# Improving Business Performance through Effective Inventory Management

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***Abstract***
*This paper seeks to analyse inventory management systems in the grocery stores in Aberdeen, UK and see how it impacts on the business performance such as customer satisfaction and cost. In an attempt to gain an an understanding of inventory management the grocery retail sector in the UK was analysed. A purposive non probability sampling technique was adopted for the research using the qualitative research approach. A case study approach was adopted to further analyse inventory management systems and it effect on supply chain performance within the grocery retailing stores. The sampling size for the research was restricted to those practitioners who are involved in inventory management in grocery stores and those involved in customer services.*

***Keywords-****Business Performance, Inventory Management, Customer Satisfaction and Cost*

## Introduction

During the past years there has been emergent realisation of the important contribution of inventory management to supply chain performance. It is the general characteristic of practitioners in most industries to improve performance for competitive advantage (Porter, 1985). Performance can be measured against value, which simply implies meeting customer needs. In accessing the impact of inventory management on supply chain performance, two key components are identified, i.e. doing it more effectively, and doing it more effectively and efficiently. Effectiveness refers to value maximization whereas; efficiency refers to minimisation or elimination of non value-adding items.

It is important to assess the impact of inventory management on supply chain performance. Groceries retailers and their suppliers are beginning to understand how both can gain competitive advantage through the inventory management. For an efficient and effective inventory management, an organisation should be able to determine how much inventory should be held at a particular time, when to reorder, what is the lead time the end user is willing to accept, what inventory model best suits the organisation and how can the inventory system be controlled.

Tersine (1994) defined inventory as material held in an idle or incomplete state awaiting future sales, use, or transformation. Wild (1995, p.18) defined inventory management as planning and control of physical stocks, or idle items with economic value. Almost all operations keep some kind of inventory, most usually of materials but also of information and customers which Slack, Chambers and Johnston (1998, p.467) referred to as "queues" (customer inventory). Inventory is employed by organisations in order to; cope with random or unexpected interruption in supply or demand (buffer inventory), cope with an organisation's inability to make all products simultaneously (cycle inventory), cope with planned fluctuation in supply or demand (anticipatory inventory), cope with transportation delays in the supply network (pipeline inventory).

Divergent opinions have been expressed on the usefulness of inventory holding; it is seen as liability and asset to organisation. Holding too little inventory can lead to stock-out while excess of it is costly. Though, inventories will increase customer service and revenue, but it comes at higher cost (Werner and Gerald, 2007). Inventory management and continuous availability of products/services at the same time minimising the costs in the grocery retail supply chain is important. The cost associated with inventory is so huge when compared with the total spend in the industry (Wallin, Rungtusanatham and Rabinovich, 2006). Chase, Jacob and Aquilano (2004) estimated that between 30-35% of the value of purchased good are indirect costs of managing inventory of purchased goods. Also, Monczka, Trent and Hanfield (2005) stated that a typical wholesaler or retailer spends more than 56% of revenue; on average; on direct cost of purchased goods.

These figures show how important it is to have a proper inventory management system and its impact on the organisation's profit goal. Therefore, the management of supply chain processes has to resolve this trade-off by identifying possibilities of decreasing inventories by simultaneously improving customer service.

**Aim**

To analyse inventory management systems in the grocery stores in Aberdeen, UK and see how it impacts on the business performance such as customer satisfaction and cost.

**Objectives**

1. To provide an understanding of inventory management.
2. To assess the impact of inventory management in aiding business performance in grocery stores, Aberdeen.

## THEORITICAL FRAMEWORK

### The Grocery Retail Sector in the UK

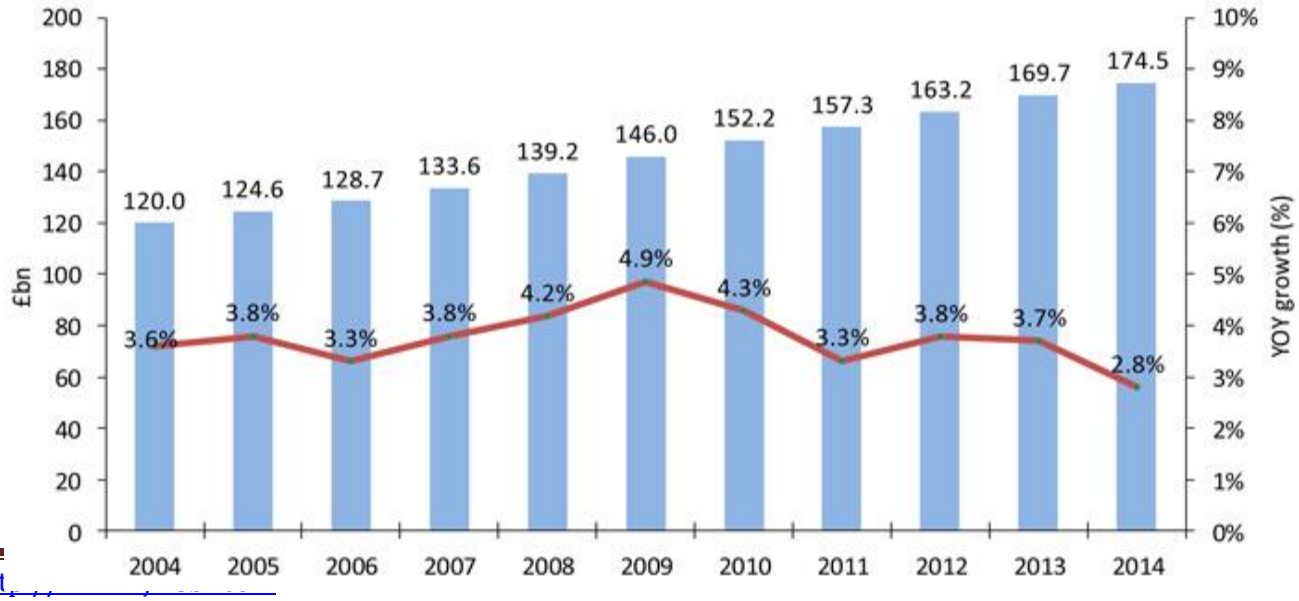
The retail industry has undergone many changes since 1980 and the number of people employed in the industry has trebled to almost 2.7 million people in that time, almost 11% of all those employed in the UK. The industry is now the second largest employer in the UK.

Grocery is the largest sector within the retail market. One major challenge in the UK retail sector is the blurring of industry boundaries. The increasing sale of non-food items put grocers in competition with a wider sphere of retailers than any other specialist retailer (Verdict, 2008). Organisations traditionally involved in retailing one product or the other are now involved in several other sales. For instance, some supermarkets traditionally known for retailing grocery and general home basic products now also sells mobile phone lines, petrol, gas etc.

The UK grocery market was worth £174.5bn for the calendar year 2014 representing an increase of 2.8% on 2013. The market is quite large with food and grocery accounting for 54.5p in every £1 of retail spending (IGD, 2014). Figure 1 below shows the market performance from year 2004 to 2014.

**UK Grocery Market Performance**

**Figure 1**: Grocery market performance



Source: IGD Research, 2014

According to the Institute of Grocery Distribution (IGD, 2014) there are 92,796 grocery stores in the UK. These are categorised into six sectors, which are defined as follows:

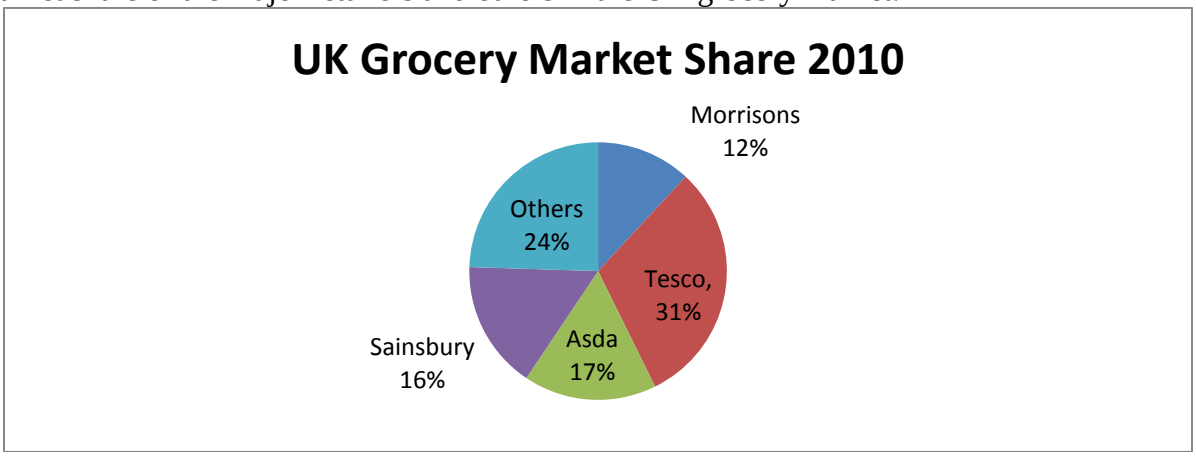
1) **Hypermarkets and superstores:** Large format stores that sell a full range of grocery items and typically a substantial non-food range. Hypermarkets have a sales area of 60,000 sq ft +, superstores are 25-60,000 sq ft.
2) **Small supermarkets:** Defined as food-focused stores with sales area of 3-25,000 sq ft.
3) **Convenience stores: S**tores with a sales area of less than 3,000 sq ft, which are open for long hours and sell products from at least eight different grocery categories. Examples include SPAR, the Co-operative Group and Londis.
4) **Discounters:** Includes all sales through food discounters Aldi and Lidl (and Netto until December 2010) and the grocery sales of the main high street discounters such as Poundland and 99p Stores.
5) **Other retailers:** Includes stores with a sales area of less than 3,000 sq ft, typically newsagents, off-licences, some forecourts and food specialists, such as butchers and bakeries. This channel also includes the grocery sales of predominantly non-food retailers such as department stores.
6) **Online:** Internet orders placed at grocers and online food specialists for home delivery and customer collection.

The grocery retailing industry in the UK is made up of several retailers; however this industry is dominated by four major retailers (Awe, 2008). IGD's annual performance update on Grocery & Foodservice Wholesaling shows that total sector sales hit £29.8bn for 2014 – up just a modest 1% and representing a distinct slowdown on 2013 growth levels. The top four supermarkets combined accounted for around 76% of the market (Morrison, 2010). The break-down of other three big players shows Tesco having 30.8%, Asda 16.7% and Sainsbury 16.1%. This is represented in table 1 and fig. 2 below.

**Table 1:** UK Grocery Market Shares 2010

| Grocers | Market Share (%) |
|---|---|
| **Morrisons** | **11.9** |
| **Tesco,** | **30.8** |
| **Asda** | **16.7** |
| **Sainsbury** | **16.1** |
| **Others** | **24.5** |

**Fig. 2**: Market share of the major retailers and others in the UK grocery market.



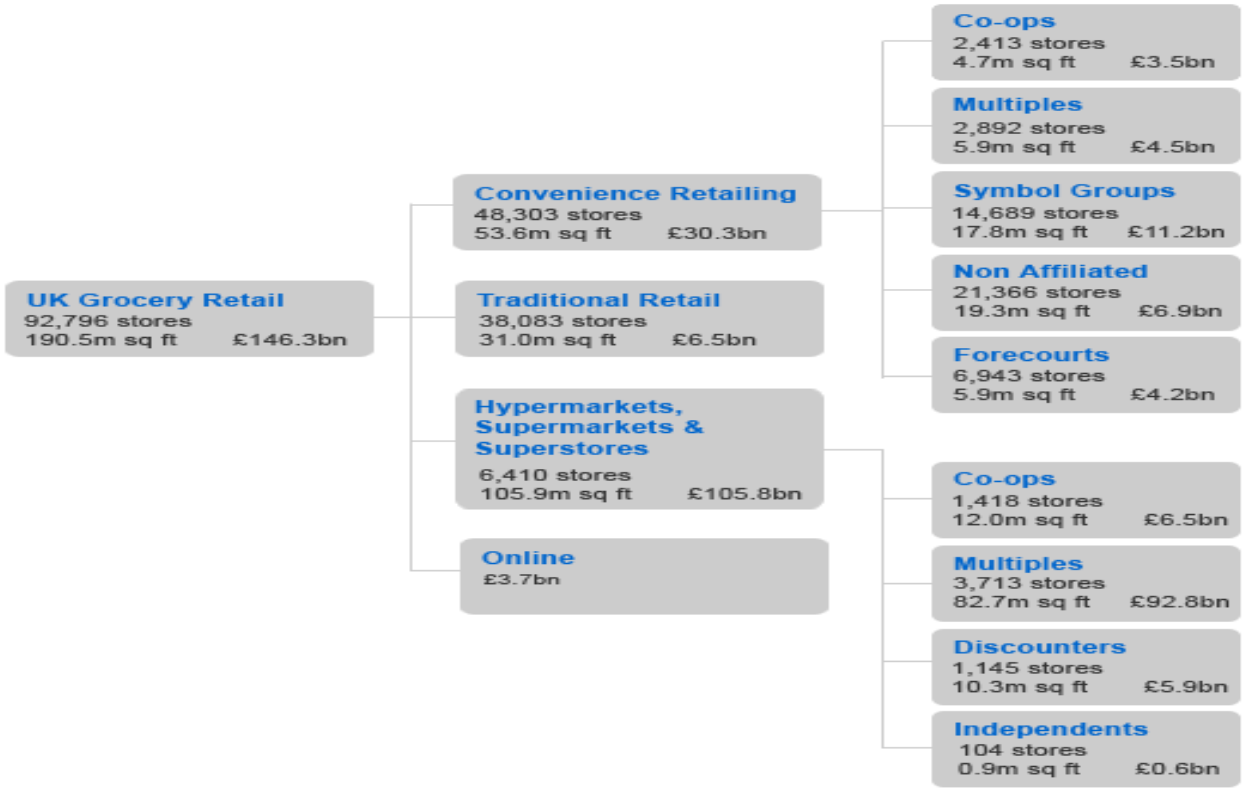
Source: Adapted from Felsted, A., 2010.

According to Bounds, Rigby and Goff (2010), the big players in the market are moving in the direction of neighbourhood retailing. Tesco has more than 1,000 Tesco Express stores across the UK, while Sainsbury is planning to raise its number of store from 280 (as at middle of last year) to 380 stores in year 2010. In an attempt not to be left behind, Co-operative group recently acquired the supermarket chain Somerfield and it is aiming to turn the race to the race of 'big five' from 'big four'.

The chart below shows the number of stores within each sector and the worth of each sector. From figure 3, we can see that about 75% of sales in the sector are done by the big four through super markets and superstores. It is imperative to be able to anticipate demands and meet customers' needs efficiently and effectively to be very competitive in the sector. Also, Atkinson (2010) quoting AMR research (2009) stated the projected sales for retailer in year 2010 through various channels. It was identified that most stock out situations occur at the store level due to improper re-stocking and re-ordering processes. Supply chain efficiencies and effectiveness in grocery stores is achievable by preventing those situations (stock-outs of products, pilferage and spoilage). Also, it will guarantee competitive advantage for the organisation derivable from customers' satisfaction.

Considering the competitive nature of the market, retailers are now becoming smarter in managing their inventory. Most retailers are now involving suppliers in inventory management. This involves doing a lot to have the right levels of inventory in the right place (Atkinson, 2010).

**UK Grocery Retailing - Store Numbers & Sector Value**
**Fig. 3:** UK store numbers chart




Source: IGD Research, 2009

**Inventory Management**

Inventory control is an activity under Supply Chain Management (SCM) (Tyan and Wee, 2003). In the last couple of decades, the products offered to the consumers have significantly increased. At the same time, the life-cycle of the products has drastically reduced. These two situations lead to a situation of inaccurate demand forecast resulting in inventory management crisis (Mangal and Chandna, 2009). Inventory is regarded by many small business owners as more visible and tangible aspects of doing business. Raw materials, goods in Process and finished goods are all various forms of inventory. Each form represents money tied up until the inventory (raw materials, goods in process and finished goods) leaves the company as purchased products (Hedrick et al., 2009). Inventory is generally classified into four types: cycle stock, safety stock, pipeline stock, and speculation stock (Larson and DeMarais, 1999).

In literal term, inventory is the stock of anything required or needed to do business. This stock accounts for a large proportion of business investment and requires effective management for profit maximisation. Inventories remain unreliable, inefficient and costly unless they are well controlled and monitored (Hedrick et al., 2009). Simchi-Levi, Kaminsky and Simchi-Levi (2008) stated that inventory is one of the major costs for any organisation or industry and its importance as a key performance measure was highlighted by Waller, Johnson and Davis (1999) when they stated that end-of-the month inventory level is a key performance measure for most retailers; thus inventory management is very important for the success of any organisation. However, it is known that one of the objectives of inventory control is to maximise the level of customer satisfaction by avoiding under-stocking. Success in supply chain management usually derives from understanding and managing the relationship between inventory cost and the customer service level (Waller, Johnson and Davis, 1999).

Inventory management is a supply chain process whose management is challenging because it directly impacts both cost and service. Supply Chain Inventory Management (SCIM) is described as an integrated approach to the planning and control of inventory, throughout the entire chain i.e. from material sourcing to final product end user. SCIM aim is to improve customer service, increase product variety and reduce cost. All these are aimed at the end users (Giannoccaro, Pontrandolfo, and Scozzi, 2003). SCIM encompasses the responsibility for planning, acquisition, storage, movement, and control of material and final product (Tersine, 1994).

Uncertain demand and uncertain supply and/or production cycle times make it necessary to hold inventory at certain positions in the supply chain to provide adequate service to the customers. As a consequence, increasing supply chain process inventories will increase customer service and revenue, but it comes at higher cost (Jammernegg and Reiner, 2007). This lead to a situation whereby the trade-off has to be resolved and it involves identification of possibilities of decreasing inventories by simultaneously improving customer service. Successful inventory management involves balancing the cost of inventory with the benefits of inventory (Hedrick et al., 2009).

Many studies have been carried out on the impact of effective inventory management. For instance, Vastag and Whybark (2005) explored the relationship between the use of effective inventory management practices (as reflected in inventory turnover) and the implementation of other manufacturing practices with a hypothesis "*effective inventory management practices have a positive knock-on effect on the implementation of other practices."* The results show that inventory turnover is significantly related to the implementation of other techniques and weakly related to an index of overall company performance. The results suggest a positive knock-on effect, but that it takes more than inventory management to achieve high levels of performance.

Lau, Xie and Zhao (2008) used simulation model to investigate the effects of information sharing and early order commitment on the performance of four inventory policies used by retailers in a supply chain of one capacitated supplier and four retailers. Subsequent analyses showed that the inventory policy used by the

retailers, information sharing, and early order commitment can significantly influence the performance of the supply chain.

There are several inventory management approaches. A well-known management lever is risk pooling by different types of centralisation or standardisation e.g. central warehouses, product commonalities, postponement strategies (Jammernegg and Reiner, 2007). In this way, it is usually possible to reduce inventory costs to a large extent. Waller, Cassady and Ozment (2006) warned that care must be taken while implementing some of these approaches. They said even though techniques like cross-docking reduces inventory and comes with other efficiencies, careful attention must be paid to impacts such as product availability to consumers especially by retailers faced with products availability challenges.

Mazhar (2008) advocated inventory 'right sizing' rather than inventory reduction. He pointed out that right sizing has to do with identification of precise location where inventory is out of balance and bringing same under control in order to minimize uncertainty in purchasing cycles. The process of right sizing involves analyses of buying behaviour and identification of improvement areas, slow selling items and excess inventory, establishment of a base line and commitment to a go-forward strategy (Mazhar 2008).

'Right sizing' is the first of the seven steps to performance improvement via pro-active inventory management proposed by Mazhar (2008). The remaining six steps are:

- Optimization of slow and excess inventory
- Reduction of holding cost
- Optimisation and synchronisation of SCM and visibility
- Improving forecast accuracy
- Making the right investment in inventory
- Monitoring of key performance indicators (KPIs)

In most stores, inventory is controlled using some of the proven methods listed below (from simplest to complex).

**Visual control:* this enables the manager to examine the inventory visually to determine if additional inventory is required. This type of method is most appropriate only for slow moving or expensive items;
**Tickler control*: enables the manger to physically count small portion of inventory each day so that each segment of the inventory is counted every so many days on regular basis;
**Click sheet control*: enables the manager to record the item as it is used on a sheet of paper. Such information is then used for reorder purposes;
* *Stub control:* this is commonly used by retailers and it enables manager to retain a portion of the price ticket when the item is sold. The manager can then use the stub to reorder the item that was sold.

However, reduction of inventory costs is often related with an increase in other costs, like transportation costs or production costs (Jammernegg and Reiner, 2007). The sharing of future order plans by the retailer and the supplier has been shown to be the most effective way for reducing the supplier's cost and improving its service level; however, the magnitude of these benefits achieved is less for the retailers (Lau, Xie and Zhao 2008).

Marien (2002) in Tyan and Wee (2003) identified strategic alliance as key Supply Chain (SC) enablers. Strategic alliances are all about how external partners (suppliers, logistics companies and customers) are selected and how the relationship is built and managed. The idea behind efficient inventory management in any supply chain is the cooperative relationship and information exchange between members, both upstream and downstream (Guo, Wiese and Xu, 2007). Inventory in any supply chain usually has a limited shelf life with a window of opportunity open to sell the item, once that window closes; the value of sale for the product drops

and this impacts the overall profitability of the supply chain (Branch, 2009); efficient management of inventory is therefore one of the requirements for organisational success and competitive advantage in retail organisations. Considering the fact that SCM is concerned with finding the best strategy for the whole supply chain, finding such a strategy is not an easy task. The process requires intensive communication and coordination among supply chain partners so that material and information flow along the supply chain are optimized (Sari, 2008).

Information technology has had a substantial impact on supply chains. Rapid innovation in technology (information technology inclusive) has made it feasible for real time information on retail level demand to be captured and exchange across all strata of supply chain. There are great prospects such as great reduction in excess inventories and stocking by supply chain partners of those inventories that are required to meet current demands (Cachon and Fisher, 2000). In support of this point, Atkinson (2010) concluded that retailers will continue to look to technology in order to reduce their inventory costs while maintaining customers' satisfaction.

Web-based communication is faster and is available at a cheaper price more trading partners can afford. It is an established fact that older communication techniques such as mail, fax, or electronic data interchange are slower, typically require a more error-prone manual update of identical data by the trading partners, may be unaffordable by some supply chain trading partners, and may be done in batch file transfer mode, which also delays the exchange of information (Fliedner, 2005).

Current technologies offer supply chain partners the ability to develop forecasts in a "pull" manner, namely beginning with the point where demand occurs, at the retail level and working back sharing information upstream through the supply chain. At the retail level, point-of-sale (POS) using scanner collect sales data (what is selling, when, where and how much) as it occur, data mining can detect the early onset of demand trends, and electronic data interchange (EDI) allows these data to be shared immediately with all echelon of the supply chain (Fliedner 2005; Cachon and Fisher, 2000; Atkinson, 2010).

These technologies can better enable supply chain partners to share and agree upon joint forecasts and to ultimately synchronize production planning, purchasing, and inventory allocation decisions across a supply chain. Leading to impressive improvement in supply chain/business performance in the grocery industry (lowered time and cost to process an order) is the application of these technology (Cachon and Fisher, 2000; Fliedner, 2005).

So many inventory management systems have been mentioned in the literature. These include:
i) Vendor Managed Inventory (VMI)
ii) Quick Response (QR)
iii) Synchronised Consumer Response (SCR)
iv) Efficient Consumer Response (ECR)
v) Rapid Replenishment (RR)
vi) Centralised Inventory Management (CMI)
vii) Continuous Replenishment Policy (CRP)
vii) Collaborative Planning, Forecasting and Replenishment (CPFR)

The two major collaborative strategies at managing inventory levels are VMI and CPFR. These are discussed in the next sub-headings.

**Vendor Managed Inventory (VMI)**

The VMI strategy is designed to better match demand and supply, by this means, controlling inventory and ensuring continuous availability through external collaboration among supply chain partners (Williams and Tokar 2008).

Vendor Managed Inventory is not a new philosophy. Though, it was popularised in the late 80's by Wal-Mart and Procter and Gamble and subsequently implemented by other leading organisations from different industries it was initially discussed by (Magee, 1958, p.298) in a presentation of a conceptual framework for designing a production control system according to (Disney and Towill, 2003b). Quoting Magee directly from Disney and Towill (2003b)

*"Frequently there is argument as to who should control inventories. For example, should it be the sales organisation or (some) other unit that draws on the stocks and wants to be sure they are there, or the operation that supplies the stock point and wants to feed it economically? There is probably no resolution to this question as stated; the difficulty is that both have a legitimate interest. It is possible to restate the question slightly and reach a solution. The user has to be sure the material he needs is there. He has corresponding responsibility to state what his maximum and minimum requirements will be. Once these limits are accepted as reasonable, the supplier has the responsibility of meeting demand within these limits, making whatever use he can of the flexibility the inventory provides. Thus both have a share in the responsibility for and control over a stock unit. One specifies what the maximum and minimum demands on the stock unit will be; the other has the responsibility of keeping the stock unit replenished but not overloaded as long as demand stays within the specified limits".*

VMI, also referred to as Continuous replenishment or Supplier managed inventory, is one of the most widely discussed partnering initiatives for encouraging collaboration and information sharing among trading partners (Sari, 2008). It is a supply chain initiative where supplier (vendor) decides on the proper inventory level of each product and the proper inventory policies to maintain the levels. The retailer is saddle with the task of providing the vendor access to its real-time inventory level. In VMI system, the retailer's role basically is to provide space rather than manage inventory. The retailer set the space requirement/service level requirement and the responsibilities of the retailer are nothing but to share sales and inventory data. This is so because in a typical VMI programs, retailers are excluded from demand forecasting process (Simchi-Levi, Kaminsky and Simchi-Levi 2003; Sari, 2008).

VMI offers competitive advantage for retailers because it results in higher product availability and service level with lower inventory monitoring and ordering cost (Sari, 2008) while it leads to reduction in the bullwhip effect on the part of the vendors (Lee, Padmanabhan and Whang, 1997) and better planning and use of resources (Henningsson and Linden, 2005).

It is not everything about VMI that is success. It also has some challenges and these challenges can hamper the derivation of benefits obtainable from VMI. According to Simchi-Levi, Kaminsky and Simchi-Levi 2003; and Fiddis 1997 as cited by Sari 2008, Spartan stores, a grocery chain shut down it VMI effort about one (1) year after due in part VMI vendors were unable to deal with product promotions while Kmart cut a substantial amount of VMI contracts because it is not satisfied with the forecasting ability of VMI vendors.

**Collaborative Planning, Forecasting and Replenishment (CPFR)**

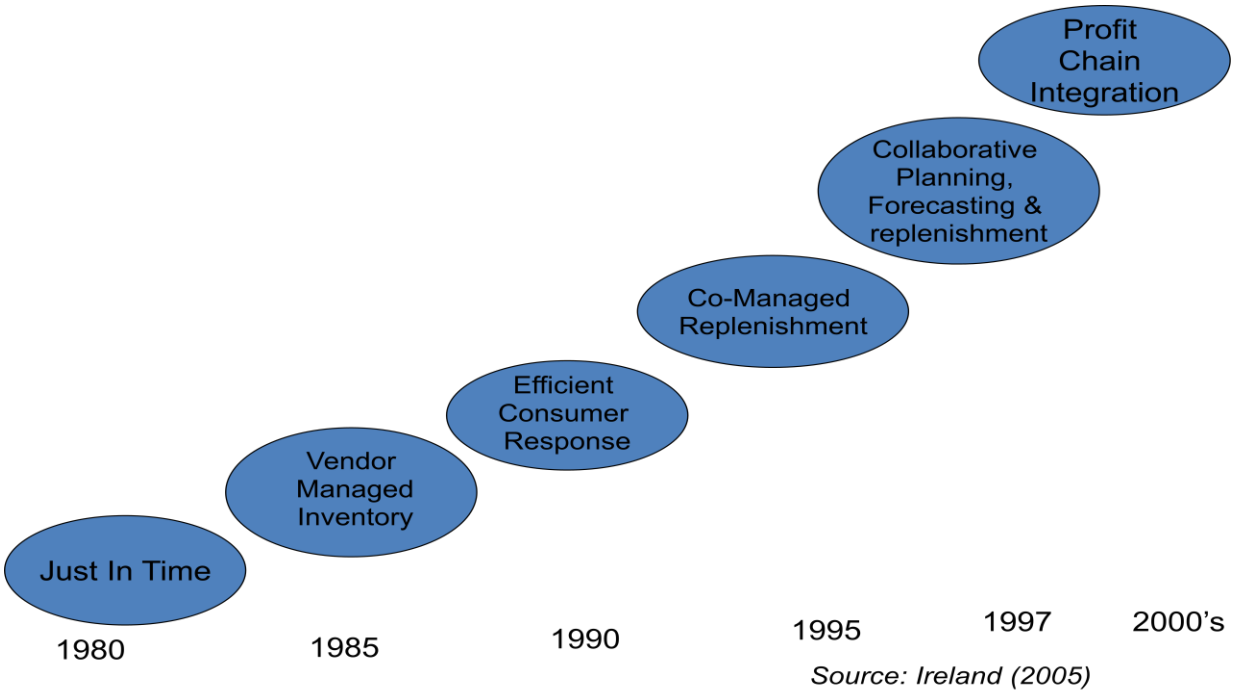
CPFR is a collection of business processes that are better enabled by jointly agreed information system. It is a business practise that combines intelligence of multiple trading partners in the planning of fulfillment of customer demand (Sari, 2008). It involves collaboration and coordination of plans, actions and activities to

ensure product availability to consumers. The process allows for planning rather than reacting and looks to improve the forward visibility of requirements across the supply chain (Emmett and Crocker, 2006).

CPFR is a web-based attempt to coordinate the various activities in supply chain (production, purchasing, planning, demand forecasting and inventory replenishment). Its main objective is to exchange selected internal information on a shared web server in order to provide reliable, longer term future views of demand in the supply chain (Fleidner, 2003). CPFR adds value to supply chain by reducing inventory and increase customer service level by achieving a better matching of demand and supply (Sari, 2008). Fliedner (2003) traced the evolution, cited benefits that have been achieved, identified obstacle to implementation and proposed logical development to the future of CPFR.

CPFR has evolved considerably overtime in its short existence. It was initially referred to as '*Collaborative forecasting'* which represented an exchange of early demand expectations between trading partners. It was later referred to as '*collaborative forecasting and replenishment (CFAR)'* aimed at representing its collaborative forecast and replenishment objectives between trading partners relationships (Fliedner, 2003).

**Fig. 4:** Evolution of CPFR




*Source: Ireland (2005)*

Applications of CPFR to date have focused on the food, apparel and general merchandise industries this can be attributed to the stiff competition in this sector. The second reason behind the need for early exchange of information is the innovative nature of the products, or the life cycle of the products. Most grocers know that most products have short product life cycle and as such the need to have effective inventory management system in place; otherwise, either tremendous lost revenues (wastage) or markdown price (price reduction due to expiry date) will be experienced.

Another reason is the sourcing system. Most organisation now source internationally which has contributed to the lengthy supply chain and cycle time. Thus, supply chain planning visibility is necessitated by having a more complex and longer supply chain (Fliedner, 2003).

The fourth reason behind the CPFR is the cost structure of supply chain. According to Raghunathan (1999), in an effort to cut cost, global market and competitors are likely to advance SC towards universal participation by all retailers in CPFR. All the above stated reasons support the need to respond quickly to volatile market demand and other market signals and these also lead to development of SC tools such as CPFR (Fliedner, 2003).

Researches carried out by IGD (2010) highlighted the fact that 65% of consumers looking for a grocery item in the UK would either switch stores in the absence of the product at the chosen store, postpone the purchase at the same store or may not purchase the item at all. These results highlight the fact that a simple shelf stock-out can result in missed sales for an organisation and greatly impact on its profit figures and customer satisfaction levels. On-shelf-availability is simply defined as the provision of products desired by the consumers in a saleable condition when and where the consumer wants it (IGD, 2010). On another hand, excessive holding of inventory is a major cost for an organisation especially in situations where the products are perishable. *"Holding inventory shows that we don't have control"* (Wild 2002, p.60). For these reasons, efficient inventory management systems are imperative and seek to guarantee that the quest to gain competitive advantage is achieved.

The adoption of the inventory management practices such as the procurement process in operation will definitely have an effect on the supply chain and business performance. Constraints that exist in inventory management as resources are never enough. This is also the situation in the chain as elaborated by Yeo and Ning (2002), '*Any system must have a constraint that limits its output*'. This makes inventory management tools vital for the successful operation of any supply chain. A key feature of the present day business is the idea that it is the supply chains that compete, not the companies (Christopher, 1992), and that the success or failure of supply chains is ultimately determined in the market place by the end consumer (Christopher and Towill, 2002). Only organisations who are proactive in their approach will effectively and efficiently meet the consumer demand. Inventory management is the vehicle needed to drive home this achievement.

## METHOD OF ANALYSIS

### Sampling Techniques

Participants used for this research are from several grocery retailing organisations (include major players and those I refer to as 'one-man' stores). A purposive non probability sampling technique has been adopted for this research because it permits the researcher to personally make a sample selection that best fits the research and better answers the research questions (Patton, 2000). Aberdeen was purposively chosen for this study because of the desire of the researcher to understudy a blend of micro and small business which the city offers.

### Method of Data Collection

Face-to-face interview approach was chosen as the most appropriate out of various methods of data collection methods considering the aims and objectives of this research work. The perceptions of the stakeholders are very crucial to the success or otherwise of this work and their answers were based on their experience and what they are doing currently, skills and their observation about the grocery inventory management and business performance. However, in conjunction with the face to face interview, physical observation, telephone interview and informal discussion were used to gather data.

Saunders, Lewis and Thornhill (2007), listed the advantages of telephone interviews to include reduced costs, speed of data collection and reduced issues linked with distance and access to respondents. As good as the advantages may sound, telephone interviews has it disadvantages too. Saunders, Lewis and Thornhill (2007) stated that it can be very expensive conducting telephone interview especially when the respondents are not within same locality. Also, the quality of data gathered is dependent on the experience of the interviewer.

The data for this study were elicited from primary and secondary sources. A structured questionnaire and personal interview was used for collecting primary data in the study area. Another data collection method that was used to elicit the primary data from respondents was informal discussion with household heads. The secondary data sources of information were from research reports, published and unpublished theses, the internet and text books. Primary data collection lasted for two months. i.e. from mid may to early July 2012.

**Research Approach**

This research would be carried out using the qualitative approach. The nature of this research requires a methodology that is flexible to allow open questions and data collection. Qualitative approach has been chosen for the research because they provide an opportunity to gather data using any method of data collection. The methodology that was used for this study was case study approach because it allows for picture or model to be built up which illustrates the relationships and patterns of interaction among constituent parts.

Case study method allows broad knowledge and good access to the organisation, knowledge of the problem background and provides useful information for the participating parties (Yin, 1989). Qualitative approach allows for collection of data with complex responses and individual perspectives. The methods include unstructured in-depth interviews, physical observations, and participant observation. Other reasons for choosing the qualitative research are because it also allows for the use of subjective source of data and it uncovers and understand what lies behind any phenomenon about which little is known. Also, it can be used to gain novel and fresh slants on things about which quite a bit is already known (Strauss and Corbin 1998; Mark, 1996). This is in line with the research aims which are to analyse inventory management systems in grocery stores and see how it impact on the supply chain/business performance such as customer satisfaction and cost from the literatures, consumers and practitioners point of view.

The researcher builds a complex, holistic picture, analyses words, reports detailed views of informants, and conducts the study in a natural setting. Amaratunga et al., (2002) in their own view described qualitative approach as the origin of well grounded, rich descriptions and explanations of processes in identifiable local context. With qualitative data one can safeguard sequential flow, see exactly which actions or events led to which reactions or consequences, and come up with fruitful explanations. Good qualitative data are most likely to lead to unanticipated findings and to new integrations; these help researchers to move beyond original conceptions and generate or revise conceptual structure. They concluded by saying "*the findings from qualitative studies have a quality of un-deniability*".

**Analytical Techniques**

The process of analysis in qualitative research comprises of "*data collection, data analysis, and the development and verification of relationships and conclusions, also analysis occurs during data collection and after it*" (Saunders, Lewis and Thornhill, 2003). Many researchers after collecting qualitative data spend a great deal of time turning it into numbers or otherwise trying to quantify it while some argues that doing this spoils the richness of the data because it leads to failure of giving the holistic view that is so important in qualitative research (Easterby-Smith, Thorpe and Lowe, 1991).

The characteristics and nature of qualitative data has great implications for both its gathering and its analysis. Qualitative data cannot be gathered in a standardised manner in which quantitative data are gathered if the objective of capturing the richness and fullness associated with qualitative data is not to be compromised (Saunders, Lewis and Thornhill 2003; Easterby-Smith, Thorpe and Lowe, 1991). This last statement shows that the collected qualitative data can be analysed in two basic ways. According to Easterby-Smith, Thorpe and Lowe (1991), the basic ways are '*content analysis'* and '*grounded theory'*. Also, Tharenou, Donohue, and Cooper (2007), stated two approaches to analysing qualitative data: '*template analysis'* and '*editing approach'*.

'***Content analysis'*** and '***template analysis***' are both the same considering the processes. The two can be used interchangeably. The template consists of a number of themes or categories relevant to the research question(s). In this type of analysis, the researcher goes by numbers and frequency. The creation of patterns is an interpretive process instead of statistical process (Tharenou, Donohue and Cooper, 2007; Easterby-Smith, Thorpe and Lowe, 1991).

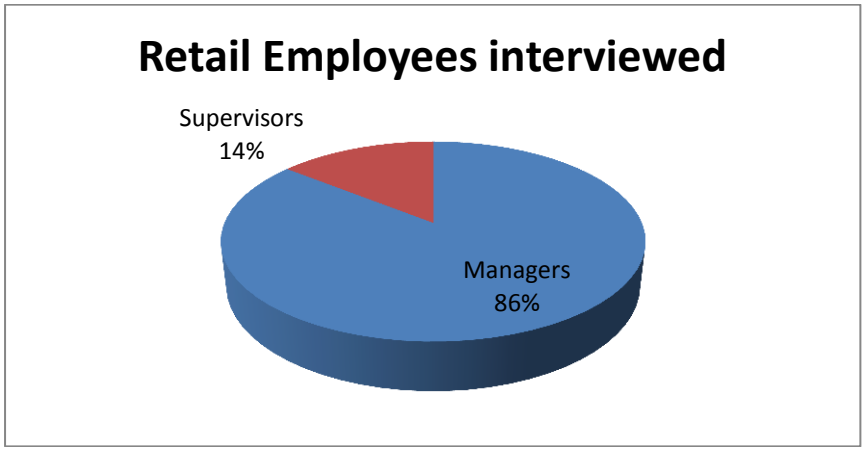
*'**Editing analysis'** just like the '**grounded theory**' " involves an interpreter rearranging the text in order to identify meaningful segments that stand on their own and relate to the purpose of the study*" (Tharenou, Donohue, and Cooper 2007, p.256). *'Editing analysis' and 'grounded theory' can be used interchangeably.* The theory is derived from the concepts and categories used by the social actors themselves to interpret and organise their worlds. The analysis provides a more open approach to data analysis which is particularly good for dealing with transcripts. It recognises the problematic nature of qualitative data analysis due to the large amounts of non-standard data generated.

## RESULT AND DISCUSSION

### Data Analysis- Grocery retail employees

A total of seven people were interviewed. The position of respondents includes Store managers (6) and Grocery supervisor (1). This is represented graphically by the chart below:

**Fig. 5:** Sample of grocery retail employees interviewed




Source: Survey data

The interviews were labelled C, $S_f$, $F_f$, $S_r$, $S_p$, I, and Ts in order to maintain the anonymity of the respondents.

### Understanding of Inventory Management

In order to elicit the respondents understanding of inventory, and inventory management generally, questions which were asked included: what do you understand by the word "inventory"?, How do you manage stock?, And how do you place order(s)?

All the respondents show understanding of the term 'inventory'. They are all of the view that inventory has to do with stock. This view is supported by Tyne and Wee (2003); Hedrick et al. (2009); Giannoccaro, Pontradolfo and Scozzi (2003). The responses show that most of the respondents demonstrated that they have depth knowledge of inventory management as most of their responses seems consistent with theory. Most are actually involved in stock taking and order placement.

Respondents from the big stores appear to be more knowledgeable about inventory management in comparison to those from smaller and self owned stores.

It also became apparent from the interview that stock management and order placement are carried out electronically in the big stores while they are done manually by the small ones. One of the established stores also do not do its ordering electronically as the respondent $F_f$ beliefs doing it manually brings accountability. However, there is no literature to back up his claim. During self observation of the process, it was discovered that what respondent $F_f$ referred to as manual ordering was actually what I termed 'man-machine' ordering process in which adjustment are only made to order list generated by the computer system. This practise is supported by Fildes et al. (2009).

**Importance of Effective Inventory Management**

Inventory management is described as a key indicator of how effective an organisation is. In buttressing this point, Waller (2002) stated that effective inventory management is aimed at improving consumer service and satisfactions, reduce operational cost and increase product variety. In view of this, all these aims are only achievable when products are made available to consumers as at when required.

Responses from the interviews show that inventory cost is of importance to the grocery retailers. The view of inventory being a major cost for grocery retailers and other importance of efficient inventory management system were supported by Chase, Jacobs and Aquilano (2004); Waller, Nachtmann and Hunter (2006); Mazhar (2008).

All respondents responded in affirmative when asked if their stores have ever run out of stock of any product. Even though they all claim to have effective inventory monitoring and control system in place, some of them blamed being out of stock on computer system error (information technology). This reason is supported by Tyne and Wee, 2003; Hemingsson and Linder (2005); Yao, Dong and Dresner (2010) who assert that incorrect data entry (retailer sending wrong or incomplete data to the supplier(s)), and electronic data interchange (EDI) issues constitute system failure. When any of these happen, it takes time to be corrected which leads to depletion of in-house stock. Fleisch and Tellkamp (2005) further argued that even with the information technology within SC to share information, there are still often discrepancies between the customer demand and inventory levels in information systems. They attributed this to media breaks and missing real time or near real-time alignment of both data. Citing the work of Raman, DeHoratius and Ton (2001), stated that information on inventory in inventory management system (IMS) in more than 65% of stock keep unit (SKUs) in retail stores are inaccurate. The difference between the physical stock and Inventory Management System (IMS) was on the average of 35% of the target inventory (Fleisch and Tellkamp, 2005). These discrepancies are caused by theft, low process quality and products becoming unsalable due to obsolesce or damages.

However, Cachon and Fisher (2000) present a counter view. They contend that Information technology has had a positive impact on supply chains performance because it makes it easy for data and information to be shared immediately with all stages of SC (this supports the assertion of respondent $S_r$). The Application of point-of-sale and EDI in the grocery industry, has lowered the order cost and processing time considerably, thus leading to impressive improvement in SC performance (Cachon and fisher, 2000).

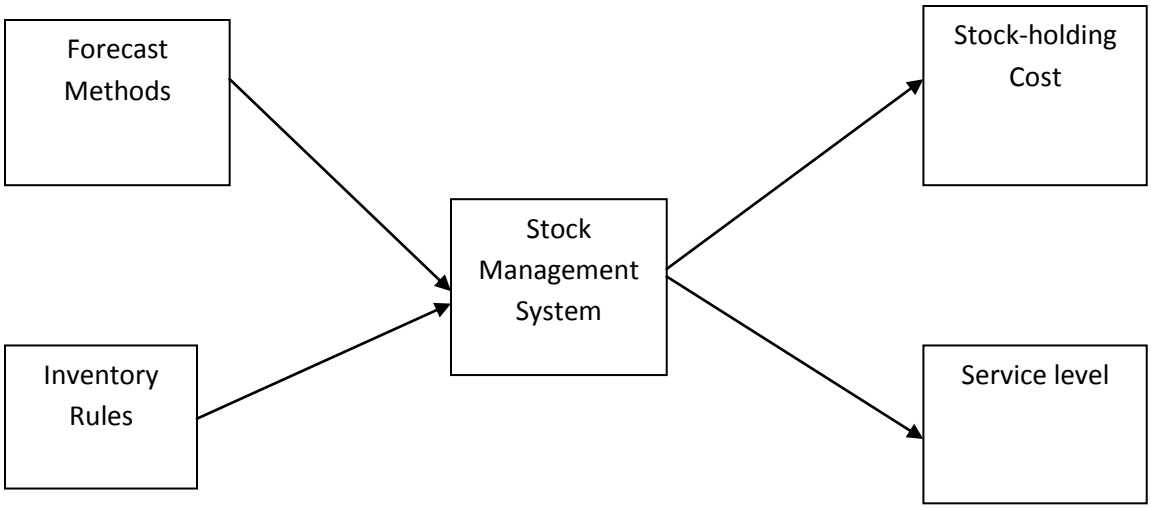
Respondents $F_f$ and $S_f$ specifically mentioned wrong forecast as a great contributor to ineffectiveness of inventory management. In support of their claim, Fildes et al. (2009) described forecasting as a crucial aspect of supply chain planning process of which inventory management is a part. Considering the fact that retailing organisations stock and sell thousands of SKU which was highlighted by respondent $F_{f.}$ It is typically impossible for the forecaster to give individual attention to all SKUs. Most forecast are done with the use computerised systems to produce initial forecast while the forecasters/planners make adjustments taking into

account the circumstances expected (such as weather and local holidays as pointed out by respondent $S_p$ and $S_r$) over the planning horizon. Although, these adjustments do improve accuracy, it involves considerable amount of time and efforts. These two factors could lead to errors being introduced into the forecast. These errors are at each stage of the SC and are potentially amplified; translating into poor service and or excess inventory levels (Fildes et al., 2009). It is however observed that improved forecasting accuracy can lead to significant cost savings, better customer/supplier relationships, and reduction in out-of-stock level and customer satisfactions which are the aims of effective inventory management.

All the respondents are of the view that efficient inventory management will minimize cost and improve customer service levels. In summary, they are all of the opinion that efficient inventory management systems contribute towards improve organisational profit, reducing cost and building competitive advantage it helps in maintaining adequate stock (reduce over-stocking while avoiding out-of-stock situation) thus increasing customer satisfaction levels which is a motivating factor for continuous patronage. This view was supported by Waller, Nachtmann and Hunter (2006).

Syntetos, Nikolopoulos and Boylan (2010), however stated that inventory performance measurement should not be about inventoryrules/techniques but also the forecasting method. This is represented in figure 8.

**Fig. 6:** Inventory System Performance Measurement.




Source: Syntetos, Nikolopoulos and Boylan (2010)

It has been highlighted by IGD (2010) that 65% of UK consumers will switch stores or postpone purchase at the same store if they are unable to get what they want from a particular grocery store.

On the issue of cost, it is very difficult to get the value in monetory terms of the cost of an inefective inventory system to an organisation. Most of the respondents were not ready to give figures but they accepted that they incur costs due to wastage and obsolence. Dominick (2010) came up with a formula for calculating cost of stock out as:

CS = (NDOS x AUSPD x PPU) + CC
Where,
CS = Cost of a Stock-out
NDOS = Number of Days Out of Stock

AUSPD = Average Units Sold per Day
PPU = Price per Unit (some use Profit per Unit)
CC = Cost of Consequences

Though he is in support of having a lean strategy to manage inventory, he was quick to point out that inventory level must not be too lean as the consequence of Stock-outs is its negative impact on organization's revenue and putting money in competitors' pockets.

**Techniques of Inventory Management**

Monitoring and measurement of inventory has to do with finding out what has to be measured and monitored, this includes information gathering process, knowing what constitute a good warehouse management system and the benefit of using both inventory control and warehouse management together while working with limited systems. Inventory control sits at the data level business control hierarchy as defined by Tomlinson (1994) and cited by Ballard (1996). This may probably explain the reason why only two out of six respondents (i.e. the managers, grocery supervisors and warehouse supervisors) have an idea of the inventory management system in use within their organisation. Although, all the respondents gave a vivid explanation of how they manage inventory within the stores and believe that the inventory management system in use is computerised. Respondent $S_p$ when asked if she has an idea of the inventory management system in use by the company, she said it should be the same as she explained during the interview. Their lack of understanding of inventory technique was collaborated by Waller, Cassady and Ozment (2006) when they said inventory is often managed at the factory or warehouse level, not at store level because stores are seen as the marketing and sales outlet. This should not be an excuse as Ballard (1996) stated that inventory monitoring and measurement takes place at each point in the supply chain.

From the responses, it was gathered that inventory management depends on the size of the store and location. Another factor that determines the type of technique to be employed is the nature of the products.

It was gathered from respondent $F_f$ that creating a niche by specialising in unique range of products makes it easy to manage inventory and stock. This reduces the amount of stock to be counted and ordered.

One major trend that was noticed during physical shelf observation was the method of stock count in the big and the medium stores. They all seem to follow the same steps highlighted below.

- Daily exception count are carried out
- Recording of daily waste
- Daily gap scan
- Weekly count on bread, milk and sandwiches
- Weekly review of space plan implementation to maintain and manage product availability
- Review of stock on order reports and action stock on hand (SOH) issues

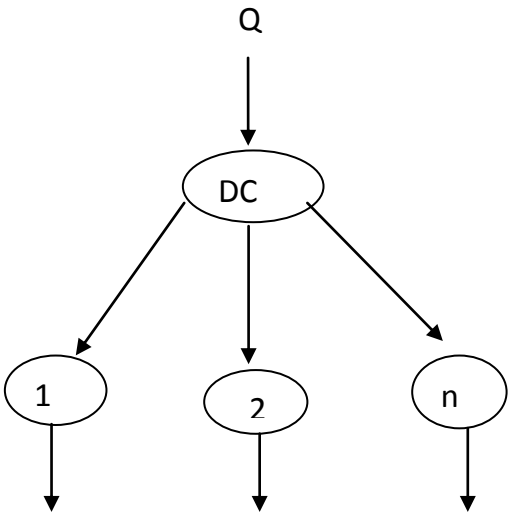
For the independent stores, it was gathered that inventory management still follows the traditional method of shelf observation and purchase of missing item on a cash and carry bases. They do not have any regular supplier or a form of agreements with suppliers.

With a follow up question of where replenishment comes from, it was observed that all the organisations except the small stores all have distribution centres spread across UK. Purchase and actual forecast are carried out at the distribution centres and head offices. All suppliers send in their products into the distribution centres based on agreed terms and conditions. The stores are then replenished based on individual request. This process is called cross-docking. According to Simchi-Levi, Kaminsky, and Simchi-Levi (2003), cross-docking is a process in which warehouse function as inventory coordination points rather than inventory storage points. When

respondent $F_f$ was asked how long it takes for an order delivery to arrive for replenishment from the depot after an order placement, he responded that it takes less than 24hours and sometimes that same day.

Figure below shows a retail distribution centre serving a number of stores. The arrow to the distribution centre node denotes the flow of inventory from suppliers to the retailers' distribution centre and the arrows out of the retail stores denotes consumer purchases (Waller, Cassady and Ozment, 2006).

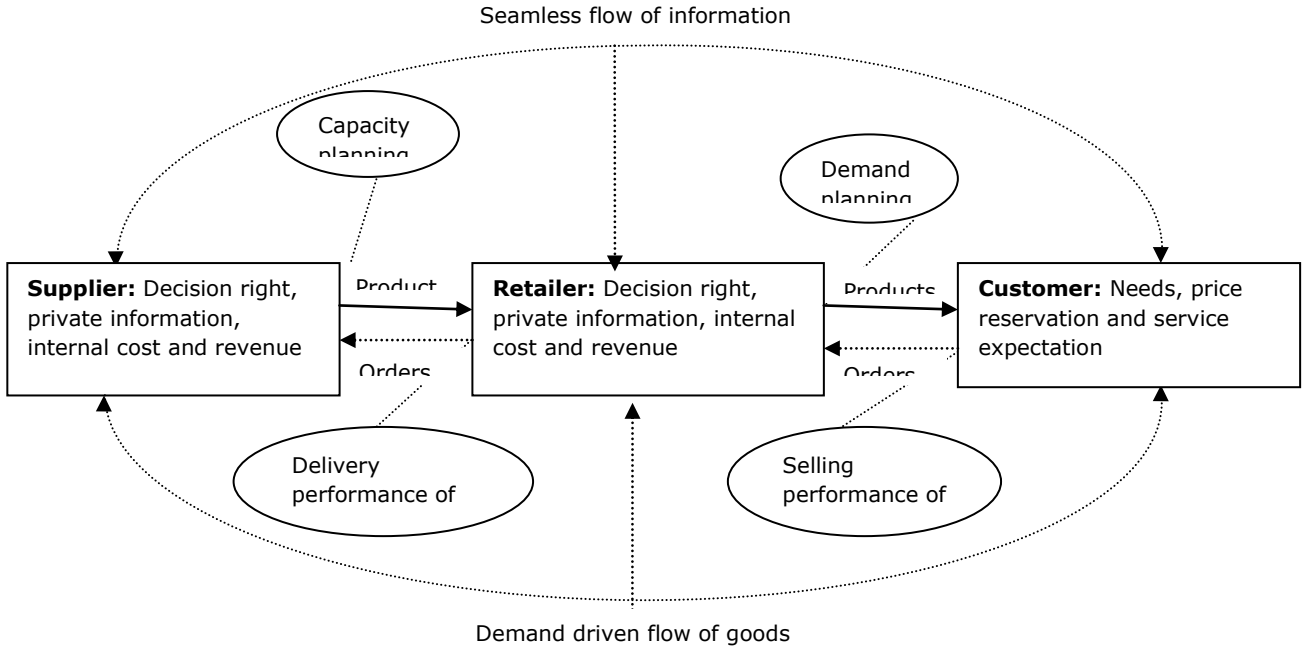
**Fig. 7:** Retail distribution system.




Source: Waller, Cassady & Ozment (2006)

From the interview, it was gathered that the stores are into collaboration with their suppliers (though not at store level). One key element noticed is the flow of information from consumer (use of POS data) through the retailers to the suppliers. This was captured and described by Derrouiche, Neubert and Bouras (2008) as a situation in which autonomous partners engage in efforts to effectively meet consumers' needs with lower cost. Figure 10 shows simple structure of supply chain collaborative SC.

**Fig. 8:** A simple structure of collaborative supply chain




Source: Derrouiche, Neubert and Bouras (2008)

On the difficulties faced in running the inventory management system, respondent $S_f$ and $F_f$ stated that staffing has always been a major issue. Respondent Ff was specific about the time factor. He said it takes him two hours every day to do stock count and place orders. The time he believed could have been used for other value adding activities. Respondent $S_p$ raised the issue of correct data entry and proper documentation and this was in line with what respondent $S_f$ said when he said issue of short staffing brings along 'overloading' of available staffs which results in documentation errors and the ripple effect is generated throughout the system. The issue of inaccurate inventory was raised by all respondents. According to Fleisch and Telkamp (2005), this could be resolved using two approaches: non-technology approach (use of benchmarking, awareness building and process improvement) and technology approach (e.g. use of RFID).

Respondent Sf, Sp, Ff, Sr, C and Ts gave between 80-85%, 75-80%, 100%, 100%, 97% and 100% as acceptable inventory level respectively, respondent I did not have any bench mark to measure his inventory level. Respondent Ff accepted that it is difficult to attain and maintain 100% stock level; the store has always been on a higher 90percentile. To support the claim, a real life data was shown to the researcher where out of about 5000 products the store stocks, four products were not on the shelf and this gives the store 97.8% inventory level.

**FINDINGS FROM THE PHYSICAL SHELF OBSERVATION AND INFORMAL INTERVIEWS WITH SHOP FLOOR STAFF**

The physical process observation and informal discussions with shop floor assistants revealed to a greater extent the submissions of the respondents about number of complaints received from the customers regarding the unavailability of their preferred products on the shelves.

It was however noticed that the most of the shop-floor assistants do not have any idea about inventory management within their stores even though they are involved in gap scanning. They are mainly concerned with customer service and shelf restocking. They also affirmed the submission by the other respondents that shelves are stoked immediately a gap is noticed baring any omission due to human error and non-availability of the products. Four of the interviewees provided an explanation into how stock counts and ordering are carried out based on their observations and interaction with the superiors. It was also found out through physical observation that replenishment was rapid. Staffs were seen going up and down carrying out manual checks and observation of store shelves to confirm which stock are running low to ensure that there is no gap on the shelves. Whilst some use electronic hand device to scan; these data are then transmitted or inputted into computer systems alongside sales data from EPOs. This data is then transferred to the depot(s) or distribution centre(s). However, most of them do not know what happened afterwards but they are of the opinion that the data are transferred to the suppliers or supplies are released to them form the inventory being held at the depots. The interviewees were of the opinion that stock frequently out of shelves are caused by internal inefficiency as the suppliers are prompt in their response when it come to meeting order deliveries.

The interviews with shop-floor assistants were specifically intended to gain more insight into the rate of customer complaints, product availability and replenishment. Six shop-floor assistants were interviewed. When asked how often the store runs out of a product both on the shelf and in the storeroom, a major response was "not too often", two of the interviewees answered the question by saying "*hardly"*. They said it happens mostly when there are promotions or special events like the FIFA world cup.

These findings from the physical observation and informal interviews with shop floor staff corroborate the views provided by the respondents collated through semi-formal interviews; staffs were seen carrying out stock counts and replenishments. Some were seen advising consumers on alternative products when the products of their choice were not available.

**Conclusion**

In essence, this research was undertaken to provide an understanding of inventory management whilst at the same time providing an insight into performance measures in the grocery supply chain and the impact of inventory management on the measures. This research has looked at the analysis of different inventory management systems in the grocery retail organisations and the relationship to performance.

All respondents are stakeholders in the grocery supply chain based in Aberdeen. The grocery retail industry differs from other industries because it is very difficult to define the boundary as most of the stores sell other products like mobile telephones etc. As a result, further research could be carried out to analyse the inventory management systems in the retail industry and see if there are similarities.

**Recommendations**

This study considers a relatively a small sample of the population which might make it difficult to generalise the result.

The sample included only the stores located in Aberdeen. It would have been more useful to have respondent from the head offices of these organisation as most of the inventory related decisions are taken there.

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