ongoing, iterative process. The replenishment phase handles order execution and delivery (Tayur & Ganeshan 2012:73).

Information sharing can reduce demand uncertainty to such an extent that suppliers can build inventory well in advance of receiving a promotional order (Fahrenwaid, Wise & Glynn 2001). In the promotion-driven business model, supply order replenishment complicates interpretation of "push replenishment (production triggered by a forecast-based plan) and pull replenishment (triggered only by real consumption)" (Sabri & Shaikh 2010; Packowski 2013). Bowersox, Closs, Cooper & Bowersox (2013:12) interpret an anticipatory business model as a push system (produces a product based on a market forecast) while the responsive business model is associated with a pull system (relies on timing and agility) that focuses on reducing reliance on forecasts and improving joint planning and real-time information exchange (Mbhele 2016:53). Arguably, the different types of replenishment depend on the type of industry and predictability of demand.

4.4 Inventory Order Management

The Council of Supply Chain Management Professionals (CSCMP) (CSCMP, Waller & Esper 2014:2) notes that inventory is an asset to any organisation because it "represents property that is likely to be converted to revenue, as the ultimate aim is that inventory will facilitate sales for an organisation". However, poor inventory management leads to

increased costs and retailers having to store too much of the wrong type of inventory. In other words, inventory levels must be optimal - as effective as possible - thereby ensuring that stores stock the right product to suit customers' requirements. Reduced capital investment due to more accurate inventory planning (Scottsdale 2013) requires continuous replenishment systems that employ a number of different inventory management mechanisms. Vendor managed inventory (VMI) uses daily sales data for reordering extracted from point-of-sale (POS) (Christopher 2013). Co-managed inventory (CMI) systems refer to "a scenario in which retailers would share information regarding promotional activities of all suppliers in a category with participating suppliers" (Walters & Hanrahan 2000:330). According to Buyukozkan & Vardaloglu (2012:10438-10455), successful CPFR depends on "information sharing and system integration", "people management and development", "relationship building and trust management" and "other factors" such as forecasting and system and data security.

4.5 Supply Order Management

An organisation needs to identify potential suppliers in a network in order to improve processes, eliminate demand order variability and remove non-value adding activities. "Suppliers in the supply network must contribute to the retailer's competitiveness by providing expertise in various aspects such as product improvement, new product development, process improvement and quality management programmes through the sharing of key information between all the actors in a supply chain - often referred to as supplier collaboration" (Buttle 2009; Rayner 2012). This collaborative relationship develops when actual costs and sales data are shared. "Supplier/Retailer Collaboration (SRC) occurs when both retailers and suppliers share proprietary internal or external data, and/or share policies and processes used in decision making with the clear objective of sharing the benefits and information as a direct impact on customer service levels" (Walters & Hanrahan 2007; Bevilacqua, Ciarapica & Giacchetta 2012).

The benefits of improved service levels and shared supply chain strategies to the retailer are reduced inventory levels, minimal obsolete products in the network and being able to react to changing customer requirements and requests. Category management (CM) has, therefore, become "a critical marketing and operational decision facing retailers of today" (Hubner & Kuhn 2012:199-209). It involves "managing product categories as business units and

customising them on a store-by-store basis to satisfy customer demands. It has become crucial as space management in the retail sector becomes more complex" (Nielsen 2012:190-250). Developing supplier-retailer relationships shifts the focus to product categories, reducing costs and establishing strategic alliances that draw on suppliers' market expertise (Leinwand & Mainardi 2013:67-69). The retailer that is successful in CM execution is one that prioritises collaboration through supplier integration and quasi-real time information sharing.

Sharing relevant information with suppliers and trading partners across supply chains ensures that manufacturers and partners are able to maximise the accuracy of ordering, capacity planning and material planning. Supply chain dynamics are thus optimised (Cheng 2011:374) and sharing information is an effective coordination mechanism that can integrate chain activities and improve overall chain profitability (Ghosh 2012:1-152). It refers to "the extent to which critical and proprietary information is communicated to one's supply chain partner" (Li & Lin 2006). Information content refers to information pertaining to the supply chain members (tripartite-echelon), and information quality focuses on the degree to which such information satisfies the purpose of information exchange (Zhou & Benton Jr 2007; Marshall 2015). This requires collaboration based on trust and commitment to develop an integrated supply chain network. Trust refers to supply chain partners' willingness to engage with one another and share expertise, and believing that all members will demonstrate reliability and integrity to deliver long-term benefits. On the other hand, commitment means that all parties pledge to retain and strengthen their connectivity (Salam 2011: 360-361).

4.7 Information Technology Systems

The proliferation of Internet-based IT has laid the foundation for firms to electronically share rich information with partners in their supply chain (Sodero, Rabinovich & Sinha 2013:331). This promotes knowledge creation and coordination of activities that enhances business operations. (Sodero *et al*. 2013 and Lin 2014) state that "electronically-enabled supply chain management (e-SCM) relies heavily on socio-technical interactions to permit the integration of silo-orientated and fragmented supply chain process with low cost and rich content". In contrast, Lin (2014:80-85) argues that implementing an electronic supply chain system is expensive and that the benefits are not clearly apparent. Furthermore, successful adoption of new technology requires substantial resources and employee involvement. Nonetheless,

Wu, Chuang & Hsu (2014:130) argue that "IT infrastructure is necessary for a physical connection between supply chain members to make information sharing feasible" within organisations and across trading partners. The challenge is that electronic supply chain management demands collaboration with external trading partners such as suppliers, carriers, customers and manufacturers (Lin 2014:80-81). An "electronic information system can be considered as the core of a successful virtual supply chain network due to the ability of the various forms of IT to: improve communication, enable effective decision making, acquire and transmit data, real-time demand information sharing and enhance integration strategy and value-adding performance outcomes of the supply chain network" (Marshall 2015:10).

5. RESEARCH DESIGN

Kumar (2014:23) asserts that, "research involves systematic, controlled, rigorous exploration and description of what is not known and establishment of associations and causations that permit the accurate prediction of outcomes under a given set of conditions". An exploratory study was conducted to gain insight into the phenomenon, discover new ideas and enhance knowledge of the phenomenon using a quantitative paradigm (De Vos, Strydom, Fouche & Delport 2011:95). A quantitative paradigm that gathers and analyses numerical data using mathematically based methods (Yilmaz 2013:312) was appropriate for the study. Thanh & Thanh (2015:24) state that "positivism views the world as operating according to set quantifiable principles, surveys as well as statistical analysis" that can be studied empirically (Goduka 2012; Lewis, Saunders & Thornhill 2009). Deductive reasoning was adopted for "theory testing that began with an idea which was narrowed into researchable questions to validate the original idea" (Hair, Money, Samoul & Page 2007:288). The exploratory study of a selected retail group used deductive reasoning to gather information on the South African FMCG industry. According to Lewis *et al*. (2009:155) case studies are "well suited to cross sectional time horizons to acquire information at a point in time." Data were gathered from various managers within the Durban region, eThekweni municipality, KwaZulu-Natal province, South Africa at a single point in time (Cooper & Schindler 2010:144).

5.1 Sampling design

The target population for this study was specific individuals in a selected FMCG retail business group and its 50 largest suppliers in terms of volume. These individuals were able

to provide pertinent information. The target population was based within the Durban region, eThekwini municipality, KwaZulu-Natal. Nonprobability sampling offered "compelling practical advantages to meet the sampling objectives of the study" (Blumberg, Cooper & Schindler 2008:235). Such sampling occurs "when a researcher selects sample members to conform to some criterion" (Cooper & Schindler 2008: 397). Purposive sampling was deemed suitable for this study. In line with Sekaran & Bougie (2010:276), it enabled the researcher to obtain as much information as possible from lower, middle and top level management as well as non-managerial personnel such as supervisors. The respondents included directors, executives and managers [corporate buyers (38), supply/demand planners (30), store managers (23), logistics staff (95), executives (6), directors (4), SC managers (6), merchandise managers (4), IT managers (13), store operations staff (13), non-managerial staff (100), and suppliers (50)] within the corporate office, stores, regional distribution centres and supplier stakeholders.

The total population comprised of 292 individuals. Employees within the retail organisation were selected based on the fact that their jobs and roles enabled them to provide rich, detailed information. The 50 largest suppliers in terms of rand value receipts that supply goods to the retail distribution centres were also selected. Using Sekaran's (2003) guidelines for sample sizes for different population sizes, a target of 165 participants was selected from the estimated population of 292 (smallest distance away from actual N= 290) . The return rate (87%) for completed questionnaires reflects a sample of 143, which is an acceptable data set.

The sample size was confined with an alpha of 0.05 and a degree of accuracy of 0.05. The alpha value or level of significance (0.05) was the threshold value for declaring statistical significance in this study. Data were collected by means of self-administered questionnaires to employees at the retail group's corporate office, stores and regional distribution centres, and key suppliers between 2016. Respondents were requested to return hard copies or email the completed questionnaire within a period of eight weeks. Bernard (2000:25-67) states that a letter of consent should be part of the questionnaire. It describes the nature of the study and guarantees confidentiality. The questionnaire was designed to gather data on each independent variable (Kumar 2014:66). The independent variables that constitute the literature review were used to develop the questionnaire as data collection instrument.

Relevant letters (gatekeeper's letter, ethical clearance certificate, and letter of consent that ensured confidentiality and anonymity) were presented to the gatekeepers to gain access to their domain.

5.2 Data Analysis

Data were analysed using the frequency distribution, descriptive statistic and multiple regression. The purpose of data analysis was to ascertain the overall perceptions of respondents towards the extent to which optimised information sharing enhances integrated supply chain activities across the extended enterprise. The Statistical Package of Social Science (SPSS) software was used to analyse and the interpretation of data employed univariate (frequency distribution and descriptive statistics), bivariate (Pearson's Correlation), and multivariate (multiple regression) analysis. The frequency distribution depicted how the different values of the variable are among the units of analysis by representing the data graphically. While descriptive statistics focused on measure of dispersion (standard deviation) and central tendency (mean). The Pearson's correlation looked at the strength of the variables while multiple regressions focused on the relationship between information sharing and several independent variables.

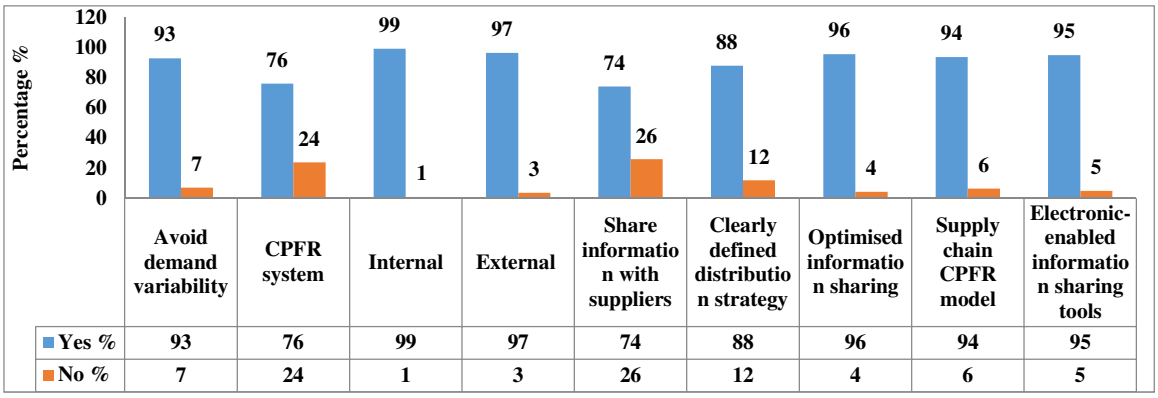
6. RESEARCH RESULTS

6.1 Demographic Profile of Respondents

The sample included corporate buyers, supply and demand planners, logistics managers, supply chain managers, store managers, the key suppliers and executives of the retail organisation. The study shows that 57 % of the respondents are male, while 43 % are female. The gender analysis shows that there is fairly proportionate gender representation in this study. In analysing the number of years the respondents has been employed within the organisation, it shows that 29% of the respondents had been employed within the retailer for 7-10 years, 14% for more than 10 years; 22% for 4-6 years; and 24% for 1-3 years. Only 10% of the respondents had been employed within retailer for less than a year. Seemingly, the respondents have sufficient experience to provide accurate responses to the survey instrument, and have an in-depth understanding of the concepts.

Figure 2 depicts the responses to the dichotomous questions posed to the respondents.

Figure 2: Dichotomous questions relating to information sharing and CPFR



	Avoid demand variability	CPFR system	Internal	External	Share information with suppliers	Clearly defined distribution strategy	Optimised information sharing	Supply chain CPFR model	Electronic-enabled information sharing tools
Yes %	93	76	99	97	74	88	96	94	95
No %	7	24	1	3	26	12	4	6	5

Source: Designed by researchers

Bajpai (2011:75) observes that "dichotomous questions have only two response alternatives usually presenting the two extremes of yes or no". This section of the questionnaire gauged the retail group's employees and suppliers' perceptions of information sharing and systems. The retail group seeks to mitigate the bullwhip effect by sharing information with upstream supply chain partners (93%) to manage demand order variability. The CPFR aims to develop integrated supply chain relationships between retailers and manufacturers in order to reduce inventory for the retailer while increasing stock turns for the supplier; the study confirmed that the retail group and its partners use CPFR systems (76%) to enhance supply chain partnerships. The CPFR results in decreased inventory levels, reduces out-of-stocks, increases sales and enhances accurate forecasting, and also improves relations and internal communication (Qi *et al*. 2013; Yao *et al*. 2012). It was found that supply chain partnerships reduce internal costs and improve collaboration efficiency within the various business divisions (99%) while external collaboration (97%) (with and among trading partners such as suppliers, distributors and 3PLs) adds value to mitigate demand variability. The organisation shares information (74%) with and accesses information from suppliers prior to making any strategic decisions due to a clearly defined distribution strategy (centralised vs decentralised supply chain model). Optimised information sharing enhances integrated supply chain activities (96%) and these supply chain value-added performance outcomes are underpinned by a CPFR model (94%) across functions and enterprises. The overwhelming majority (95%) of the respondents agreed that electronically-enabled information sharing tools enhance integration, co-ordination and collaboration in supply chain networks.

5.3 Descriptive statistics

According to Longnecker (2010:78-81), "the two most common numerical descriptive measures are measures of central tendency and measures of variability. Among the measures of central tendency are mode (the measurement that occurs most frequently); median (the middle value when data is arranged from lowest to highest) and the mean (average value within the dataset)".

Table 1: Descriptive statistics

Variable	N	Min	Max	Mean	Std. Deviation
Promotion-driven Activity	143	2	5	4.7552	0.52025
Centralised Distribution model	143	2	5	4.6783	0.68794
Replenishment Frequencies	143	2	5	4.6014	0.65154
Risk pooling	143	2	5	4.5524	0.76617
Product Categories	143	2	5	4.5245	0.68002
Supplier Performance	143	2	5	4.4126	0.62041
Willingness to Cooperate	143	2	5	4.3846	0.72114
Performance problems	143	2	5	4.3566	0.64356
Inbound Order Fulfilment	143	1	5	3.9860	0.99283
Shelf Space	143	1	5	3.8881	0.87295
Different Models per category	143	1	5	3.8671	1.23470
Five-Likert-type scale: 5=Strongly Agree, 4=Agree, 3=Neutral, 2=Disagree & 1=Strongly Disagree.					

The FMCG industry generally operates effectively with a push supply chain approach. The retail group conducts regular promotional activities (4.7552) with forecasts based on the underlying business model. The second highest mean value (4.6783) indicates that better coordination and collaboration of the group's supply chain activities is required when using the central supply chain distribution model. Stock is frequently replenished (4.6014) directly from RDC to individual store. In tandem with risk pooling, this is preferred practice in the

centralised distribution strategy. The product categories are clearly distinguished (mean value of 4.5245) at retail group level to facilitate the monitoring of supplier performance on an ongoing basis (4.4126). This encourages a high degree of cooperation and collaboration among supply chain partners (4.3846). Both suppliers and the retailer are committed to flexibility and solving performance problems, as indicated by the mean value of 4.3566. The mean value of 3.986 indicates that inbound order fulfilment at RDCs is at a satisfactory level; shelf space at stores is strictly allocated to a product category based on its rate of sale (3.8881). The mean value of 3.8671 indicates that different supply chain models are used to manage each product category. A degree of common understanding among supply chain partners to protect business information exchanged is observed for product accessibility, visibility and availability. However, no evidence was found that the organisation's information systems have built in functions that facilitate collaboration on stock position levels, or of integrated information systems that enable collaborative forecasting and planning with supply chain partners. Although there is mutual exchange of information (with trading partners) regarding production, forecasts, plans and schedule requirements, the respondents agreed that optimised information sharing enhances integrated supply chain activities across an extended enterprise.

5.4 Multiple Regression

The determinants of optimising information sharing were rated on a five-point Likert-type scale. "In order to determine the extent to which the independent variable/s affects the dependent variable, multiple regression analysis is used" (Downing & Clark 2003:67). The study analysed the influence of the independent variables (centralised distribution model, risk pooling, different models per category, replenishment, shelf space, inbound order fulfilment, and supplier performance monitored), on the dependent variable, optimised information sharing. In order to achieve the study's objectives, it was critical to establish correlation among the variables using Pearson correlation coefficient analysis. According to Urdan (2005:20-29), correlation coefficients have two fundamental characteristics. The strength or magnitude of the variables may range from -1.00 to +1.00. The closer the correlation coefficient is to either -1.00 or +1.00, the stronger the relationship. The relationship was established between the dependant variable and those variables categorised within the CPFR section of the questionnaire. Optimised information sharing shows little or no correlation to information systems, built in functions, forecast

collaboratively, information protection and willing to cooperate. Information systems, built-in functions and forecast collaboratively display strength in their relationship as the correlation coefficient is 0.83, and there were excluded as the predictive power was exhausted among each other. Correlation and multiple regression analyses were conducted to examine the relationship between information sharing and various independent variables. The multiple regression model with all seven predictors produced $R^2 = .548$, F (11, 2).

Table 2 illustrates the relationship between information sharing (dependent variable) and various independent variables.

Table 2: Multiple Regression - Model 7 Summary

Regression results – Model 7						
Collinearity						
Dependent variable – Optimised Information Sharing	**B**	**Beta**	**T**	**Sig.**	**Tolerance**	**VIF**
Constant	1.235		10.74	0.000		
Centralised Distribution	-0.210	-0.764	-9.147	0.000	0.480	2.083
Risk Pooling	0.088	0.335	3.638	0.000	0.396	2.527
Models per Category	-0.047	-0.285	-3.876	0.000	0.618	1.619
Frequencies to Replenishment	0.054	0.166	2.387	0.018	0.695	1.438
Shelf Space	0.046	0.201	3.074	0.003	0.784	1.276
Inbound Order Fulfilment	-0.055	-0.271	-3.751	0.000	0.641	1.561
Supplier Performance	0.080	0.248	3.348	0.001	0.612	1.634

Model Summary				
R = 0.740	**R²** = 0.548	**Adjusted R²** = 0.524	**F** = 11.209 (**Sig**. = 0.001)	
Df	**Df1** = 1		**Df2** = 135	
ANOVA				
Sum of Squares = 3.149	**Mean Square** = 0.45	**Df** = 7	**F** = 23.369	**Sig.** = 0.00
Durbin-Watson	1.91			
Residuals Statistics				

Residuals Statistics	Minimum	Maximum	Mean	Std. Deviation
Predicted Value	0.8286	1.7867	1.042	0.1489
Residual	-0.2732	0.9020	0.000	0.1353
Student Residual	-2.0410	6.8320	0.003	1.0210
Mahal. Distance	1.6690	37.657	6.951	7.0210
Cook's Distance	0.0000	0.6080	0.013	0.0560
Centered Leverage Value	0.0120	0.2650	0.049	0.0490

Dependent Variable: **Optimised Information sharing**

Predictors: **Centralised distribution model, risk pooling, different models per category, replenishment, shelf space, inbound order fulfilment, supplier performance monitored**

Source:Designed by the researchers

Under the column df the first value represents the number of independent variables. In model 7, R = 0.74 indicates a good level of prediction, R square = 0.548 and the model is able to explain 55% of variation. The regression equation appears to be moderate for making predictions since the value R^2 is not close to 1. Model seven has the highest value of

adjusted $R^{2;}$ (0.524); therefore, it has better explanatory power (after controlling for the number of variables) for the variation in information sharing. The *F* ratio is 23.369 and is significant at $p = 0.001$. An assessment of the beta value provides evidence of the existence of a linear relationship between the response and the seven explanatory variables (centralised distribution model, risk pooling, different models per category, replenishment, shelf space, inbound order fulfilment, supplier performance monitored). Among the seven dimensions, centralised distribution model ($\beta = -0.764$, $\rho < 0.05$) , risk pooling ($\beta = 0.335$, $\rho < 0.05$), different models per category ($\beta = -0.285$, $\rho < 0.05$), replenishment ($\beta = 0.166$, $\rho < 0.05$), shelf space ($\beta = 0.201$, $\rho < 0.05$), inbound order fulfilment ($\beta = -0.271$, $\rho < 0.05$), and supplier performance monitored ($\beta = 0.248$, $\rho < 0.05$) were found to be considerably related to optimised information sharing.

The *t*-values show the importance of a variable in model 7, and the percentages are greater than 1.96 at a significance level of $p < 0.05$. The larger the value of the beta weight, the more influence this factor has on predicting the dependent variable (information sharing). Risk pooling and supplier performance monitored have the highest beta value of 0.34 and 0.25 among the seven models. Thus, risk pooling and supplier performance monitored make the strongest unique contribution to explaining the dependent variable when all other variables in the model are controlled. Furthermore, since the tolerance value was more than 0.10 and the VIF was below 10, there was no multicollinearity problem between items in the independent variables. Assumption is not violated. The Durbin-Watson test "is a test for correlation between successive error terms. Values may range from one to four. If it is close to zero, positive auto-correlation is likely. If it is close to four negative auto-correlation resides" (Webster 2013:276). In examining the degree of autocorrelation, model 7 indicates a value (1.91) of the Durbin-Watson statistic consistent with the ideal range values (between 1.5 and 2.5) and no problems related to multicollinearity. All seven models have a significance value of 0.000 at the 95% confidence level; the deduction is that models one to seven reach statistical significance.

The original data contained a number of outliers. In regression these outliers simply identify those cases that are three standard deviations away from the best fit line for the regression (Butler 2008:24). Cook's distance is a measure of influence. It measures the extent to which the line would change if data points were omitted. Points with Cook's distances that are

greater than one, or are larger than other points, may warrant investigation (Maindonald & Braun 2010:149). The maximum value of Cook's distance is 0.076 under residuals, suggesting no major problem D < 1. In the case of normality, the scatter plot maintains points between the ranges of -3.3 and +3.3 without any outliers. The output stated the measure (min = 0.000 and max = 0.024) of leverage on how much an observation influences the regression coefficient; this study reveals acceptable *hat* element within the rule of thumb (leverage goes from 0 to 1).

5.5 Reliability and Validity

It is important to ensure that the research instrument used to measure the variables is able to provide relevant and accurate information. The consistency as well as stability of a measuring instrument (Jackson 2008:67) is critical to reduce bias across time and selected items. The Cronbach's alpha of reliability coefficient indicates how well the items in a set are positively correlated to one another (Sekaran 2003).

Table 3: Cronbach's Alpha

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
.793	.834	20

The closer Cronbach's alpha is to 1, the higher the internal consistency reliability. The Cronbach's alpha is a statistical test of how well the items on a scale correlate with each other. The internal consistency reliability of the scale used by the researcher reflects Cronbach's alpha value of 0.79, which indicates that the scale utilised in the research is indeed reliable on 20 number of items.

Validity tests how well the instrument developed measures the particular concept it is supposed to measure. SPSS (Statistical Package for the Social Sciences) software 20.0 was used to aid analysis of the data. The pre-formulated thematic instrument was pre-tested using key industry practitioners and discipline-based academics for suitability to enhance face and content validity. Assiduity selection for the sampling strategy allowed the researcher to absorb pertinent sample members to conform to criterion validity.

6. Discussion

6.1 Information sharing and integrated supply chain activities

Integrated supply chain activities across the extended enterprise imply an effective, adaptive supply chain network with optimised efficiency and transparent participation in visible and interconnected business activities. The study revealed that the retail group shares information with and accesses information from suppliers prior to making any strategic decisions due to a clearly defined distribution strategy (centralised vs decentralised supply chain model). The dichotomous questions revealed the magnitude of agreement on individual variables. Information sharing and centralised distribution strategy exhibited the highest associated values of all the variables in the multiple regression, implying that an information sharing system is required to effectively underpin the operations and functionality of a central supply chain distribution system. Interestingly, it was noted on figure 2 that optimised information sharing enhances integrated supply chain activities while these supply chain value-added performance outcomes are underpinned by a CPFR model across functions and enterprises. The use of electronically-enabled information sharing tools enhances integration, co-ordination and collaboration in supply chain networks. However, the study's findings suggest that the organisation does not have the required system tools and resources for a detailed collaborative process, although employees' perceptions of collaboration with trading partners are extremely positive. As a result, it is unable to reap the maximum benefit of optimised information sharing. The literature confirms that optimised and electronic information sharing strategically enhance integrated supply chain activities across the extended enterprise; however the retail group seems to lack the system tools to benefit from potential value-added performance outcomes.

The retail group requires better coordination and collaboration of its supply chain activities for frequent stock replenishment directly from RDC to individual store as the preferred practice. A major finding of the study is that optimised information sharing has enhanced risk pooling and enabled the monitoring of supplier performance on an on-going basis through the CPFR business model. It is also noted that the central supply chain distribution system has not been sufficiently utilised for optimum information sharing since its diffusion and adoption. Suitable combinations of different models per category are not sufficient to optimise information sharing since order fulfilment for inbound deliveries at regional distribution centres is not satisfactory. Optimised information sharing requires a centralised

distribution model underpinned by different models per category to achieve risk pooling, frequencies of replenishment, and manageable shelf space provided inbound order fulfilment is well-managed through meticulously monitored supplier performance.

6.2 The role of electronically-enabled information sharing tools and a CPFR model for integrated supply chain value-added performance outcomes

Under objective one, it was established that the retail group shares information infrequently with both its external trading partners and internally, and does not have the tools to align activities across the supply chain. There was overwhelming agreement among the respondents that electronically-enabled information sharing tools enhance integration and collaboration in supply chain networks. CPFR develops integrated supply chain relationships between retailers and manufacturers (who seek to reduce inventory quantities for the retailer while increasing stock turns for the supplier); this study confirmed that the retail group and its partners use CPFR systems to enhance supply chain partnerships.

CPFR is extremely important in decreasing inventory levels, reducing out-of-stocks, increasing sales and forecast accuracy and improving relations and internal communication. The retail group has an active supplier advocacy process to encourage responsible supplier conduct in the supply chain. This incorporates self-assessment surveys, issue-specific workshops, random data verification, site visits and sharing comparative data. It is evident that this organisation indeed practices and fosters a culture of information sharing and collaboration with suppliers. The concern is that the methods used to achieve this are currently manual and driven by human intervention. The lack of IT sharing systems means that this retailer is not sufficiently effective and efficient to remain abreast of its competition. The magnitude of supply chain value-added performance outcomes in the CPFR model across functions and enterprises has far-reaching, positive results for key success factors such as sales, inventory levels, service levels and relations with trading partners.

CPFR is driven by optimised information sharing which can only be achieved with the aid of IT. Given the promotional-driven nature of the retailer, the organisation lacks system resources that are absolutely necessary for effective information sharing. Successful CPFR implementation requires investment in systems and people. The most common systems are in-house and email and point-of sale systems. The respondents recommended that SAP,

radio frequency identification devices (RFID), e-business collaboration and B2C e-commerce systems be introduced.

7. CONCLUSIONS AND MANAGERIAL IMPLICATIONS

In conclusion, information systems innovation and rapid evolution are not evident in this particular retail business. Manual workarounds and manual intervention are creating bottlenecks, disjuncture and misalignment across the supply chain, resulting in out-of-stocks, poor visibility, low levels of supplier performance and the inability to forecast accurately. Given the promotional nature of the business, in order to remain relevant and competitive, the retail group should recognise that the supply chain will provide the best long-term return on investment. The theoretical context of social exchange theory underpins the need for optimal information sharing under the auspices of CPFR system. In relation to the theory, better collaboration among the extended enterprises under the tripartite-echelon dynamic supply chain network can improve supply chain integration and technological innovation for better customer rewards and benefits. The study thus employed the SET theory to examine the optimisation of information sharing to enhance value-adding performance outcomes and the use of electronic tools in cross-functional and extended enterprises.

In the modern world, organisations are called on to move away from silo operations and embrace technological innovations as a critical driver. Without accurate information which is accessible in real-time, managers are forced to make decisions based on manual data and assumptions. This can be attributed to difficult economic conditions, a lack of consumer confidence and shrinking disposable income. A common challenge for retail customers is that a store advertises products, but when the customer arrives at the store, it is out-of-stock. This represents a failure in the central supply chain distribution system, inefficient inbound fulfilment deliveries at the regional distribution centre and the lack of a well-configured combination of different supply chain models to manage product category. Further downstream, the logistics network is struggling to respond to customer requests and weekly promotions. This is caused by a lack of alignment between the marketing, logistics, and planning, sourcing, replenishment and IT departments.

8. LIMITATIONS AND IMPLICATIONS FOR FUTURE RESEARCH

The discernible limitations of the study are the sampled population relying on the selected case of single retailer and further depicting dearth of representativeness of the population. The multiple cases can be considered in future to contrast different approaches from promotional-driven retailers and examine the extent how information sharing optimisation influences the integration and efficiency of successful supply chain network.

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